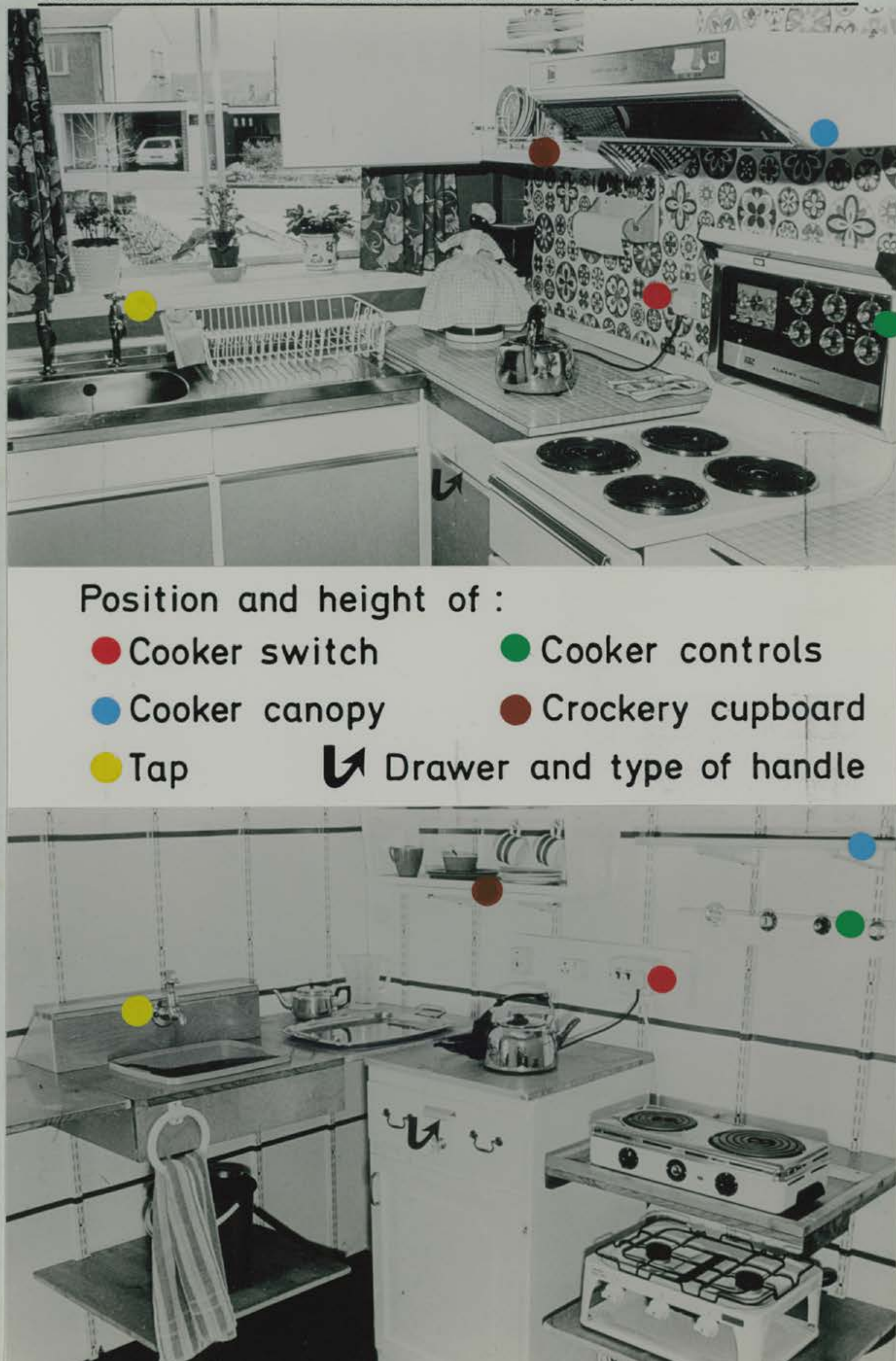
FIGURE 9.4 (i)

SIMULATION OF A HOME SITUATION IN THE A.D.L. ASSESSMENT UNIT



SUMMARY

The randomised controlled trial has been introduced into the evaluation of health services in order to obtain comparable data as a basis for testing hypotheses about alternative methods of providing health care. Using epidemiological methods enables the results of evaluation studies to be applied to whole populations once it has been demonstrated that changes in the organisation of health care can alter the natural history of disease for the better.

This approach has been adopted in the planning and conduct of a study which has tested the hypothesis that a stroke unit could discharge a higher proportion of elderly patients with acute stroke who were independent in daily living activities compared with the proportion of such patients who were discharged from medical units.

The data enabled the hypothesis to be accepted. Differences in the use of some of the components of stroke rehabilitation which could have contributed to the improved functional outcome of stroke unit patients were identified. These differences included nursing dependency, social work involvement, provision of aids/adaptations, utilisation of physiotherapy and occupational therapy and communication between hospital staff and the families of patients. The intensive use of therapy that might have been implied by the creation of a stroke unit did not occur. What was achieved in the stroke unit was almost universal coverage of physiotherapy and occupational therapy, and shorter delays before commencing treatment. Adopting an epidemiological approach enabled the size of a stroke unit per unit of population to be calculated.

The/

The improvement in outcome amongst stroke unit patients compared with medical unit patients which was present at the time of hospital discharge had disappeared by the end of one year. This occurred despite better communication in the stroke unit between hospital staff and patients' families, general practitioners and community health and social services at the time of hospital discharge. Moreover, the utilisation of hospital and community services following hospital discharge was higher amongst patients from the stroke unit compared with patients from medical units throughout the follow-up period of one year.

Factors which might have contributed to the final outcome were the over-protection of stroke unit patients living at home who were not permitted to carry out activities of daily living in which they were independent; and the early discharge from medical units of a group of dependent patients whose full rehabilitation potential had not been realised.

Thus, whilst intervention in the management of stroke at an early stage after onset through the establishment of a stroke unit created a temporary improvement in the natural history of the disease, the improvement was not sustained in the long term over more conventional management in medical units.

PREFACE

Much of the work on which this thesis is based was undertaken on research contract K/OPR/2/2/C298 awarded to the author by the Scottish Home and Health Department, with Drs. A.J. Akhtar, R.J. Prescott and L. Hockey as co-investigators.

Dr. A.J. Akhtar was responsible for the clinical organisation and management of the stroke unit; undertaking home visits to establish patient's eligibility to participate in the study and supervising clinical members of the research team who made up the on-call rota for home visits; and for initially suggesting the tests which comprised the neurological examination.

Dr. R.J. Prescott was responsible for statistical advice in the design of the study and the analysis of results; for devising the randomisation procedures which were adopted for the study and supervising the computing component of data processing.

Dr. L. Hockey was responsible for supervising the data collection of nursing dependency during the acute phase of rehabilitation; providing advice on the composition and administration of the Nursing Dependency Index used throughout the continuing phase of rehabilitation.

I declare that this thesis has been composed entirely by myself, and that the work which is described in the thesis has been carried out entirely on my own, or under my supervision, with the exception of the contributions which have been specified above.

C O N T E N T S

PART 1

REVIEW OF THE LITERATURE

PART II

PLANNING AND CONDUCT OF THE STUDY

PART III

RESULTS OF THE STUDY

PART IV

DISCUSSION

P A R T I

REVIEW OF THE LITERATURE

CHAPTER 1

EXAMINING THE WORKING OF HEALTH SERVICES

Summary

Evaluation based on scientific principles is required to overcome the deficiencies of traditional methods of developing health services which were based on subjective judgements or descriptive evidence only. The adaptation of the randomised controlled trial to the field of health care has been suggested as one way of achieving this. Because health care trials must be carried out in the context of the organisation of health services, limitations in their planning and conduct must be observed. Adopting an epidemiological approach to health care studies enables the results to be applied to whole populations once it has been demonstrated that changes in the organisation or use of health services can alter the natural history of disease for the better.

Evaluation of Health Services

To examine critically the working of health services is not a new idea in itself. The first interest in examining differences in practice was expressed over a century ago when William Farr, Sir John Simon and Florence Nightingale figured prominently amongst those who advocated "a carefully conducted comparison of hospitals to determine the relative value of different methods of treatment" (Mackay, 1951). This view never attracted the attention it deserved, probably because the provision of health services at that time was based on needs which were well understood and accepted by both medical practitioners and their patients.

They constituted the control of communicable disease in the community and the provision of basic nutrition and hygiene for the individual. The term evaluation used in the context of examining the working of health services, should not be used indiscriminately to describe assessments which take the form of subjective judgements of success or failure (Klineberg, 1955). This view is supported by the World Health Organisation (1973) whose working definition of evaluation of health services is: "the systematic and scientific process of determining the extent to which an action or set of actions are successful in achieving predetermined objectives. It involves measurement of the adequacy, effectiveness and efficiency of health services". Using the term evaluation in this way implies a comparison between alternatives conducted as far as possible by a rigorous scientific method (World Health Organisation, 1968). The scope of evaluation in health services includes the range of services available, the personnel and facilities for providing them and the conditions that affect their receipt such as organisation, costs and attitudes towards both giving and receiving them. The distinguishing feature of an evaluation project is that knowledge being sought will be used as a guide for practical action (Fleck, 1963), and it constitutes one of the few ways open to us to rationally change the direction of our activities (Hyman, 1962).

The Traditional Method of Developing Health Services

Since the inception of the National Health Service, many practitioners who have otherwise done excellent work under difficult conditions, have been unwilling to proceed with an evaluation of their efforts. If a need for a particular service appeared to exist, then supplying that service in accordance with the best available knowledge seemed to be sufficient justification in itself. Reports issued on the working of the Health Service have usually failed to carry conviction precisely because we can never be sure that other individuals sitting in judgement of a particular problem might not come up with an entirely different solution. For example, the conflicting conclusions drawn by different reports concerning the future requirements for medical manpower (Morrison, 1968), or the divergent views about the role of the community hospital (Ministry of Health, 1962 a, b). This is in striking contrast to modern therapeutic practice where there would be no question of introducing a new preparation without it undergoing the closest scrutiny for therapeutic potency and side effects. Yet different patterns of health care provision which may have a greater bearing on a patient's future than many therapeutic substances are introduced with very little if any attempt at scientific assessment (Garraway, 1976).

Innovations in the provision of health services have been introduced where differences appeared to be present on the basis of clinical opinion or descriptive assessment, but whose effectiveness has subsequently been questioned. An example of this is the introduction of the coronary care unit for treating acute myocardial infarction. The first description of the recovery of a mammalian heart from ventricular fibrillation by electrical shock was reported in 1929 (Hooker, 1929). The sequence of events which occurred over the following years culminating in hospital coronary care units providing continuous monitoring and defibrillating facilities is summarised in Table 1.1.

TABLE 1.1

SEQUENCE OF EVENTS LEADING TO CORONARY CARE

1929	First successful demonstration of the effect of electrical shock on ventricular fibrillation in monkeys. Hooker (1929). Am.J.Physiol; 91 : 305-328
1947	First successful open chest electrical defibrillation of a human heart. Beck,C.S., Pritchard, W.H. & Feil, H.S. (1947). J.A.M.A.; 135 : 985-986
1956	First successful application of closed external defibrillation in a patient. Zoll,P.M., Linenthal,A.J., Gibson, W. et al, (1956). New Eng. J. Med.; 254 : 727-732
1960	First published series of closed external defibrillation following acute myocardial infarction. Zoll,P.M., Linenthal, A.J. and Zarsky,L.R.N. (1960). New Eng. J. Med.L 262 : 105-112
1963	First report describing the work of an intensive coronary care unit. Day, H.W. (1963). Lancet; 83 : 53-55.

Subsequent studies advocated an extention of the principle of coronary care by arguing, on the basis of observational evidence only, for mobile coronary care units (Adgey, Nelson, Scott et al, 1969). Yet the time distribution of an early high mortality from acute myocardial infarction (Fulton, Julian and Oliver, 1969), evidence of delays occurring in the provision of medical services following acute heart attacks (Armstrong, Duncan, Oliver et al, 1972) and deficiencies in the public's knowledge of the signs and symptoms of acute heart attacks (Moore and Garraway, 1976) suggests that the provision of specialised coronary care facilities will be no more effective in reducing mortality from acute heart attacks than a more general organisation of medical care. Experimental studies (Mather, Pearson, Read et al, 1971; Hill, Hampton and

Mitchell, 1978) concluded that home care may be just as effective as hospital admission for treating the majority of patients with acute myocardial infarction, although the previous widespread development of coronary care units is already a fait accompli.

Experimental Studies of the Working of Health Services

(a) The place of the randomised controlled trial

The randomised controlled trial is an application of a statistical method in medicine which is now generally accepted as the method by which the efficacy of new treatments in clinical medicine should be assessed. Although earlier examples of the use of this type of experimental approach had been reported (Amberson, McMahon and Pinner, 1931; Hinshaw and Feldman, 1944) after Fisher wrote his classical account of randomisation in agricultural field experiments in 1926 (Fisher, 1926), the step forward which launched the experimental approach to clinical medicine was the publication of the Medical Research Council's Trial of Streptomycin Treatment of Pulmonary Tuberculosis in 1948 (Medical Research Council, 1948). Examples of the wide and varied applications of the controlled trial in therapeutic and preventive medicine have been described by Bradford Hill (1962), but it is only comparatively recently that the contribution which the controlled trial could make to health care has been put forward for consideration (Cochrane, 1972). This suggestion was made as a result of misgivings about the adequacy of introducing innovations in the organisation of health care on the basis of observational evidence alone. This is analogous to the similar deficiencies which existed in the approach to clinical medicine prior to World War Two, and which were subsequently high-lighted as the raison d'etre for the introduction of chemotherapeutic trials for tuberculosis (D'Arcy Hart, 1946).

(a) The use of the randomised controlled trial

The aim of using the controlled trial to evaluate the working of health services is to provide accurate comparable data as a basis for testing specific hypotheses about the outcome of alternative methods of providing health care (Garraway and Prescott, 1977). Although controlled trials have been used widely in therapeutic and to a lesser extent in preventive medicine (with the notable exception of health education), epidemiologists and medical statisticians have been slow to turn to the controlled trial in assessing the working of health services. There are reasons for this in addition to the ethical, logistical and methodological problems which are encountered in the organisation of a therapeutic controlled trial. First of all, it is difficult to identify problems in such a way that they can be researched by a controlled trial (World Health Organisation, 1976). The planning and organisation of health services is often undertaken in a fairly general way and may not be readily adaptable to provide the circumstances in which a precisely formulated hypothesis can be tested by a controlled trial. The second problem is that evaluation of the working of health services requires the consideration of hundreds of variables (Williamson, 1971) and it is often difficult to identify which factors have the greatest probability of effecting significant improvement in the health of the target population. It is therefore difficult to clearly define alternative patterns of health services which might form the basis for the comparisons necessary to test hypotheses. A third deterrent has been the difficulty in defining the measures to be used as end results or outcomes of controlled trials (Shapiro, 1967). Many factors other than medical care may influence outcome and precautions must be taken to hold all significant factors other than medical care constant if valid conclusions are to be drawn, (Donabedian, 1966). Although some outcomes are generally unmistakable (e.g. mortality), other outcomes, not so clearly defined, can be difficult to measure. These include patients attitudes and satisfactions, social restoration, physical disability and rehabilitation. A further important consideration is that outcomes per se may well indicate good or bad medical care overall, but they do not give any insight into the nature and location of the deficiencies or strengths to which the outcome might be attributed. Finally, it has been pointed out that controlled trials of health services, by their very nature, often involve a large number of individuals of several different professions and this makes the task more complicated than, for instance, a randomised trial of the efficacy of a therapeutic treatment, (World Health Organisation, 1976).

Consequently, comparatively few controlled trials have been completed. Studies have been concentrated on areas with clear cut outcomes such as differences in mortality in home versus hospital care following acute heart attack (Mather, Pearson, Read et al, 1971; Hill, Hampton and Mitchell, 1978) or the effect on hospital re-admission rates of differing lengths of hospital stay following elective surgery for conditions such as inguinal hernia or varicose veins (Ruckley, Cuthbertson, Fenwick et al, 1978; Russell, Devlin, Fell et al, 1977; Adler, Waller, Creese et al,1978).

(c) <u>The limitations of the randomised controlled trial</u>

It has been suggested that controlled trials in health care have many similarities to their counterparts in the field of therapeutics (Alderson, 1976). However, health care trials must be carried out in the context of the organisation of health services and this places restrictions on their planning and conduct. The following are the main limitations which apply to the use of controlled trials in evaluating the working of health services (Garraway and Prescott, 1977).

(i) <u>Natural history of disease</u>

Once the planning of a controlled trial is complete, the criteria which have been adopted must be strictly obeyed. Modifications to the natural history of disease whose health care is being studied which are reported after a controlled trial has begun may invalidate trial criteria and reduce the significance of its findings.

(ii) <u>Blindness</u>

Double blind procedures are widely used in therapeutic trials in order to avoid the possibility of bias. Blindness will seldom be achieved in a health care trial. Patients will usually have to be informed of the option they have drawn. In most situations, members of the health care team will know the pattern of care which patients are receiving. Accordingly, careful attention must be given to devising methods of monitoring for bias.

(iii) <u>Observer variation</u>

In the absence of blindness, measurements should be made using independent observers, employed in such a way that each observer 'measures' the response on each subject. This will not eliminate bias in itself, but allows a measure of observer variation in either direction to be obtained. Estimates of observer variation should form an important part of all health care trials.

(iv) Establishing sample size

Sample size must be established in advance if an accurate estimate of the length of a study is to be made. This requires baseline information and the variability between subjects. It is often difficult to find comparable data to satisfy this requirement for trials involving the working of health services.

(v) Choice of outcome variable(s)

The difficulty of defining appropriate outcome measurements for use in health care trials has already been mentioned. A further problem lies in deciding which variable to select for testing out of the many hundreds which may be available. A suitable compromise is to study, in depth, a limited number of variables reflecting different areas of outcome that can be identified and for which suitable measurements can be developed

(vi) Area differences

Geographical areas may have different local priorities, one area being influenced by the social consequences and another by the cost of the alternative patterns of health care being examined. The relative merits of the options being tested must therefore be weighed up, taking into account the size and importance of differences that have been found in each variable.

(vii) Limitations in inference

The controlled trial in therapeutics enables broad inferences to be drawn which can then be applied to patients in many different locations. This extrapolation cannot be justified in health care trials, the results of which may be influenced by many factors other than the alternative methods of health care which are being compared. Replication of health care trial results elsewhere is required before wider inferences can be made.

Using Epidemiology in Health Services

What is the place of epidemiology in examining the working of health services? Cochrane (1972) has suggested that it should be used as the basis for determining the effectiveness of medical services, i.e. measuring the extent to which stated objectives are achieved in relation to activity and subsequent outcomes or end results (World Health Organisation, 1973). This is similar to the view expressed by Morris (1975) that the place of epidemiology was to ensure the systematic study, by observation and experiment,of the working of health services with a view to their improvement. Including epidemiology in the study of health care enables the results to be applied to whole populations once it has been demonstrated that changes in the organisation or use of health services can alter the natural history of disease for the better.

The contributions which epidemiology can make towards this aim are twofold. Firstly, it brings knowledge of the frequency, distribution and determinants of disease. This includes the identification of appropriate groups in the population who should obtain maximum benefit from changes in the organisation of health services. The second contribution which epidemiology can make is through the application of methodology which has been developed in descriptive, analytical and experimental studies. The emphasis of the epidemiological method is based on objectivity and definition of the disease under examination, the population being studied and the organisation of the health services being considered. Thus, epidemiology should be able to identify and define a "high risk" or susceptible disease group within a defined population who would derive most benefit from intervention in their health care. Epidemiology should, through its knowledge of the natural history of disease, be able to determine what intervention would be most appropriate, when it should occur, what form it should take and how much of it should be used.

So far no randomised controlled trials have been successfully employed in examining the working of health services for stroke although this disease forms a major burden on health services. This may be due, at least in part, to the fact that it is only comparatively recently that the epidemiology of this disease has been described.

CHAPTER 2

THE EPIDEMIOLOGY OF STROKE

Summary

The incidence rate for stroke is up to 1.5 per 1,000 person years. Rates are higher in males than females at all ages, and rise rapidly with increasing age. Despite an overall decline in the incidence of stroke, prevalence rates remain stable because of an increased probability of survival. Risk factors for stroke are not well established. Consequently, stroke prevention remains in its infancy. The natural history of the disease is such that after an early period of high mortality, the prognosis for survival is good in terms of years of life, despite the presence amongst survivors of high levels of functional dependence.

Definition of Stroke

The short, harsh-sounding word stroke is well suited to describe one of the most sudden, unexpected and disabling of diseases. Other words which are used synonymously with stroke include apoplexy, cerebrovascular disease and cerebrovascular accident (C.V.A.).

Stroke is defined as the sudden onset of a focal neurological deficit due to a presumed local disturbance in blood supply to the brain. 'Sudden' refers to a time period which may range from a few seconds to several hours or even several days (World Health Organisation, 1971). The underlying vascular disturbance manifests itself as various neurological symptoms. These are related to the extent and site of the area involved, to the speed with which the pathological process develops, and to the underlying condition. The neurological manifestations in turn produce physical and/or mental impairment, leading to transient or permanent disability and handicap. The term stroke is usually reserved for cases where the neurological deficit is present for 24 hours or longer, the term transient ischaemic attack (T.I.A.) being used to describe episodes of neurological deficit which are present for less than 24 hours.

Frequency and Distribution

It is only recently that the basic descriptive epidemiology of stroke has been studied (Eisenberg, Morrison, Sullivan et at, 1964; Brewis, Poskanzer and Rolland, 1966; Aho and Fogelholm, 1974; Abu-Zeid, Choi and Nelson, 1975; and Stensgaard, Hansen and Marquardsen, 1977). Whilst the criteria used to define stroke in these studies and the demographic and ethnic characteristics of the populations on which they are based differ, there is general agreement that the incidence rate of stroke is about 1.5 per 1,000 person years, and the point prevalence rate is 5.0 per 1,000 persons. Probably the most accurate morbidity statistics available are those based on the defined population of Rochester, Minnesota (Whisnant, Fitzgibbons, Kurland et al, 1971; Matsumoto, Whisnant, Kurland et al, 1973). Table 2.1 summarises the age and sex specific incidence rates from this source. The incidence rate of stroke in males is higher than females in all age groups, and rises sharply with increasing age in both sexes. The prevalence rate shows the same steeply rising rate. As regards diagnostic categories, about 80 per cent of all stroke can be categorised as cerebral thrombosis (including both cerebral infarction and embolus); 10 per cent as primary or secondary intracerebral haemorrhage; and five per cent as subarachnoid haemorrhage,

TABLE 2.1

AGE AND SEX SPECIFIC INCIDENCE RATES FOR STROKE
AVERAGE ANNUAL RATES PER 100,000; 1955-69

Age Group (in years)	Male	Female	Total
35	3 (6)	5 (10)	4 (16)
35-44	43 (15)	27 (10)	35 (25)
45-54	158 (43)	71 (24)	110 (67)
55-64	511 (104)	261 (75)	364 (179)
65-74	1082 (147)	603 (127)	791 (274)
75	2504 (163)	1988 (269)	2156 (432)
TOTAL	165 (478)	146 (515)	154 (993)
Age Adjusted*	204	128	158
Age & Sex Adjusted*			164

Figures in parentheses are actual number of cases

* Adjusted to the U.S. 1950 white population

Source: Matsumoto, Whisnant, Kurland et al, 1973. Stroke, 4, 20-29

based on defined clinical criteria. A further five per cent is classified as stroke of uncertain origin. Difficulty in maintaining continuity has made it difficult to investigate time trends in the occurrence of stroke, but a recent study using the defined population of Rochester (Garraway, Whisnant, Kurland et al, 1979) showed that the overall incidence rate had decreased over the past 30 years to an age adjusted rate of 104 per 100,000 person years during the quinquennium 1970-74. It could be concluded that the problem of stroke is becoming less serious, but this is not so. Another study of the defined population of Rochester, Minnesota did not show a corresponding decrease in the point prevalence of cerebral infarction during the same time period (Garraway, Whisnant, Kurland et al, 1979). This was because the decreasing incidence has been matched by an increasing probability of survival between the quinquennial periods 1945-49 and 1970-74. The proportion of patients with a first episode of cerebral infarction who survive up to five years after onset has gone up by no less than 16 per cent between these quinquennial periods. This improvement may be a result of a reduction in the rate of progression of the underlying vascular disease. It may also represent therapeutic progress in the treatment of associated disease such as congestive heart failure and respiratory infection in persons with established cerebral infarction.

Aetiology

What is known about the aetiology of stroke? The pathogenesis of stroke is occlusion, stenosis or rupture of vessels in the intra- or extracerebral circulation. Evidence from autopsy studies (Sternby, 1968) has established the association between widespread atheromatous plaques in the cerebral circulation and mortality from stroke. Our knowledge of the risk factors of stroke has been derived from studies originally designed to investigate arteriosclerotic heart disease (American Heart Association, 1972). Consequently, the risk factors of stroke are not so well defined.

This is because cohort studies have been orientated towards ischaemic heart disease and relatively few strokes have been available on which to estimate the relative risk of stroke from the presence of personal risk factors. In general, it would appear that the relative risk of stroke occurrence is less than that for ischaemic heart disease for factors such as the presence of obesity, diabetes mellitus, cholesterolaemia, smoking and electrocardiographic abnormalities, but greater for the presence of hypertension (Kannel, Dawber, Sorlie et al, 1976).

Natural History

It has previously been suggested that no single medical measure could make such a contribution to the quality of life in old age as the prevention of stroke (W.H.O., 1971). But the problems which have been encountered in establishing the effectiveness of stroke prevention programmes, particularly in community surveillance and control of hypertension, means that stroke prevention remains in its infancy. It is therefore important to appreciate the course which the natural history of stroke takes once clinical onset has occurred. Up to 50 per cent of mortality resulting from stroke occurs in the first three weeks following onset (Eisenberg, Morrison, Sullivan et al, 1964). Once this initial period of high mortality is over, the prognosis for life is good, with a constant probability of dying of approximately eight per cent per annum. This, it has been postulated, is because the risk of dying for survivors is related not to the mental or physical disability caused by the lesion but to the slow progression of the underlying vascular disease (Marquardsen, 1969).

The natural history of stroke follows a similar pattern to that of acute myocardial infarction, with an initial period of early mortality followed by a good prognosis for life for the survivors. However, unlike survivors of myocardial infarction who regain independence in weeks or months (Sharland, 1964), stroke survivors have high levels of physical and mental dependency as a result of residual disability (Marquardsen, 1969). The consequent long-term needs of stroke survivors constitutes a considerable burden on health services.

CHAPTER 3

THE BURDEN OF STROKE

Summary

Stroke creates a major burden on the family and the resources of health and social services. A large reservoir of stroke patients require support from community services and the consequences of stroke have a major impact on the hospital service. Stroke utilises more hospital bed days than any other single disease group. Projections of hospital utilisation by stroke to the end of the century show a marked increase.

The Burden on the Family

It has been estimated that up to 130,000 persons live in private households in Great Britain handicapped to at least some degree by stroke (Harris, 1971). Thirty per cent of such persons are in need of special care, being dependent on someone else for the performance of daily living activities. This large reservoir of disability has important implications for involvement of relatives and friends of stroke patients and for the provision and use of community health services. A stroke is a massive blow not only to the patient, but to his whole family. It forces a dramatic change in the family's life style and in the patient's role within the family. Borden (1962) has highlighted the psychological problems of stigma and loss of self esteem following stroke which can be such a burden to the family. The home situation has been shown to be under particular strain in cases where patients have deteriorated mentally following stroke (Collins, Marshall and Shaw, 1960). This occurs while the family has to cope with feelings of guilt over the stroke, which in turn can lead to over-protection of the patient and increase his dependency on the family. Yet the important role of the family in providing a supportive role to the stroke patient has been recognised (Litman, 1964). Patients tend to look for and receive both comfort and encouragement from their immediate families who play an important role in augmenting the patient's response to treatment. One might expect that the policy advocated by Rusk and Novey (1957) of understanding what is involved for the family in coping with specific types of long-term illness such as stroke would be widely adopted. This is particularly important if, as has been suggested, the sort of adjustment that the patient and his family can make to their new situation will determine the patient's ability to live in a non-institutional environment (Hyman, 1975). But one study concluded that often, very little effort has been made to involve the family following stroke admission to hospital, as social and emotional issues are pushed into the background by frenetic physical activity. Often, neither the patient or his family may understand the nature of his illness or treatment because of inadequate information (Mykyta, Bowling, Nelson et al, 1976).

The Burden on the Health Service

The value of community health services in maintaining continuity of care following hospital discharge of stroke and providing support for the family has been recognised (Report of the Joint Committee for Stroke Facilities X., 1974). One might therefore reasonably expect data to be available on which the planning of community services can be undertaken for specific groups of diseases. But surprisingly, the only utilisation data which is available on services such as community nursing or the home help service is collected for administrative purposes only and cannot be analysed in a disease orientation form.

A report issued by the World Health Organisation (1971) stated that acute stroke should be equated with a medical or surgical emergency and requires hospital admission. But there is considerable dispute as to what proportion of strokes are actually admitted to hospital during the acute phase. Langton Hewer (1976) estimated that only 40 per cent of patients with an acute stroke are admitted to hospital in Bristol within the first week. This estimate is similar to that given by Cochrane (1970) who stated that 60 per cent of all "clinical" strokes in South Wales do not go to hospital and that they are similar as regards severity and case fatality to those which are hospitalised. In neither of these statements was any indication given that the proportions quoted were based on defined populations. Nor was the definition of stroke which was used given. The most reliable way of estimating the proportion of strokes receiving hospital care is to establish a stroke register based on a defined population (Harmsen and Tibblin, 1972). Such a study has been done in South East England (Weddell, 1974). All persons in the area of Frimley and Farnham who had a stroke defined as a focal neurological deficit lasting 24 hours or more, due to any underlying pathological cause of sufficient severity to necessitate medical or nursing care at home or in hospital between 1st December, 1970 and 31st May, 1972 were included. Of those patients registered within three weeks of occurrence, 73 per cent were receiving hospital care. The difference between Bristol and South Wales on the one hand, and Frimley and Farnham on the other, may be due to incomplete recording of the total number of cases occurring in the catchment areas of the admitting hospitals. The extent of hospital admission for acute stroke in a particular locality will also depend on the health services policy which is adopted towards such admissions. This in turn may be influenced by the levels of provision of both hospital and community based health and social services.

Evidence that stroke is creating a burden on the hospital service comes from opposite ends of the hospital spectrum; at admission and on discharge. Warren, Cooper and Warren (1967) studied referrals for urgent admissions to hospital by general practitioners made through the Emergency Bed Service (E.B.S.) in London. Of 237 patients with stroke presenting for admission through the E.B.S., only 48 (20%) were placed without difficulty. Eighty-three (35%) had to be mandated into hospital by the Regional Medical Admissions Officers, and the remaining 106 (45%) of patients were refused emergency admission and were referred back to their general practitioner. At the other end of the spectrum, a study of the utilisation of acute medical wards in Aberdeen (Sutherland, 1972) found that long-stay patients occupied one-third of all acute medical bed days. A diagnosis of cerebrovascular disease was shown to be closely associated with this group of patients who constituted 'bed blockers'. This term was not specifically defined in the study.

Hospital Utilisation by Stroke

The contribution which stroke makes to the utilisation of hospital resources is considerable. The period prevalence rate of hospital admission for cerebrovascular disease in Scotland in 1976 was 2.6 per 1,000 persons per annum (Information Services Division, Common Services Agency, 1978). This constituted 2.5 per cent of ALL hospital admissions in Scotland during 1976 (excluding mental illness, mental deficiency and maternity) and was the second commonest cause of admission. The proportion of hospital bed occupancy attributable to stroke is summarised in Table 3.1. In 1976, cerebrovascular disease had the highest

TABLE 3.1

LEADING CAUSES OF HOSPITAL BED UTILISATION*, SCOTLAND, 1976

DISEASE	BED DAYS USED Male %	 Female %	 Total %
Cerebrovascular Disease	3.4 (328477)	7.7 (742521)	11.1 (1070998)
Pneumonia	2.8 (232692)	5.2 (497032)	7.6 (729724)
Acute Myocardial Infarction	1.5 (149081)	1.6 (149516)	3.1 (298597)
Fractured Neck of Femur	0.3 (31958)	1.5 (137139)	1.8 (169097)
Bronchitis and Emphysema	1.1 (102668)	0.6 (58722)	1.7 (161390)

Figures in parenthesis are actually numbers of bed days

*Excluding maternity and mental illness

Source: Scottish Hospital Inpatient Statistics, 1976. Information Services Division of the Common Services Agency, Scottish Health Service, Edinburgh, 1978.

occupancy of hospital bed days of any diagnostic group, utilising no less than 1,070,998 bed days. This represents 11.1 per cent of all bed days in all specialties for that year (excluding mental illness, mental deficiency and maternity). How and where are patients with stroke admitted to hospital in Scotland? Table 3.2 presents the type of hospital unit from which stroke patients were discharged, medical units making the largest contribution with 56 per cent of all stroke discharges, four-fifths of whom are admitted as emergencies.

TABLE 3.2

HOSPITAL SPECIALTIES DISCHARGING STROKES, SCOTLAND, 1976

Type of Unit	No. of Discharges (%)
General Medicine	8144 (56)
Geriatric Medicine	4072 (28)
Neurology	147 (1)
Neurosurgery	481 (3)
Physical Medicine	214 (2)
All Other Units	1435 (10)
Total	14493 (100)

Source: Scottish Hospital Inpatient Statistics adhoc tabulation MORA 8/218A. Information Services Division of the Common Services Agency, Scottish Health Service, Edinburgh 1979.

This represents almost nine per cent of discharges from general medical units from all diagnostic groups.

The prospects for the future are not promising. The trend over the past few years in Scotland shows a relative increase in the proportion of hospital bed days being devoted to the care of stroke patients in relation to total available resources, particularly in the elderly age groups (Garraway, 1976). The percentage of all hospital bed days occupied by patients with a diagnosis of cerebrovascular disease increased from 7.4 and 10.2 per cent for males and females respectively in 1968 to 8.6 and 12.8 per cent for the two respective sexes in 1976 (Table 3.3).

TABLE 3.3

TREND IN HOSPITAL BED UTILISATION, SCOTLAND, 1968-1976: PROJECTED TO 1981, 1991 and 2001

	Bed Days used (or projected)	
	Males (%)*	Females (%)*
1968	319772 (7.4)	545235 (10.2)
1976	328477 (8.6)	742521 (12.8)
1981	355213 (9.3)	829535 (14.3)
1991	404867 (10.6)	997762 (17.2)
2001	454521 (11.9)	1165990 (20.1)

*Percentage relate to actual or projected TOTAL bed day utilisation.

Source: Derived from Scottish Hospital Inpatient Statistics adhoc tabulations MORA 8/218B. Information Services Division of the Common Services Agency, Scottish Health Service, Edinburgh, 1979.

If the average annual percentage increase in bed day utilisation by stroke seen during the period 1968-1976 is projected, patients with stroke will occupy 12 and 20 per cent of ALL male and female hospital bed days respectively (excluding mental illness and maternity) by the year 2001 (Table 3.3). This assumes that hospital admission and discharge criteria as well as hospital treatment policy remains the same, and the number of available bed days is constant. The incidence of stroke rises rapidly with age, and the trend will be further accentuated by population projections which predict a relative increase in the elderly, particularly amongst the very elderly for the rest of this century (Office of Population Censuses and Surveys, 1976).

The Economic Cost of Stroke

The economic cost of cerebrovascular disease is difficult to estimate. It is not possible to quantify the suffering and loss of quality of life of stroke patients and their caring relatives and friends who look after them in economic terms. The direct costs of the use of resources by stroke in the health service in Scotland have been calculated (Carstairs, 1976). These represented almost five per cent of all National Health Service costs, and amount to 17.5 million pounds at 1974 prices. Only five per cent of the direct costs were for general practitioner and home nursing services, the hospital service absorbing 93 per cent of all direct costs. Unfortunately, Scottish Hospital Costs are calculated on the basis of inpatient weeks in different types of hospital, and do not allow costs for specific diagnostic categories to be analysed.

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? What impact has the introduction of advances in medical technology and in therapeutic and surgical practice had on the natural history of stroke?

CHAPTER 4

THE IMPACT OF MEDICAL TECHNOLOGY ON STROKE

Summary

Developments in special diagnostic procedures applied to stroke have ensured better anatomical localisation of lesions, made more specific diagnosis possible, or allowed the correct underlying pathological process to be identified; but have not been shown to improve the natural history of the disease for the better. Despite numerous therapeutic trials, the indications for medical treatment remain few. Surgical intervention has given promising results following subarachnoid haemorrhage from ruptured aneurysm, but this group only comprises a very small proportion of stroke. Changing the organisation of stroke care to provide intensive care equipment, facilities and staffing has no impact on overall mortality during the immediate period following onset.

Diagnostic Procedures

The extent to which patients with stroke should be investigated in order to establish more specific diagnostic categories is uncertain. The dilemma is that a proportion of patients presenting as stroke have underlying pathology which is not primarily related to the cerebral circulation (Jennett, 1968). For example, Heasman and Lipworth (1966) found that a cerebrovascular condition had been diagnosed clinically in 10 per cent of 180 patients found at post mortem to have died from a neoplasm of the brain. Among a group of 303 patients having signs and symptoms of cerebrovascular disease seen by the neurological service at Bellevue Hospital, New York (Groch, Hurwitz, Wright et al, 1960), four were later found to have non-vascular pathological lesions. The advent of Computer Assisted Tomography (C.A.T.) has extended these findings. In a recent series of 130 patients in whom the initial diagnosis of cerebrovascular disease was made on a clinical basis and who subsequently had C.A.T. scanning, 30 had other lesions ranging from glioma, meningioma, metastatic carcinoma, subdural haematoma and generalised atrophy (Weisberg and Nice, 1977). A confusing picture emerges of actual practice. Table 4.1 summarises the situation. All these studies were completed before the advent of C.A.T. What evidence is there that a wider application of special diagnostic procedures for acute stroke than that which occurred in the studies represented in Table 4.1, would have had any impact on the natural history of stroke?

Computer Assisted Tomography (C.A.T.) is a recent development in the field of neuroradiology which is particularly valuable for differentiating cerebrovascular disease from non-vascular mass lesions, and for distinguishing infarct from haematoma. Although a comparison showed C.A.T. to be superior to isotope brain scanning in identifying the nature of acute and progressive cerebral hemisphere lesions (Du Boulay and Marshall, 1975), it remains to be seen what impact this advance will have on the natural history of stroke. The value of brain scanning in the diagnosis of cerebrovascular disease is disputed. One study undertaken in New York concluded that it was a useful tool in the diagnosis of strokes and helped to predict the degree of recovery following a

TABLE 4.1

PROPORTION OF ACUTE STROKES IN DIFFERENT STUDIES WHO RECEIVED CERTAIN DIAGNOSTIC PROCEDURES

Investigation	Author(s)			
	Aho[1]	Hemmingsen[2]	Carpenter[3]	Harmsen[4]
Brain scan	20	4	31	18
Lumbar puncture	63	14	47	48
Angiography	16	18	15	34
Skull X-ray	N.R.	N.R.	36	46
Electroencephalogram	87	40	51	N.R.
Echoencephalogram	4	N.R.	N.R.	60

N.R. Not recorded

Sources:
1. Aho, K. (1975) Academic dissertation. Helsinki University.
2. Hemmingsen, J. & Marquardsen, J. (1975) Ugeskrift far Laeger 137. 3083-3087.
3. Carpenter, R.R. Rodgers, K.D. & Reed, D.E. (1972) Stroke 3. 747-758.
4. Harmsen, P. & Tibblin, A. (1972) Acta.Med. Scand. 191. 463-470.

vascular insult (Antunes, Schlesinger, Michelsen et al, 1975). However, a similar study undertaken in St.Louis, Missouri only found an abnormal brain scan in 27 per cent of cases compared with the 77 per cent of positive brain scans in the New York series (Welch, Coleman, Hardin et al, 1975). The St. Louis group concluded that the presence or absence of a scan abnormality would be of little predictive value in the individual stroke patient. The place of cerebral angiography in diagnosing intracranial aneurysms, cerebral arteriovenous malformations, and subdural and extradural haematomas is beyond doubt. But its place in the diagnosis of cerebral arterial occlusion and intracerebral haemorrhage is less certain. Bull and his colleagues (Bull, Marshall and Shaw, 1960) concluded that the place of angiography could not be assessed until the value of various forms of treatment of stroke was better known. Moreover the severity of an acute stroke is not directly related to the extent of the occlusion (Drake and Drake, 1968) and the "yield" of angiography in terms of operable lesions is low (Gurdjian, Lindner, Hardy et al, 1961).

What is evident from reviewing studies which have set out to investigate the merits of special diagnostic procedures in cerebrovascular disease is that none of them have been subjected to a thorough examination of sensitivity, specificity, predictive value or repeatability. It is not possible to gauge the effectiveness of any particular procedure in stroke diagnosis without information on the values of these characteristics. Whilst developments in special diagnostic procedures have provided better anatomical localisation of lesions, allowed a more specific diagnosis to be made or the correct underlying pathological process to be identified, they have not been shown to alter the natural history of stroke for the better.

Medical Intervention

During the past 20 years or more, there have been a large number of studies of medical treatment for cerebrovascular disease. In spite of this, the indications for treatment remain few (Whisnant, 1977). Controlled studies of therapeutic intervention in stroke have been wide ranging including attempts to reduce cerebral oedema by glycerol therapy (Larsson, Marinovich and Barber, 1976) and dexamethasone (Bauer and Tellez, 1973). Other studies have focussed on risk factors in established stroke by treatment with clofibrate (Veterans Administration Cooperative Study Group, 1973) or antihypertensive agents (Hypertension - Stroke Cooperative Study Group, 1970). None of these studies have had any impact and attention in recent years has focussed on the role of anticoagulants, anti-platelet drugs and the primary prevention of stroke by the treatment of hypertension.

A recent Canadian Study followed 585 patients with threatened stroke in a randomised controlled trial to determine whether drugs that decrease platelet adhesiveness (aspirin or sulfinpyrazone), singly or in combination, influence the subsequent occurrence of continuing T.I.A.s, stroke or death (The Canadian Cooperative Study Group, 1978). The results indicated a statistically significant risk reduction from aspirin, but in males only. But this study has been criticised on the grounds that almost as many patients were excluded from the study as were randomised, and that if death is removed as an endpoint, there were almost identical numbers of strokes in the treatment and placebo groups (Whisnant, 1978). The most promising avenue for therapeutic intervention is the primary prevention of stroke by treating hypertension. Controlled trials on U.S. Veterans with average diastolic blood pressures of 90-114 mmHg and 115-129 mmHg, where allocations were antihypertensive drug therapy and placebo showed a reduction in both morbidity and mortality from cerebrovascular disease in the treated group (Veterans Administration Cooperative Study Group on Antihypertensive Agents, 1967, 1970). The subjects participating in these studies were carefully selected with respect to drug compliance, and so it is not surprising that a later, community based, controlled trial of anti-hypertensive therapy was unable to confirm these findings in its preliminary results (Berglund, Wilhelmsen, Sannerstedt et al, 1978). A difference may yet appear in this ongoing study between treatment and placebo groups as the number of person years of observation increases.

A number of studies looking at the effect of anti-coagulant therapy on acute thrombotic strokes have been undertaken (Enger and Bøyesen, 1965; Hill, Marshall and Shaw, 1962; McDowell, McDevitt and Wright, 1963 and Thygesen, Christensen, Dyrbye et al, 1964). They concluded that there was no difference in the immediate recovery from stroke, the recurrence rate of cerebral infarction, or the occurrence of fatal cerebral infarction as a result of long-term anticoagulant treatment. There is now evidence that the previously declining incidence rate of primary intracerebral haemorrhage was arrested during the early 1960's when anticoagulant therapy was commonly used extensively in treating myocardial infarction and acute ischaemic stroke (Furlan, Whisnant and Elveback, 1979). A number of studies of anti-coagulant use in progressive stroke have been done. The most informative one was reported by Carter (1961). A significant difference between anticoagulant treatment and placebo groups was found when the data on recovered and improved patients, and on unimproved and dead patients were combined. When the ischaemic strokes had progressed to completion by the time treatment had begun, no significant difference was noted between treated and untreated groups. The importance of chronic atrial fibrillation as a precursor of stroke has recently been reported from the Framingham study (Wolf, Dawber, Thomas et al, 1979). Chronic atrial fibrillation in the absence of rheumatic heart disease was associated with a fivefold increase in stroke incidence, while atrial fibrillation with rheumatic heart disease had a seventeenfold increase. No controlled trials of anticoagulants or antiarrhythmic agents in persons with chronic atrial fibrillation have been reported. The effect of anticoagulant therapy on transient cerebral ischaemic attacks (T.I.A.) has been investigated. No significant difference in the age-corrected survival rates occurred between treated and untreated patients with T.I.A. in the population of Rochester, Minnesota between 1955 and 1969 (Whisnant, Matsumoto and Elveback, 1973). However, the probability of stroke was greater for untreated than for treated patients with T.I.A. in the carotid system and the vertebral-basilar system.

Surgical Intervention

Surgical impact on stroke occurs in the treatment of acute subarachnoid haemorrhage from a ruptured intracranial aneurysm. A recent study reported from the Mayo Clinic (Sundt and Whisnant, 1978) analysed the management of 310 such cases, 280 of whom survived to go to operation. Operative mortality was only five per cent and intraoperative complications related to the size and location of the aneurysm occurred in a further five per cent of cases. The conclusion reached was that results of surgical treatment, including preoperative deaths, were better than the natural history of the untreated illness. Patients who survived for six months after operation had a long-term survival similar to that of the normal population. Unfortunately, subarachnoid haemorrhage comprises only five per cent of cerebrovascular disease and the proportion in which an aneurysm amenable to operation can be demonstrated on arteriography is even smaller.

Operation for ischaemic brain disease can be considered only when the responsible occlusive lesion is readily accessible. Given this limitation, it is not surprising that the Joint Study of Extracranial Arterial Occlusion (Bauer, Meyer, Fields et al, 1969) did not show any difference in survival between surgical and conservatively treated groups. An attempt to extend the scope of surgical intervention in ischaemic stroke has recently been made with the establishment of a multicentre randomised controlled trial to test the hypothesis that extracranial/intracranial arterial anastomosis will reduce the incidence of first or recurrent completed stroke (McDowell, 1978). It will be a number of years before a sufficient number of patients have been recruited to be able to accept or reject the hypothesis being tested.

Intensive Care Facilities for Acute Stroke

There is broad agreement on the kind of supportive care which is required for the stroke patient during the acute phase, and a detailed description of the type of general care which is most appropriate in the acute phase has been provided by the United States Department of Health, Education and Welfare (1976). Guidelines have also been suggested for the utilisation of special procedures, equipment and consultative medical services (Report of the Joint Committee for Stroke Facilities VI, 1973). At the same time, minimum standards of facilities, staff, research and educational activities for hospitals admitting stroke patients were laid down in the United States by the Joint Committee on Accreditation of Hospitals (1973). But what is not clear is whether care of the acute stroke should be in the hands of a general medical service, or should be the responsibility of a specialised hospital group or unit. Several attempts have been made to clarify this issue.

An appropriate way of demonstrating a beneficial effect of specialist care in the acute stage of stroke is to compare results prospectively with a similar group of patients treated in a general hospital setting. Not all studies claiming advantages for stroke units have done this. For example, it was suggested that although secondary complications such as pneumonia, pulmonary embolism, pressure sores and urinary tract infection showed a sharp decline during the first year of operation of an intensive care stroke unit in Toronto, the effect of intensive care had a minimal impact on death from the primary cerebral lesion in the early phase (Norris and Hachinski, 1976). No comparative group was used in this study. A similar study undertaken as part of the California Regional Medical Programme Stroke Project took the form of a 'before' and 'after' comparison (Drake, Hamilton, Carlsson et al, 1973). Three hospitals in the San Francisco Bay Area developed acute neurovascular care units (N.C.U.'s). The emphasis was on the provision of personnel and services rather than special equipment. Comparisons of 'before' and 'after' outcomes revealed no difference in immediate mortality, but a 50 per cent reduction in secondary complications such as pneumonia, pulmonary embolism and congestive cardiac failure. It was concluded that the Neurovascular Care Unit was a useful and practical method for improving care of acutely ill stroke patients. A further study of an intensive stroke unit in Memphis, Tennessee (Pitner and Mance, 1973) used controls matched by diagnosis from an adjacent neurological ward in the same hospital. They confirmed that there was no difference in overall mortality between stroke patients admitted to the intensive care unit and those in the adjacent neurological ward. The best attempt to ascertain whether a stroke intensive care unit can lower mortality during the acute phase of stroke has been undertaken in Pittsburgh (Kennedy, Pozen, Gabelman et al, 1970). The outcome of admissions to a stroke intensive care unit (S.I.C.U.) was compared with control stroke patients from local community hospitals. However, no matching of variables between S.I.C.U. patients and controls was undertaken. No overall reduction in stroke mortality was demonstrated for patients receiving intensive medical and nursing care. The study concluded that acute stroke care could not be equated with acute coronary care and expectations of results similar to those being claimed for coronary care units would not be realised.

The conclusion which must be reached with respect to medical technology is that it makes little or no improvement in the natural history of stroke. Focus on changes in the working of health services which might improve the natural history of stroke should be shifted to those patients who survive the immediate period of mortality, and the most effective means of organising the rehabilitation of stroke survivors should be determined.

CHAPTER 5

THE PRINCIPLES AND PRACTICE OF STROKE REHABILITATION

Summary

The principles of stroke rehabilitation are well established, but the picture which emerges of actual practice is confusing. The confusion has been created by the almost complete lack of uniformity with regard to definitions and criteria used in studies of stroke rehabilitation, and the absence of an adequate description of therapy prescribed. Whilst the benefit of stroke rehabilitation is difficult to establish, there is general agreement on three central issues in this field. These are the importance of the early introduction of therapy; of selecting those patients who are likely to derive the most benefit from rehabilitation and of judging the outcome of rehabilitation, at least in the elderly, on an assessment based on activities of daily living.

Principles of Stroke Rehabilitation

The World Health Organisation (1969) has defined rehabilitation as the combined and co-ordinated use of medical, social, educational and vocational measures for training or retraining the individual to the highest possible level of functional ability. The basic principles for the rehabilitation of stroke are well established and have been summarised by the Rehabilitation Study Group of the Joint Committee for Stroke Facilities (1972). The principles are based on prevention of complications, regaining functional independence, compensating for residual disability, substituting for lost function, providing motivation and encouraging social participation.

Broad areas of agreement have been established in applying the principles of stroke rehabilitation. At the centre of the problem of stroke rehabilitation is the fact that, as in many central nervous system problems, a relatively small lesion may result in global deficits involving a variety of mental, motor, sensory and communication impairments (McCann, 1969). From the very first day after onset of stroke, even if the patient is still unconscious, passive rehabilitation to prevent the onset of secondary complications such as contractures or bedsores should begin (Nichols, 1976). If a patient proves their survivability during this acute phase, they will pass into the active rehabilitation phase. The distinction between the earlier acute phase and the active rehabilitation phase is not always clear and the one merges with the other (Langton Hewer, 1976). It is important to recognise when this is occurring in order to establish a baseline before rehabilitation begins (Rusk, 1950). Stroke rehabilitation requires close co-operation between physicians, nurses and the other allied health personnel (Joint Committee for Stroke Facilities, 1972). There is general agreement that the coordinator of this team approach should be the physician, whether it is the responsibility of the family physician, specialist in physical medicine and rehabilitation, physician in general or geriatric medicine, or the neurologist (Lee, 1958). The rehabilitation team should establish early and continuing contact with one another so that every member knows about the medical, psychological and social problems of the patient. They should all co-operate in the planning of the treatment programme (World Health Organisation 1971). No rehabilitation is possible without the patient's active co-operation and members of the rehabilitation team can increase the patient's motivation by giving him a feeling of purpose, hope and usefulness. Thus the training programme should be arranged in stages so that the patient experiences success and does not become discouraged. There is also a need for personal counselling of the patient and his family in order to explain the nature of the illness and the likelihood of functional recovery (Lee, 1958). Finally, it has been emphasised that once the acute rehabilitation phase is over, subsequent follow-up must be regarded as an important part of the patient's continuing programme (Rosenthal, 1961).

Stroke Rehabilitation in Practice

The picture which emerges of the actual practice of rehabilitation is, however, a confusing one. Many studies of stroke rehabilitation have been undertaken and details of a selection of these are summarised in Tables 5.1 - 5.3. The results differ considerably, because of differences in patient selection (Table 5.1), differences in the actual process of rehabilitation (Table 5.2) and because different criteria have been used to measure the outcome of rehabilitation (Table 5.3). It is thus not possible to compare their results in any respect. In particular, outcome cannot be related to the actual practice of rehabilitation, because the latter is so poorly described. Details

TABLE 5.1

STUDIES OF STROKE REHABILITATION I:- PATIENT SELECTION

Place	Definition of Stroke	Nature of Patient Group
Fredericksberg[1]	Onset of a focal disturbance of cerebral function of presumed vascular origin of more than a few minutes duration	Patients with a mean age of 69 yrs. admitted to a neurological unit who survived 3 weeks from onset
Belfast[2]	Not Stated	Patients over 65 yrs. of age who survived an average of 4 weeks to be transferred to a stroke unit from medical units
Cleveland[3]	Onset of first episode of definite weakness or aphasia	Patients with an average age of 74 yrs. and no previous disability referred to a geriatric unit from a University hospital
Washington D.C.[4]	Not Stated	Patients with an average age of 57 yrs. referred to a department of physical medicine from a University hospital
White Plains N.Y.[5]	Not Stated	Patients with an average age of 67 yrs. admitted to a stroke rehabilitation centre from sources unstated
Glasgow[6]	Sudden or rapid loss of brain function of presumed vascular origin lasting for at least 48 hours	Patients admitted to a stroke unit either from their own homes or from medical units 2 or 3 weeks following onset

TABLE 5.2

STUDIES OF STROKE REHABILIATION II:- THERAPY RECEIVED

Place	Interval to Commencing Therapy	Duration of Therapy	Description, Amount or Type of Therapy
Fredericksberg[1]	Not Stated	Not Stated	"Functionally orientated medical care"
Belfast[2]	4-6 weeks after onset	6-8 weeks	Not Stated
Cleveland[3]	Within 30 days of onset	Average period of 39 days	Multidisciplinary approach to rehabilitation based on restoration of function
Washington D.C.[4]	Within 7 days of onset	Average period of 28 days	Active and passive physiotherapy and occupational therapy for training in self-care
White Plains N.Y.[5]	Average interval of 38 days	Average period of 43 days	Multidisciplinary approach with intensive therapy ancillary therapy from nursing staff, family and patient education, integrated follow-up care
Glasgow[6]	Within 2-3 weeks	About 3 months	Daily treatment from physiotherapist based on early assisted ambulation, occupational therapy based on daily living activities

TABLE 5.3

STUDIES OF STROKE REHABILITATION III:- OUTCOME ASSESSMENT

Place	Time of Assessment	Outcome Criteria	Distribution of Outcome (%)
Fredericksberg[1]	2 months after onset	Able to carry out all activities or look after own affairs	53
		Requires some help with self-care	17
		Needs help with self-care or is bedfast/chairfast	30
Belfast[2]	3 months after onset	Independent, normal intellect	30
		Need help with self-care, may have impaired intellect	30
		Bedfast/chairfast or Died	40
Cleveland[3]	2 years after onset	A graded functional performance scale of daily living activities	
		A	21
		B & C	13
		D.E.F.G or Dead	66
Washington D.C.[4]	5 weeks after onset	Walking with no aids	47
		Walking with aids	35
		Not walking at all	18
White Plains N.Y.[5]	Average of 10 weeks after onset	Completely independent for self-care	52
		Requires supervision only	4
		Needs assistance for self-care and for bowel/bladder control	44
Glasgow[6]	Not Stated	Functionally independent for self-care	40
		Functionally dependent for self-care	15
		Bedfast/Died	45

Sources for Tables 5.1 - 5.3

1. Marquardsen, J. (1969). The natural history of cerebrovascular disease. Munksgaard. Copenhagen.

2. Hurwitz, L.J. and Adams, G.F. (1972). Brit.Med.J.; 1: 94-98.

3. Katz, S., Ford, A.B., Chinn, A.B. et al (1966). Medicine (Baltimore); 45: 236-246.

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5. Feigenson, J., McDowell, F.H., Meese, P. et al (1977). Stroke; 8: 651-656.

6. Isaacs, B. and Marks, R. (1973). Age and Ageing; 2: 139-149.

of the interval from stroke onset to commencement of rehabilitation, the duration of rehabilitation, and the amount and type of rehabilitation prescribed are either not given or contain wide differences between studies. This may be a reflection of the wide variation in the organisation, personnel and techniques which are employed in stroke rehabilitation. The lack of definition and quantification of what is actually being provided has led to controversy about the nature of remedial therapy in stroke rehabilitation. The policy of relying on physiotherapists to use any technique they like has meant that a number of different approaches have been put forward and used, doctors having largely lost control of this important area of rehabilitation (Langton Hewer, 1973). Consequently, a range of therapeutic exercises based on neurophysiological and/or developmental theories have been developed over the past 20 years, amongst which those of Bobath (1959), Knott (1968) and Brunnstrom (1965) have been most prominent. The only study which has compared a programme utilising neuromuscular "re-education" techniques with a physical therapy programme which did not employ these techniques showed no difference in functional outcome amongst a group of 50 hemiplegic strokes who had been randomly allocated to two groups (Stern, McDowell, Miller et al, 1970).

Confirmation of the confusion which exists in the actual practice of stroke rehabilitation came from a postal survey undertaken in 1974 in which 58 departments of occupational therapy were asked what treatment methods they used in stroke rehabilitation (Hurd, 1975). Of 45 hospitals which replied, the Proprioceptive Neuromuscular Facilitation technique of Knott (1968) was used "often or intensively" in 23 departments, "sometimes" in 16 and "rarely" in 6 departments. The Bobath approach (1959) was used "often or intensively" in 13 departments, "sometimes" in 16 and "rarely or never" in a further 16. A study undertaken by Wilkes (1975) reported that 20 per cent of patients were thought to be inappropriate or unsuitable referrals by physiotherapists themselves. In about 20 per cent of cases again, totally inadequate diagnostic information had been supplied by the doctors making the referrals.

Another major deficiency in studies reporting the outcome of stroke rehabilitation is the lack of any attempt to relate either strokes receiving or requiring rehabilitation as a rate for a defined population. All studies undertaken to date have consisted of either self-selected groups of patients where no catchment population could be estimated (Hurwitz and Adams, 1972; Rankin, 1957; Geltner and Lupo, 1964; Isaacs and Marks, 1973; Boyle and Scalzitti, 1963; Ford and Katz, 1966; Harris, Bruk and Copp, 1964; Buchanan, 1956; and Feigenson, McDowell and Meese et al, 1977) or studies of strokes derived from defined populations which did not differentiate between patients who did or did not receive rehabilitation (Marquardsen, 1969; Gresham, Fitzpatrick, Wolf et al, 1975; Matsumoto, Whisnant, Kurland et al, 1973).

The Description of Rehabilitation Therapy

Studies are needed to determine how much and for how long strokes will benefit from rehabilitation (Wylie, 1970). It is particularly important for planning purposes that estimates of the amount of therapy used in stroke rehabilitation are obtained from studies undertaken on patients drawn from well defined populations. Yet no such studies have been reported. In a study of what stroke patients actually received, Brocklehurst, Andrews, Richards et al (1978) found that of stroke patients from the general area of South Manchester who survived for at least two weeks, 80 per cent received some physiotherapy, 25 per cent received some occupational therapy and 14 per cent received speech therapy at some stage. There are no details of the actual amount of therapy applied in this study. Thus, the confusion created by the almost complete lack of uniformity with regard to definitions and criteria used BETWEEN studies is compounded by a lack of quantification of the type, amount or duration of therapy prescribed. Moreover, it is impossible to make comparisons WITHIN individual studies because most have been of a descriptive nature. The inability to compare the effects of rehabilitation means that we can never be sure that the same stroke outcome would not have been reached in a particular group of patients even if no rehabilitation had been prescribed.

Some experimental studies have been carried out, but the conclusions which can be drawn are not clear, because what is being compared is not well defined and the numbers of patients entered in these studies fall well short of the minimum sample size required to show statistical significance. For example, a study of 82 patients admitted to hospital within two months of onset of hemiparesis were randomly allocated to "functionally orientated medical care" undertaken at ward level or to the full range of services available in a Department of Physical Medicine and Rehabilitation (Feldman, Lee, Unterecker et al, 1962). From the results of functional status assessed at the time of hospital discharge, it was concluded that the great majority of hemiparetic stroke victims could be rehabilitated adequately on medical and neurological wards without formal rehabilitation services if proper attention is given to ambulation and self-care activities. The two forms of rehabilitation being tested were not adequately described or quantified.

Central Issues of Agreement in Stroke Rehabilitation

Although evidence of the benefit of rehabilitation is difficult to interpret, there is general agreement about three central issues in this field. These issues are the importance of the early introduction of rehabilitation, of selecting those patients who are likely to derive the most benefit from rehabilitation, and that the most appropriate outcome measurement for judging the success of stroke rehabilitation in the elderly is an assessment based on activities of daily living.

(i) Early introduction of therapy

In the first decade following World War II, it was felt that early activity in the patient with a stroke was contraindicated as it might produce further extension of the damage or "trigger" a second episode (Buchanan, 1959). But several descriptive studies have since modified this view by demonstrating advantages for stroke patients whose rehabilitation began earlier rather than later. For example, Adams and Merrett (1961) examined the outcome of 574 patients admitted to geriatric wards of Belfast City Hospital between 1948-56 and found that 75 per cent of their patients judged to have "recovered" from their stroke commenced rehabilitation within one month of onset. A study of 62 patients admitted to the Burke Rehabilitation Centre in 1968-69 demonstrated a greater improvement in mobility and self-care status in patients where the interval from onset to admission was short compared with patients who had a long onset to admission interval (Stern, McDowell, Miller et al, 1971). Truscott, Kretschmann, Toole et al, (1974) reported on the outcome of patients admitted to hospitals participating in the North Carolina Comprehensive Programme from 1969-73. They found that rehabilitation instituted within 48 hours of onset resulted in both a reduction in mortality and improvement in motor strength. These authors concluded that the effects of the early institution of rehabilitation occurred regardless of the severity of the illness, age or presence of associated diseases.

The problem of deciding whether early rehabilitation actually leads to an improvement in stroke outcome has been recognised. Bruell and Simon (1960) undertook a study of 80 patients admitted to a Department of Physical Medicine and Rehabilitation in Cleveland, dividing them into two groups: "recovered" patients who were ambulant and independent following rehabilitation and "failed" patients who in spite of therapy, remained bedfast or chairfast. The mean interval from onset to commencing rehabilitation was 18.8 days in the "recovered" group compared with 66.5 days in the "failed" group. This difference is difficult to interpret because patients who commenced rehabilitation at different intervals following onset might have done so because they were suffering from different levels or combinations of disability. Feigenson and his colleagues (Feigenson, McCarthy, Meese et al, 1977) in their series of patients admitted to the Burke Rehabilitation Centre, attempted to get round this difficulty by comparing the outcome of rehabilitation with onset to admission intervals in patients with the same degree of physical and mental disability. They found that patients with similar levels of disability who had shorter intervals to the commencement of rehabilitation therapy had a higher proportion of home discharges, a higher proportion were independent for dressing, feeding, hygiene and for bladder or bowel care. This does not resolve the question of whether the apparent benefit derived from early rehabilitation is simply masking a spontaneous recovery of function following stroke. Lowenthal (1960) estimated that up to 65 per cent of stroke patients surviving the acute phase recover spontaneously and rapidly, while 35 per cent would remain disabled without rehabilitation. It has been suggested that the only way to substantiate the generally held view that early rehabilitation improves the outcome of stroke, and in particular, produces a better response than would occur by relying on spontaneous recovery alone, is through an experimental study (Wylie, 1966). No such studies to clarify these important points have been reported.

(ii) Patient selection

Wylie (1964) has commented that the humanitarian spirit of medicine tends to support the course of maximum effort for all patients, even when a proportion of patients will respond poorly to such effort. This is an appropriate approach when services and facilities are abundant. But when resources are scarce, it may be more humanitarian to provide maximum service to those who respond most readily, while providing less intensive care to those persons who are likely to be poor responders. This situation can be applied to stroke rehabilitation and it has been suggested that efforts should be concentrated on patients who are most likely to derive the most benefit from stroke rehabilitation (Wylie, 1964). To some extent this policy is already adhered to because the results of stroke rehabilitation obtained by a general hospital admitting the acute patient are different from those of the rehabilitation unit admitting a selected group of survivors, and these again will differ from the results likely to be obtained in a geriatric unit (Harris, Bruk and Copp, 1964). Many rehabilitation centres have a selective admission policy. For example, the Rehabilitation Unit at Bellevue Hospital, New York admitted a highly selected group of patients who were regarded as suitable for rehabilitation; patients were not admitted if they had marked organic brain damage or severe cardiovascular disease, or if their social problems would make it difficult to discharge them home after rehabilitation (Rusk, 1950). Feigenson, McDowell, Meese et al (1977) analysed details of 248 patients who had been admitted to a stroke rehabilitation unit and concluded that stroke rehabilitation could be made most cost-effective by limiting care to well motivated patients under 80 years of age, without perceptual problems, who were not severely confused. But this study also pointed out that many patients with "unfavourable prognostic signs" on admission made significant improvements after admission and were subsequently discharged. It has been emphasised that the identification of stroke patients who will derive most benefit from intensive rehabilitation should be done along scientific rather than intuitive guidelines (Wylie, 1968). In particular, there is a pressing need to consider selection criteria for stroke rehabilitation amongst patients coming from a well defined population. Only in this way can the relative frequency of the "stratum" of strokes who derive most benefit from rehabilitation be established. An additional advantage of basing such a study on a defined population is that it would enable validation of the selection criteria by comparing the outcome of those strokes who were selected for intensive rehabilitation with the outcome of strokes who received only general rehabilitation or no rehabilitation at all.

(iii) Assessment of outcome

The patient's ability to care for himself, to walk and to be independent at home has become a well accepted goal for the elderly stroke (Peszcynski, 1961). But the problems of measuring progress or describing the end results of rehabilitation programmes which aim to achieve this goal are complex because stroke rehabilitation has to concern itself with an overwhelming number of variables (Schoening and Iverson, 1968). It would be useful if clinical assessments could be used to assess the end results of rehabilitation treatment, but Kelman and Willner (1962) demonstrated that this was not feasible in a study of the rehabilitation potential of a disabled population in a nursing home. They showed considerable differences in the assessment of patient's change in status following rehabilitation according to whether the observer making the assessment was a physician, a nurse, physical therapist, occupational therapist or a social worker. This was attributed to the fact that the different disciplines utilised different frames of reference in arriving at their judgements. Two simple classifications of capacity for self-care have been developed. Grading in one classification is defined in terms of 'recovery' (Adams and McComb, 1953), and the other is based on 'residual disability' (Rankin, 1957). These two clinically based classifications have been used extensively to assess the outcome of many stroke rehabilitation studies despite the deficiencies of being subjective and having indiscrete or overlapping grades within their classifications.

Developing an Objective Method of Assessing Outcome

The need to develop an objective method of evaluating and classifying the functional capacity of the chronically ill and aged has been recognised for many years. One of the first attempts to develop a systematic functional classification was based on the "Pulhems Profile" method used by the Canadian Army during World War II. This was geared to the performance level of young recruits and was modified by Moskowitz and McCann (1957) for use in the elderly by including additional categories for bowel and bladder continence. Since then, many different indices of activities of daily living (A.D.L.) have been developed. The emphasis on function has practical importance in the elderly stroke because it can be measured objectively. Moreover, it also reflects the impact of the stroke at a time when knowledge as to its cause and pathogenesis may not be known (Katz, 1970). An A.D.L. index is an ordered record of a patient's capabilities. The purposes of an A.D.L. Scale have been summarised by Donaldson, Wagner and Gresham (1973) as:

(a) To describe a patient's functional status at a given point in time.

(b)/

(b) To detect improvement or deterioration in functional status by sequential evaluations.

(c) To monitor functional status and to reinforce progress to the patient and those working with him.

(d) To enhance communication of patient information between health care facilities and personnel.

(e) To promote comparability of clinical observations in medical rehabilitation.

It has been suggested that A.D.L. indices ought to conform to a set of rules in order to achieve these objectives (Nichols, 1976). The rules include the need to be comprehensive in its coverage of activities and as short and concise as possible; simple enough to be carried out by any member of the rehabilitation staff; suitable to assess any degree of impairment from relatively insignificant problems to those of the very disabled patient; constructed in such a way that it can be used for assessments of patients as individuals and delineate their needs for care. A.D.L. indices must be completely objective. These characteristics are not compatible. The more comprehensive the index, the more difficult and time consuming it is to administer. The simpler to administer and score, the less specific and sensitive will the index be to change in the patient's capabilities.

Problems in using A.D.L. Indices

A.D.L.indices use different scales, have been constructed with different definitions and instructions for use, and are based on different combinations of activities. Other problems in using A.D.L. scales have to be considered. Tests carried out in a hospital rehabilitation setting may be unrealistic and their results may not reflect the actual situation when a patient returns to their home environment (Nichols, 1976). It is therefore important to apply A.D.L. indices in the context of the patient's home situation and to include in the assessment, all necessary aids and adaptations which improve the patient's functional performance (Bruett and Overs, 1969). Another problem which these authors mention is that although the two extreme points on an A.D.L. scale are easy to identify, grades which are inserted in between to reflect the patient's ability to perform an activity with some degree of assistance can be identified with far less assurance. A major area of A.D.L. assessment which requires clarification is the inter-relationship between various activities of daily living and other measurable clinical features. The method of analysis used in A.D.L. scoring can influence the outcome, different interpretations of results of rehabilitation for the same population being possible, depending on the chosen method of analysis (Kelman and Willner, 1962). Finally the reliability of a set of A.D.L. indices must be established and the observer variation, repeatability and patient variability in an A.D.L. assessment ascertained (Benjamin, 1976). The need for uniformity in A.D.L. assessment has been recognised by Isaacs (1973) amongst others, and a call for a consensus of expert international opinion has been made to complete the framework of a classification and to decide the grading of functional recovery within it (Adams, 1975).

Neurological Function Following Stroke

Much interest has been focussed on neurological function following stroke The neurological manifestations of stroke are many and varied, according to the site, extent, type, spread and speed with which the vascular lesion becomes established. There are remarkable variations in the neurological presentations of stroke, ranging from abrupt onset and rapid evolution of hemiplegia with loss of consciousness to a slow cumulative change in the neurological picture over weeks or even months. Changes in motor, sensory, communication and mental function may be involved. In addition to these focal neurological deficits implicit in the definition of stroke, there may be a more diffuse or general disturbance of neurological function. For example, symptoms such as drowsiness or confusion which cannot be attributed to a particular anatomical region of the brain may be present. These more diffuse neurological manifestations are usually transient and more reversible than the focal signs and symptoms. A useful classification of the neurological manifestations of stroke based on clinical experience has been suggested by Isaacs (1973), and this can be used to summarise neurological findings after stroke.

Disorders of Movement and Balance

Loss of motor function is a frequent occurrence in stroke. Hemiplegia was present in 84 per cent of the immediate survivors of the Fredericksberg series (Marquardsen, 1969). There was a close association between the initial severity of the motor deficit and the ultimate disability grade, fewer than one fifth of patients with total loss of motor function in both arm and leg regaining independence in self-care. Although there are wide variations in the speed and extent of recovery, the rate of recovery of motor function has an important bearing on the ultimate result. Marquardsen (1969) concluded that the earlier the improvement began, the better the prognosis. Van Buskirk (1954) found that restoration of function occurred mainly during the first two months after onset and appeared to be a spontaneous process. McDowell and Louis (1971) postulated that any improvement which occurred later than three months after onset was due to increasing use of the remaining musculature, particularly on the intact side and usually could not be attributed to a return of function in the paralysed extremities. The control of posture following stroke is an important predictor of outcome. Disordered posture is usually attributed to the selective distribution of spasticity. If persistent, it indicates a poor prognosis, because, the patient who cannot sit straight without help, cannot stand; and the patient who cannot stand with confidence, cannot walk reliably (Adams, 1974).

Disorders of Perception and Recognition

The stroke patient with a hemiplegia has an easily recognised motor defect but there may be subtle perceptual losses present which are easily overlooked. The loss of ability to make sense out of sensations may retard progress in rehabilitation far more than paralysis, and many patients with perceptual problems may be unjustly labelled as being poorly motivated (Sawtell and Martin, 1967). This might even lead to active treatment being stopped because the patient is thought to be confused, uncooperative or lacking motivation (Adams and Hurwitz, 1963). The role of the cerebral cortex in sensory perception and recognition is discriminative. Patients with an extensive cortical lesion are unable to appreciate the direction and degree of passive movements of their joints and it is this defective proprioception that denies the patient the recovery of mobility (Adams, 1974). Sensory extinction, or loss of awareness of parts of the body may occur. Orientation in space is constantly maintained by matching sensory input against the body image (Adams, 1974). If this integrative process is disturbed, the patient may cease to be aware of the opposite half of his body, and may not even recognise the forgotten half. In some instances, denial of ownership of the affected limbs is added to the denial of illness. In denial of disease, patients underestimate, deny or are unaware of the extent of their disabilities (Denny-Brown, Meyer and Horenstein, 1952). In stroke, these problems are accentuated by defective grasp, loss of concentration and impaired communication, all of which can obscure an accurate estimate of sensory awareness which is essential to a valid assessment of a stroke patient's prospects (Adams, 1974). Paralysis alone seldom accounts for a patient's incapacity and may contribute little to it. This has been confirmed by studies of two series of hemiplegic patients in which disorders of spatial perception have been shown to be strongly associated with difficulties in ambulation (Bruell, Peszezynski and Volk, 1957) and with levels of dependency in performing activities of daily living (Bach, Tracy and Huston, 1971). Pain and temperature sensation are important for the health of the skin, but their loss does not appear to affect mobility (Hurwitz, 1966). In Marquardsen's series (1969), 84 per cent of patients had sensory findings recorded at the time of admission to hospital. Thirty-eight per cent of this group had some sensory disorder. Functional prognosis was found to be independent of the presence of sensory disorders. Denial of illness was recorded in only eight patients, all with a left-sided hemiplegia, and all of whom had a poor functional outcome. Marquardsen's findings have not been supported by other studies, probably because his medical records did not differentiate between perceptual and other types of sensory loss, and were restricted to the initial clinical examination which was carried out shortly after the onset of symptoms. Van Buskirk and Webster (1955) were able to demonstrate that persistent sensory loss (vibration, pain or two point discrimination) was associated with a poor functional prognosis. A study from the Burke Rehabilitation Centre (Stern, McDowell, Miller et al, 1971) reported the results of a battery of tests used to assess vibration, two point discrimination and visual field defects. Hemi-sensory losses were found predominantly in patients with poor functional results, particularly those whose sensory deficits consisted of a combination of all three of the modalities examined. In terms of rehabilitation outcome, Lehmann and his colleagues (Lehmann, DeLateur, Fowler et al, 1975) found that patients with a gross perceptual deficit were less likely to benefit from a rehabilitation programme.

Disorders of Communication

These include listening, reading, speaking and writing. Each is integrated with the other and with other conscious experiences in what has been called the 'central language process' (Mayo Clinic and Mayo Foundation, 1976). Impairment of this integrative process, affecting as it does the various language modalities is known as dysphasia. Only limited information about the type and degree of dysphasia present following stroke is available. Ten per cent of strokes occurring in the defined population of Rochester, Minnesota between 1955-69 who survived were dysphasic (Matsumoto, Whisnant, Kurland et al, 1973). This study did not give the frequency of dysphasia in the acute stage, nor was there any breakdown of the severity of language disturbance present. Brust and his colleagues (Brust, Shafer, Richter et al, 1976) found that 21 per cent of 850 acute consecutive strokes registered by the Harlem Regional Stroke Programme were dysphasic. It has been postulated that most patients with difficulty in speaking but relatively intact comprehension will be much less handicapped in achieving independence than those with poor comprehension (Hurwitz and Adams, 1972). The fact that people with poor comprehension do badly so often may be partly because they, and those responsible for them, are given no instruction or opportunity to use alternative means of communication which may bypass the use of words.

Cognitive and Related Disorders

Basic cognitive skills include learned activities such as the use of language, perception and memory function. The highest cognitive functions occur in the cerebral hemispheres, the site and size of tissue loss following stroke determining the specific disability. Loss of memory for both recent and past events, with marked impairment of learning new material may occur. Severity varies from total loss of memory for day to day events to simply an unreliable memory for recent events and slowing of learning ability. Considerable variations in the degree of impairment of cognitive functions occur amongst patients with similar anatomical lesions, and it has been suggested that this is a reflection of their cognitive function prior to the onset of stroke (Chapman and Wolff, 1959). Improvement in activities of daily living have been correlated with intellectual improvement following stroke (Berry, 1975), but Adams and McComb (1953), have emphasised the importance of previous mental capacity for a good recovery. These authors observed that the predominant handicap amongst stroke patients who subsequently became long stay cases was intellectual impairment or mental deterioration. Adams and Hurwitz (1963) later undertook a study of hemiplegic invalids who had been mentally normal and fully independent prior to their stroke. More than half of these patients were handicapped, not by physical disability, but by the 'mental barriers' to recovery. These patients were characterised by initial clouding of consciousness which was slow to clear, a failure to respond to treatment as a result of impaired comprehension, difficulties in communication, inattentiveness and lack of spontaneous effort. Loss of short term memory may be a particularly important problem in the treatment of such patients as it will result in the inability to assimilate or retain instructions (Adams, 1974). There is a pattern to cerebral hemisphere dominance. Language and related skills are lateralised to the left hemisphere in approximately 95 per cent of right handed people. Stroke involvement of this hemisphere leads to disorders of communication. Right hemisphere involvement leads to visuo-spatial impairment which results in a failure to appreciate or manipulate the spatial relationships between objects (Carroll, 1958).

CHAPTER 6

THE ORGANISATION OF STROKE REHABILITATION

Summary

It has been postulated that medical units with their emphasis on the 'cure' of disease are not equipped to handle the 'care' problems implicit in the rehabilitation of stroke. The policy, personnel and physical facilities required for a stroke rehabilitation unit have been described, but evidence of the effectiveness of stroke units compared with medical units is conflicting. This is due to methodological deficiencies in studies which have attempted to answer this question.

Stroke Rehabilitation in Medical Units

The rationale of initially admitting elderly patients with stroke to medical units has been described (Sutherland, 1972). It is to enable patients to have their diagnosis confirmed in circumstances where all the necessary investigative techniques, skills and equipment are available. But thereafter, is the general physician the best person to provide optimal care for the stroke patient? It can be postulated that medical units with their emphasis on the diagnostic investigation and 'cure' of disease are not equipped in terms of staff or facilities to handle the 'care' problems inherent in the detailed planning required for the rehabilitation of strokes. In a study of stroke care in a coal mining community in Pennsylvania, only three out of 180 patients being attended by internists had consultations with specialists in physical medicine and rehabilitation (Falk, Zimmerman and Bisdee, 1967). It was concluded that internists need education in prescribing rehabilitation services. Adams and McComb (1953) concluded that the prognosis of the hemiplegic patient was better in a geriatric unit than in the average medical unit. They evolved a ward routine geared down to the capacity of the patient which, together with the encouragement and competitive stimulus of group treatment in the company of similarly afflicted patients, was seen as an important factor in prognosis. The Report of the Royal College of Physicians' Working Party on Geriatric Medicine (1972) concluded that it would be appropriate for some departments of geriatric medicine to develop special sections such as a stroke rehabilitation unit. Sutherland (1972) in her study of problems created by the admission of elderly patients to general medical units in Aberdeen, suggested that one answer to the 'blocked bed' situation created mainly by patients with stroke might be to create a stroke rehabilitation unit.

The Components of a Stroke Rehabilitation Unit

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 (Bonner, 1973). 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" (McCann and Culbertson, 1976). A major advantage which has been put forward for having a special unit is the opportunity of developing a collaborative policy for stroke rehabilitation (Isaacs, 1977). 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 the objectives of rehabilitation and an educational role (Isaacs, 1977). Many different disciplines have been suggested for inclusion in a stroke rehabilitation team. In the Stroke Unit at the Burke Rehabilitation Centre, White Plains, New York, 19 different disciplines were included, ranging from dietician to neurologist, ophthalmologist to chaplain, neuropsychologist to audiologist (Feigenson and McCarthy, 1977).

Most stroke rehabilitation teams would not be as extensive as this, but all should contain the following personnel who are essential for stroke rehabilitation (Department of Health, Education and Welfare, 1976). These are:

Physician. Stroke rehabilitation must be under medical supervision, preferably by a neurologist or specialist in physical medicine with specific skills and interests in the clinical problems that may present.

Nursing Staff. Good nursing management in the acute stage of a stroke will shorten recovery time by many weeks. The nursing staff are responsible for initiating and implementing specific nursing measures such as prevention of deformities and bedsores, bowel and bladder training, correct positioning in bed and initiating transfer to ambulation.

Physiotherapist. Major functions of this team member include determining a patient's functional motor abilities, ascertaining joint mobility, assessing sensory disturbance, initiating a therapeutic programme including range of motion exercises, strengthening exercises, transfers, wheelchair activities, and ambulation.

Occupational Therapist. Analysing obstacles to the performance of daily tasks by determining patients' range of motion, sensory deficits, ability to perform motor tasks, to follow simple instructions and to utilise retention and recall should be undertaken. A major responsibility is to develop a programme in functional activities and self-care methods. Training the patient's family in the use of self-care aids and adaptations, advising on environmental changes and instructing the patient's family in the above techniques.

Speech Therapist. The duties include evaluating communication difficulties, suggesting methods of language stimulation to the family and initiating speech therapy when appropriate.

Social Worker. Assessing the social and psychological needs, home and community adaptations and economic resources of the patient and his family. Casework services of discharge planning, referral to community resources and assistance in job finding. Liaison with all other rehabilitation personnel, and particularly appraising the physician of all social problems that might hinder or prolong recovery.

Simply assembling a rehabilitation group with these members as a nucleus will not in itself provide optimal conditions for rehabilitation. The essential ingredient required for successful stroke rehabilitation is constant and active team-work. Coordinated 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 (Feigenson and McCarthy, 1977).

The Stroke Unit as a Therapeutic Community

An important factor is the psychological and therapeutic effect which the rehabilitation unit could have on patients (Lee, 1958). The concept of the therapeutic community in rehabilitation has been put forward as one reason why stroke units may get better results than medical units (Abramson, Kutner, Rosenberg et al, 1963). The rehabilitation unit is 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. These authors were also concerned that conventional institutional treatment could result in the patient becoming an isolated unit within the general structure of the medical ward, become dependent on hospital staff to treat him, and gradually lose his ability to respond to his disability as motivation to recover functional independence declines. Patient and family may become increasingly alienated towards each other and come to view the hospital as the only place where the patient can be properly cared for. Moreover, in the conventional institutional setting, treatment plans may not be based on a firm knowledge of the physical, social and emotional environment to which the patient will return, resulting in overtreatment or undertreatment. Another advantage which has been claimed for the stroke unit is the creation of an atmosphere of stroke awareness in the hospital or community (Borhani, 1974). By working closely together and in a highly coordinated manner, the members of a stroke team remove the artificial separation that has existed between acute nursing care and the longer term rehabilitation care of stroke patients.

Involving the Family

It has been suggested that the family is the most important resource available to the stroke patient and the stroke rehabilitation team in every phase of rehabilitation (Joint Committee for Stroke Resources II, 1972). Family members are closely related to the patient and can provide great motivation to help him reach rehabilitation goals. To fully utilise this crucial asset requires active and continuing involvement of key family members by all professional personnel who care for the patient. Discussion may call for reassurance, prognosis and a description of the plan of treatment with emphasis on the need to exploit spontaneous recovery and to use ingenuity in obtaining as much co-operation from the patient as possible. Programmes of family education have been devised (Wells, 1974; Overs and Belknap, 1967), in which the value of personal contact between each member of the rehabilitation team and members of the family has been stressed, as well as periodic panel sessions in which families can participate in informal question and answer sessions. The use of audio-visual aids may stimulate questions or highlight areas of doubt for families and can be used to complement personal contact by team members. The formation of stroke clubs has been described as a useful way of continuing support and encouragement to the relatives of stroke patients once they have been discharged from hospital (Isaacs, 1977). The real test of success in utilising the family as a rehabilitation resource has been the emergence of self-help groups which have been described by Hurwitz and Adams (1972) amongst others. These groups have been shown to be willing to promote social integration of patients and relatives, to co-ordinate transport arrangements, and to initiate and encourage voluntary work of various sorts.

Facilities for a Stroke Unit

To be effective, a stroke rehabilitation programme requires adequate physical facilities although these are of secondary importance to a properly organised and co-ordinated rehabilitation team. A recent report (Department of Health, Education and Welfare, 1976) has recommended the provision of the following facilities for stroke rehabilitation. A separately designed area properly equipped for rehabilitation. Beds for stroke patients close to rehabilitation services and ideally all to be located in one designated area. Patients undergoing rehabilitation should be separated from acute or critical cases as the latter inevitably demand more attention. In patient areas: hand rails, specially designed toilets and bath tubs, and other devices helpful in managing the physically handicapped should be installed. Finally, private space should be provided for counselling, speech therapy, interviews, and family instruction. A lounge, day room or dining room enables handicapped patients to eat away from the hospital ward, and to socialise with others who are similarly afflicted.

The Controversy over Stroke Units

Several studies have attempted to assess the effectiveness of stroke rehabilitation units, but deficiencies in methods employed make it difficult to interpret the conclusions reached by different studies. Opinion is divided. On the one hand, Waylonis, Keith and Aseff (1973) found that a stroke rehabilitation team introduced into a small community hospital did not have any effect on the functional outcome of patients. 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 (Peacock, Riley, Lampton et al, 1972). 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, several studies have concluded that a special unit is beneficial in stroke rehabilitation. Isaacs and Marks (1973) in an account of the work of the stroke unit at Lightburn Hospital, Glasgow concluded that severely disabled stroke patients can respond to prolonged rehabilitation in a suitably organised unit. This was a descriptive study with no patients available for comparison. A stroke rehabilitation unit was established in Portland, Oregon in 1969 (Dow, Dick and Crowell, 1974). It was claimed that the proportion of strokes of equal severity going home rose from 13 per cent to 56 per cent as a result of being admitted to the stroke unit, with no corresponding increase in the proportion of controls going home from other hospitals. However, no attempt was made at matching variables between cases and controls. Outcome was not based on functional status. Another comparison of two groups of patients treated 'before' and 'after' a stroke rehabilitation unit had been commissioned was reported by Adams (1971). During the period 1948-56 when elderly strokes were rehabilitated in the geriatric wards of the City Hospital in Belfast, approximately 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 at the City Hospital, Belfast and stroke patients transferred there from medical units once they had proved their ability to survive. This usually occurred at one to two weeks following onset. Thereafter, Adams was able to demonstrate that 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 (1976) compared the effectiveness of a stroke rehabilitation unit with the medical service of a general hospital in Rhode Island. The primary difference in treatment was the adoption in the stroke unit of an aggressive philosophy of 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 with 110 patients approved for stroke unit admission who were accommodated and treated in medical wards because the stroke unit was full at the time. A patient was considered to have improved if his condition decreased in severity between the time of admission to therapy and the time of discharge. Functional status of patients on admission was expressed as mild, moderate and severe disability. No significant difference was found between the two treatment systems for mild or severe disability gradings, but the stroke unit attained statistically significant better results for strokes presenting with moderate disability. Centralisation of services in a stroke unit appeared to be a better way of organising services to a certain stratum of patients than the system of rehabilitation provided in the hospital's medical wards. What none of these studies have been able to do is estimate what impact stroke rehabilitation in the acute phase might have on the long term consequences of the disease.

CHAPTER 7

LONG-TERM CONSEQUENCES OF STROKE

Summary

Stroke rehabilitation is a continuing process. Although most functional recovery occurs during the early months after onset, up to two years may elapse before the full capacity of the patient returns. The goal of independent self-care in stroke rehabilitation calls for a continuing multidisciplinary approach and the use of a full range of community services once hospital discharge has occurred. But there are no guidelines for the long-term management of stroke, and it is not clear to what extent demands are related to needs.

The Continuing Phase of Rehabilitation

Stroke rehabilitation is a continuing process which goes on well beyond the acute phase in hospital (Joint Committee for Stroke Facilities, X, 1974). It is necessary to ensure that the gains made during the initial hospital phase of rehabilitation are maintained once the patient has been discharged. A recent follow-up study of stroke patients who had been in the Rehabilitation Centre at the University of Minnesota Hospital revealed that the results achieved by rehabilitation were maintained or improved over the following seven or eight years (Anderson, Anderson and Kottke, 1977). It was concluded that this was due as much to the education of the patient and his family as through the use of community resources. Functional loss, when it did occur, was usually secondary to a superimposed health problem. It is generally accepted that functional recovery following stroke takes a long time. Hurwitz and Adams (1972) have suggested that up to two years may elapse before the full capacity of the patient to participate in social activities can be realised. This observation is supported by other studies such as those undertaken by Rosenthal (1962) and by Miglietta, Chuing and Rajeswaramma (1976). Rosenthal (1962) followed up 100 out of 153 hemiplegic patients who had been rehabilitated at the University of Pennsylvania, Philadelphia. Five years after onset, he found that there had been a ten per cent increase in patients who were functionally independent compared with the situation at the time of hospital discharge. Miglietta and his colleagues (Miglietta, Chuing and Rajeswaramma, 1976) reported on the rehabilitation outcome of 25 elderly hemiplegic patients admitted to a long stay hospital because of lack of progress of their functional and/or neurological disability. Improvement in function and performance occurred in 10 patients, including eight who were previously chairfast. These patients became completely independent in activities of daily living. It was concluded that some stroke patients need a longer and more intensive period of rehabilitation than is generally recommended. It has also been suggested that the patient who has been rehabilitated may regress to a state of disability after returning home if he and his family have not been given adequate orientation and instruction as to the need for continued effort, and do not receive encouragement and supervision (Report of the Joint Committee on Stroke Facilities, X, 1974).

Long-Term Studies of Stroke Rehabilitation

Only a few studies have undertaken a long term follow-up of stroke rehabilitation. Katz and his colleagues at the Benjamin Rose Hospital, Cleveland, Ohio (Katz, Ford, Chinn et al, 1966) studied the functional outcome over a six year period of 138 cerebral infarct patients who had received intensive rehabilitation. The conclusion reached was that functional recovery occurred most often during the early months after onset and thereafter, with decreasing frequency, up to two years. These findings were similar to those which had been reported earlier, but in less detail, from a follow-up series of cerebral infarct patients in Durham, North Carolina (David and Heyman, 1960). Another aspect of the long-term outcome of stroke rehabilitation has been highlighted by Moskowitz, Lightbody and Freitag (1972). Five hundred and eighteen stroke patients were followed up and examined at frequent intervals over a three year period. Despite significant motor recovery in many cases, the overall functional level of these patients remained poor. This was attributed, in part, to the fact that patients were not being permitted to carry out activities of daily living. Some patients even remained housebound although their disability was not the major cause of their immobility. A lack of orientation of the family during the initial period of hospitalisation was blamed. There has only been one study of long-term functional recovery following stroke undertaken on a defined population (Gresham, Fitzpatrick, Wolf et al, 1975). This study assessed the functional outcome of cases of stroke in the Framingham cohort over a period of seven years. Of the 119 Framingham survivors assessed, 84 per cent were living at home, 80 per cent were independent in mobility, and 69 per cent were independent in activities of daily living. However, only 29 per cent had normal vocational function and only 38 per cent showed no decrease in social activity outside their homes. Each of these frequencies was significantly greater than the corresponding rate in a control group composed of stroke-free living members of the cohort matched by sex and age.

Community Services for Stroke

It has been suggested that a realistic goal in stroke rehabilitation is independent self-care and a return home (Marquardsen, 1969). In the elderly, this calls for a continuing multidisciplinary approach and the employment of the full range of community services once hospital discharge has been effected (Adams, 1974). There is general agreement on the importance of the community health team in giving impetus to ongoing rehabilitation and providing support to the family as they cope with the sudden and devastating change in their life-style which the return of the stroke patient brings with him on discharge from hospital (Report of the Joint Committee on Stroke Facilities, X, 1974). Adams (1974) has given a broad outline of the place of community services in the continuing rehabilitation of elderly strokes. He emphasises that intelligent use of the services available calls for effective social work before hospital discharge, so that the patient returns to a secure home and to relatives, friends and members of the community services who are confident in the care they can offer because they have been properly informed. There is an important role for the general practitioner, health visitor, community nurse, social service worker and other staff in providing services and support for the stroke patient and his family in their own home.

The Utilisation of Community Services

The problem in providing on-going community services for stroke patients is the lack of real guidelines for the long term management of the hemiplegic stroke (Moskowitz, Lightbody and Freitag, 1972). It is not known whether the present utilisation of community health and social services by stroke patients is appropriate because criteria used to provide services are not clearly established. In particular, it is not clear to what extent demands made by stroke patients on community services are related to the actual need for these services. Information on present patterns of utilisation is fragmented, but it is possible to gain some insight by examining the extent to which different studies have found community services to be provided or used.

A job definition for the general practitioner suggests that he should be regarded as the leader of the community health team and the person who is responsible for providing continuity of care for patients in family units in the community (Royal College of General Practitioners, 1972). It has been claimed that the physical, mental and social problems of handicapped people living at home are mainly solved by the individual general practitioner who makes the major, and usually only contribution towards encouraging his patient to cope with residual disability (Yates,1968).

Evidence suggests that these obligations are not being fulfilled with regard to stroke patients. Harris (1971), found that only 25 per cent of handicapped stroke patients living in private households and in need of special care, had seen their general practitioner in the previous three months. Only three out of the 29 patients followed up in a Glasgow series (Isaacs, Neville and Rushford, 1976) were visited by the general practitioner as a result of notification by the hospital that the patient had been discharged. Further evidence of the contact which general practitioners have with stroke patients in the community can be obtained from the Second National Morbidity Study (Office of Population Censuses and Surveys, 1974). The stroke "experience" of an average Scottish General Practice of 1,920 persons in one year has been derived from published data (Table 7.1). Three points can be emphasised. The high proportion of home visits which make up the total consultations probably reflects the residual handicap which stroke patients endure. Only nine episodes of stroke seen in the year were for continuing care, yet an estimate derived from the Handicapped and Impaired Survey in Great Britain (Harris, 1971) suggests that each general practitioner has an average of five handicapped stroke patients on his list at any one time. Finally, confirmation that stroke patients living in the community receive little in the way of help from health or social services is obtained by the fact that the general practitioner only makes two referrals to community health services and four referrals to other agencies, e.g. voluntary services on behalf of his stroke patients during the course of a year.

TABLE 7.1

STROKE "EXPERIENCE" IN AN AVERAGE SCOTTISH GENERAL PRACTICE - 1920 PERSONS IN ONE YEAR

Number of Consultations = 76*, of which
- 54 were home visits resulting in
- 23 referrals being made, including
  - 10 as hospital inpatients
  - 5 as hospital outpatients
  - 3 for laboratory investigation
  - 2 to community health services
  - 3 to other agencies

Number of Stroke Deaths Certified = 2

Number of separate episodes of stroke seen = 23*, of which
- 12 were new episodes
- 9 were episodes of continuing care
- 1 was a recurrent episode of previously recognised disease
- 1 was an episode which did not receive care from the general practitioner

* Age adjusted to the Scottish Population, 1971

Source: Derived from Studies on Medical and Population Subjects No. 26, Morbidity Statistics from General Practice Second National Study, Office Population Censuses and Surveys, London, H.M.S.O., 1974.

One of the consequences of this lack of contact has been highlighted by Anderson (1978). She found that the most common reason for outcomes which did not reach expectations was inadequate follow-up. There were missing links between the family doctor and his utilisation of follow-up care resources. Wylie (1964) studied referral patterns of stroke patients from general practitioners when a physical medicine and rehabilitation unit was opened in Baltimore by the Maryland State Health Department. During the period 1956-61, only 102 out of 346 general practitioners in Baltimore referred any stroke patients to the rehabilitation unit. More participating physicians were recent graduates and belonged to national professional societies. Physicians referring the most patients also selected more suitable cases for rehabilitation than less interested doctors. Wylie concluded that improved medical school teaching of rehabilitation would be the long term remedy for more appropriate participation by general practitioners in stroke rehabilitation.

The extent of community nurse involvement in the on-going care of stroke patients does not appear to be very extensive either. Data on home nursing in Scotland (Carstairs, 1966) showed that only nine per cent of nursing workload was associated with stroke patients. The only source of data on other community service involvement with stroke patients comes from a descriptive study set up to identify the pathways of medical care and rehabilitation followed by patients who had suffered an acute stroke in Manchester (Brocklehurst, Andrews, Morris et al, 1978). Stroke patients comprised only one per cent of health visitors' workload.

More than half (57 per cent) of patients had contact with social services, divided almost equally between hospital and community based social workers. Contacts with social workers were mainly requests for provision of aids and adaptations or assessments in relation to possible services. Less than one in ten patients received Meals on Wheels and only one in every seven patients had a Home Help. Eight per cent of patients who survived to one year after onset were in receipt of chiropody services. Thus, the extent to which community services appear to be involved in providing on-going rehabilitation for stroke patients and support for the relatives and friends who are carrying the burden of dependency is not very great. The problem is exacerbated by the divided responsibilities for the provision of community services between health and social services. This may lead to particular difficulties in the provision of aids and adaptations. The provision of aids which have to be tailor-made for a particular patient is the responsibility of the health service, as are aids which are appropriately considered as nursing aids such as incontinence pads. On the other hand, the general range of ready-made aids and adaptations to housing are the responsibility of Departments of Social Services.

The Cost Equation of Stroke Rehabilitation

Although estimates of the direct cost of stroke illness to the community have been made (Carstairs, 1976), there is a lack of data on the cost-benefit of rehabilitating strokes and on the cost-effectiveness of different methods of organising stroke rehabilitation. It has been suggested that the costs of stroke rehabilitation with its labour intensive team approach may be high, but the costs of maintaining strokes in a dependent state because they do not receive rehabilitation are even higher (Kottke, 1974). Lehmann and his colleagues (Lehmann, DeLateur, Fowler, et al, 1975) described a cost-benefit ratio to assess the economics of rehabilitating a stroke victim and concluded that a substantial net saving resulted from rehabilitation. Neither of these studies which tried to make the economic case for devoting rehabilitation resources to stroke patients adequately tackled the financial equation which urgently requires to be solved. The crucial question is: If resources are devoted to stroke rehabilitation at an early stage after onset, resulting, as descriptive evidence suggests, in a higher proportion of patients becoming functionally independent, does this mean a lower input of resources from community services will be required in the long term?

PART II

PLANNING AND CONDUCT OF THE STUDY

CHAPTER 8

FORMULATING THE HYPOTHESIS

Summary

A study was set up to test the hypothesis that a higher proportion of patients could be returned to independence following rehabilitation in a stroke unit compared with the proportion of patients who were rehabilitated in medical units. The study was seen as an essential first step to establishing the relative importance of the different components of stroke rehabilitation.

Recommendations for Research

A report of the Standing Medical Advisory Committee on the future of Medical Rehabilitation (Her Majesty's Stationery Office, 1972) commented on the lack of evidence of the effect of rehabilitation. A number of reports have made suggestions which would remedy this situation with regard to stroke rehabilitation. For example, the Report of a Working Group on Stroke set up by the Geriatrics Committee of the Royal College of Physicians (Royal College of Physicians, 1974) recommended setting up a few experimental treatment centres for stroke patients, based on existing departments of neurology, rehabilitation or geriatric medicine, to act as focal points for the development of facilities and the organisation of services. This Report emphasised that any scheme designed to establish pilot stroke units should include a method of assessing their value. Another recommendation made was to estimate resources required for stroke rehabilitation. The Joint

Committee for Stroke Facilities (1973) issued an extensive list of recommendations for research in stroke. Amongst the recommendations made were the need to study the effectiveness of physical therapy and occupational therapy in functional recovery with specific reference to timing of the initial therapy and ascertaining the impact of home care on the patient's recovery. A World Health Organisation Report (1971) emphasised that the procedure used for the selection of patients should be carefully assessed in any evaluation of stroke rehabilitation.

The Essential First Step

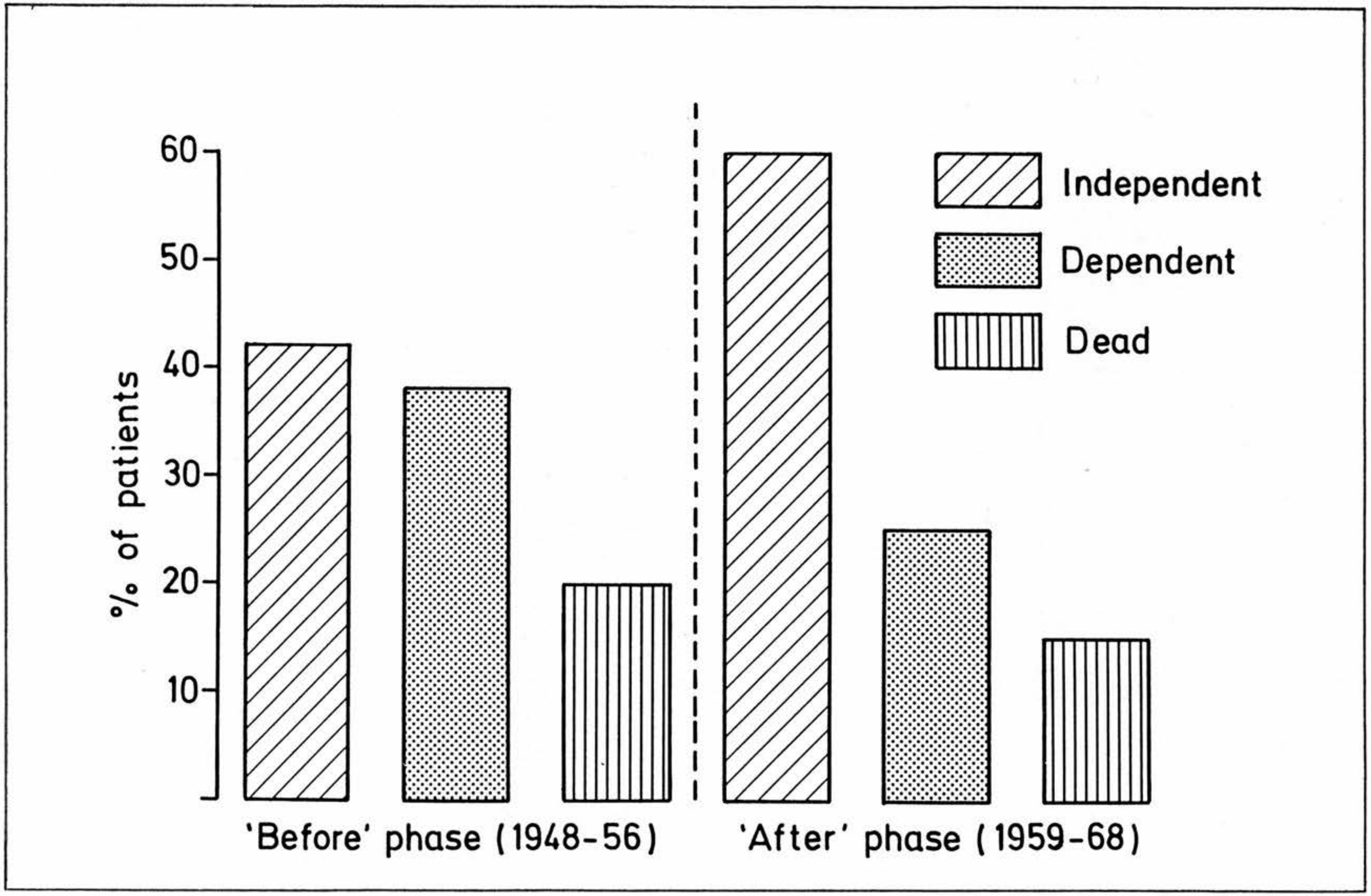
The field of stroke rehabilitation is too complex to be able to answer all the questions about the optimum level of manpower and facilities in one go, as well as the quantity, method, timing and duration of therapy which should be deployed to provide the most effective rehabilitation of strokes. What is required as an essential first step is to establish the most appropriate method of organising stroke rehabilitation. Once this has been done, it should be possible to determine the relative importance of the different components of stroke rehabilitation through a series of supplementary studies. The purpose of this thesis therefore is to test the hypothesis that a stroke rehabilitation unit can discharge a higher proportion of patients following acute stroke who are functionally independent compared with the proportion of such patients who are discharged from medical units. The basis used to establish the hypothesis was the descriptive study of stroke rehabilitation reported by Adams (1971). He reported on the prognosis of patients with strokes in Belfast who were usually admitted as emergencies to medical wards. There, they sorted themselves out into those who recover quickly from minor episodes, those who died from massive haemorrhage or infarction and the survivors who were referred for rehabilitation in the first or second week after onset. The records of 2,084 elderly stroke patients were analysed over a 20 year period and their functional prognosis ascertained. During the period 1948-56, when elderly strokes were rehabilitated in the geriatric wards of the City Hospital, Belfast, approximately 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 stroke patients were transferred there from medical units once they had proved their ability to survive. Thereafter, during the periods 1959-63 and 1964-68, Adams was able to determine that the proportion of patients discharged home rose to 60 per cent, with a consequent lowering of the percentage of patients requiring long stay care and dying within two months of onset. Figure 8.1 summarises the results of this 'before' and 'after' study which was used to establish the hypothesis which is to be tested in this thesis.

No data on age distribution, comparability of patient selection, amount or timing of therapy, or uniformity in applying the criteria of functional status over the 20 year period of observation was given by Adams (1971). Moreover, he did not differentiate between first and subsequent admissions for stroke, primary or secondary strokes or patients who were admitted from

FIGURE 8.1

COMPARISON OF THE FUNCTIONAL PROGNOSIS OF STROKE

A 'before' and 'after' study undertaken in Belfast, 1948-68.



the waiting list or as emergencies to medical units. In addition, it is not known whether the hospital admission policy or discharge arrangements following acute stroke in the elderly are currently the same in Scotland, and in Edinburgh in particular, compared with Belfast during the time periods 1948-56, 1959-63 and 1964-68. Accordingly, an adhoc tabulation of Scottish Hospital Inpatients Statistics (MORA 8/278, 1973) in which the hospital discharge arrangements for patients aged 60 years and over with a diagnosis of cerebrovascular disease (I.C.D. 430-438), who were admitted as emergencies to medical units in Edinburgh hospitals during the period 1970-72 was obtained. The proportion of patients discharged home was 38 per cent. This was similar to the proportion of acute strokes discharged home in Belfast during the period 1948-56, when the policy was to admit and rehabilitate such patients under general medical care. This was taken as corroborative evidence that the discharge situation in Edinburgh where it was proposed to test the hypothesis was broadly similar for acute strokes in the elderly from medical units as that which existed in Belfast in 1948-56 during the 'before' phase of the Adams study (1971).

Objectives of the Study

The primary aim of the study which is the basis of this thesis, was to test the hypothesis that a higher proportion of patients with acute stroke could be returned to functional independence following rehabilitation in a stroke unit compared with patients who were rehabilitated in medical units. The methods of organising stroke rehabilitation to be compared were:

(i) Hospital admission to a stroke unit following the onset of an acute stroke for initial care and subsequent rehabilitation. The unit had all the facilities required for rehabilitation located centrally, and appropriate staff available to provide therapy exclusively to stroke patients.

(ii) Hospital admission to medical units following the onset of an acute stroke for initial care, using the facilities and staff of the acute admitting or an affiliated hospital for subsequent rehabilitation.

The methods of organising the care and rehabilitation of acute strokes were compared by examining the outcome in each group of patients with regard to mortality and level of function.

<u>The secondary aims</u> of the study were:

(i) To identify variables which could contribute to the acceptance or rejection of the hypothesis being tested. This attempted to answer the question: Can the nature, duration and quantity of the various components of stroke care and rehabilitation be identified as a preliminary step to subsequently establishing their relative importance?

(ii) To complete the picture of stroke rehabilitation in the defined population. This attempted to answer the question: How many beds would be required in a stroke unit per head of population if the hypothesis was accepted?

(iii) To assess the balance of resources used during the acute and continuing phase of rehabilitation. This attempted to answer the question: Are the resources used to provide continuing care following stroke reduced by the provision of additional resources during the acute phase of rehabilitation?

CHAPTER 9

PLANNING AND ORGANISATION OF THE STUDY

Summary

Epidemiological principles and practice were used to plan and conduct the study. Particular emphasis was placed on using a system of triage to select strokes for the study, accepting patients from a well defined population, standardising all clinical examinations and devising an objective measurement for assessing outcome at the end of the acute and continuing phase of rehabilitation. Data collection on a large number of factors which might contribute to the outcome of stroke rehabilitation was arranged through an extensive network of support developed for the study.

Organisers of the Study

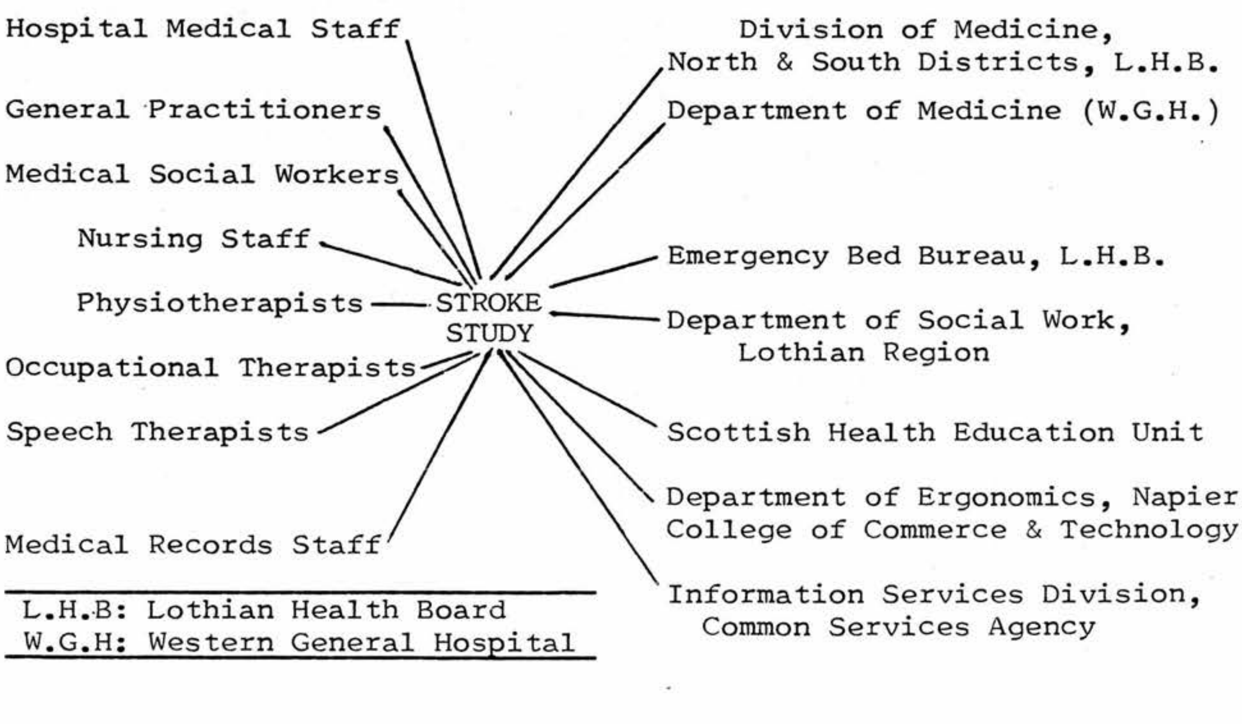
Evaluation studies in health care can be complex and require the co-operation of different disciplines. Accordingly, a multi-disciplinary group comprising an epidemiologist, a physician in geriatric medicine, a nurse and a medical statistician were formed to undertake the study. The responsibility of each member of this group is summarised in the preface of the thesis.

Collaboration and Support

Stroke rehabilitation requires a contribution from many different groups working in the health service, including medical, nursing, therapy, social work and other staff based in hospital and community services. One particularly important source of support for the study came from the Division of Medicine in the North District, Lothian Health Board which contained the defined population on which it was planned to undertake the study. The organisation of medical specialties into Divisions (Scottish Home and Health Department, 1967) amalgamated members of a particular specialty into a single organisational unit, and thus created the means by which decisions about medical services can be taken collectively. Support was sought to change the function of one of the geriatric assessment wards to which members of the Division had access. This ward formed the basis of the stroke rehabilitation unit. The agreement which was reached with the Division of Medicine made provision for returning this ward to its previous use of geriatric assessment at the completion of the study. The physicians within this Division and the Division of Medicine in the South District, Lothian Health Board agreed to co-operate in the management of stroke patients who were admitted to their medical units.

Figure 9.1 summarises the network of support which had to be built up before the study could begin.

FIGURE 9.1 : NETWORK OF SUPPORT FOR THE STUDY



Facilities

I. The Stroke Rehabilitation Unit

The stroke unit was established in 1973 in Ward 2B, a 15-bedded ward in the geriatric assessment unit at the Royal Victoria Hospital. The ward was situated within purpose built accommodation completed in 1971. A wide range of facilities were available for the rehabilitation programme including a large, well equipped physiotherapy department, an occupational therapy department incorporating an Activities of Daily Living area, a light work area, heavy work shop and courtyard garden. Speech therapy, chiropody, a dental surgery and medical social work were also available to patients in the stroke unit.

A small multidisciplinary rehabilitation team was established from staff already working in the hospital under the direction of a consultant physician in geriatric medicine, Dr.A.J. Akhtar. Particular emphasis was placed on not attempting to achieve an unrealistic level of staffing within the rehabilitation team which could not be attained elsewhere. Accordingly no additional staff were recruited. An extensive educational and in-service training programme for all staff in the stroke unit was undertaken.

The stroke unit had been in operation for a period of one year before the study commenced and had evolved an operational policy which was initially based on the work of Isaacs (1977). Particular emphasis in the stroke unit was placed on commencing rehabilitation as early as possible and on orientating the therapy entirely towards achieving functional independence so that patients could be discharged home. The nursing staff and therapists worked together to make the patients' rehabilitation a continuous process which did not stop once treatment by the physiotherapist or occupational therapist came to an end. For example, the patient was made to perform all routine activities in the ward like dressing and going to the toilet with the least possible assistance from the nursing staff. This was very time consuming for the patient and ward staff, but the ward routine was altered to make this possible and the temptation to do things for the patient for reasons of expediency was strongly resisted. The importance of family involvement in stroke rehabilitation was recognised by devising a health education programme for relatives and friends of patients. The clinical organisation of the stroke unit provided the maximum opportunity for interdisciplinary coordination. This included regular multidisciplinary ward rounds involving medical and nursing staff, therapists and a social worker. In addition, a comprehensive examination of patients' progress was reviewed at weekly case conferences involving the entire rehabilitation team. Relatives and friends of patients were invited to participate in these conferences, and appropriate liaison staff from community services were fully informed by updated reports of patients' likely requirements upon discharge.

II. Medical Units

Emergency hospital admissions for all types of disease were directed through an Emergency Bed Bureau run by the Lothian Health Board which arranges hospital placements on behalf of referring general practitioners. Admissions for patients with acute stroke were to one of 12 medical units situated in eight hospitals with the City of Edinburgh, placements being made according to which medical units were on call for emergency admissions. Each medical unit receives a wide spectrum of disease for investigation, diagnosis and treatment, and was staffed by a number of consultant physicians representing various sub-specialties with supporting junior medical staff. Accommodation used by medical units varies, but was generally of the open 'Nightingale' ward pattern. A list of medical wards in Edinburgh hospitals is presented in Table 9.1.

TABLE 9.1

MEDICAL WARDS IN EDINBURGH HOSPITALS

Royal Infirmary
Wards 22/23, 24/25, 26/27, 28/29/30, 32/33

Western General Hospital
Wards A1-5, C1-4, C8-14

Eastern General Hospital
Wards C, D

City Hospital
Wards 5, 8

Leith Hospital
Wards 5/6, 7/8

Deaconess Hospital
Wards Elizabeth/Charteris/Maxwell

Chalmers Hospital
Wards 1/2

Edenhall Hospital
Wards 1/2

All units had access to diagnostic facilities for investigating stroke as well as being able to make referrals to a range of rehabilitation staff and facilities either within their present institution or in an affiliated hospital. However, patients with acute strokes admitted to medical units had to compete for resources with many other types of case and their rehabilitation might have been subjected to a much wider range of constraints than those which patients might have experienced in the stroke unit.

III. Research Accommodation

Office space within the University Department of Medicine at the Western General Hospital located in accommodation which was remote from any patient care areas was made available to house the research staff for the duration of the project. Additional accommodation for the research project was located in a part of the Royal Victoria Hospital away from the Stroke Rehabilitation Unit. Office accommodation was also made available within the University Department of Community Medicine, Nursing Research Unit and Medical Computing and Statistics Unit.

Criteria for Stroke Selection

A stroke was defined as the onset of a focal neurological deficit due to a presumed local disturbance in blood supply to the brain, which had been present for at least six hours and not more than 72 hours at the time of initial assessment. The study was limited to persons aged 60 years and over having acute onset of stroke for the first time, presenting with a developing hemiplegia. This does not imply that other manifestations of stroke could not have been considered, but it was necessary in the initial assessment of stroke rehabilitation to concentrate on a clearly defined group of lesions. It was also important to focus this assessment on the elderly where the burden of stroke on resources is highest even though the rehabilitation potential of elderly stroke patients may not be as great as that of younger patients who often exhibit a 'cleaner' presentation of stroke (Marquardsen, 1969).

A system of triage was developed in order to concentrate limited resources on those patients who would derive the most benefit from rehabilitation. Stroke presentations were divided into three bands: 'upper', 'middle' and 'lower', using selection criteria derived from previous studies of the natural history of stroke such as that of Marquardsen (1969). These are illustrated in Figure 9.2. A stroke presentation of unconscious at onset was defined as a patient who was in deep coma, semi-coma or was stuporosed, according to the criteria of conscious level recommended by the staff of the Department of Neurology at the Mayo Clinic (Mayo Clinic and Mayo Foundation, 1976). Conscious at onset included patients who were judged to be somnolent using the Mayo Clinic criteria. Prestroke dependency was assessed on what activities of daily living patients were able to perform for themselves during the period of a few days immediately preceding the onset of stroke. An established or developing hemiplegia was present when any degree of motor weakness defined in Appendix (i) was present in both the arm and leg, on the same side of the body.

FIGURE 9.2/

FIGURE 9.2

SELECTION OF STROKES FOR THE STUDY

	Stroke Presentation	Prognosis	Eligibility
'Upper' Band	Unconscious at onset Prestroke dependency	Bad for survival Like to remain dependent	EXCLUDED
'Middle' Band	Conscious at onset Established or developing hemiplegia	Good for survival Spontaneous recovery of independence unlikely	INCLUDED
'Lower' Band	Conscious at onset No demonstrable hemiplegia	Good for survival Spontaneous recovery of independence likely	EXCLUDED

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 did 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.

Patients

Patients were drawn from persons resident within the Edinburgh City wards located in the North District of the Lothian Health Board. This gave a defined, catchment population of 226,775 (Registrar General for Scotland, 1973). The demographic characteristics of this defined population compared with Scotland is summarised in Table. 9.2.

TABLE 9.2

SOME DEMOGRAPHIC CHARACTERISTICS OF THE ELDERLY - COMPARISONS BETWEEN THE POPULATIONS OF EDINBURGH* & SCOTLAND

		Edinburgh*(%)	Scotland (%)
AGED	65 Years	18.6	12.3
	80 Years	2.4	2.0
MARITAL STATUS	Single	17.2	16.1
	Widowed	31.8	31.7
One Person Households		27.5	25.4
In Institutional Care		6.8	5.9

*The population of Edinburgh refers to persons resident within the 12 Electoral Wards of the City of Edinburgh which were located within the North District of the Lothian Health Board.

Sources: General Register Office, Edinburgh. Census 1971. Scotland Population Tables; County Report, Edinburgh City; Edinburgh. Her Majesty's Stationery Office, 1974.

This comparison indicates that the study population was representative of Scotland as a whole with regard to sex, marital status and household size, but contained a higher proportion of persons aged 65 years and over than Scotland. All patients from this defined population presenting with stroke within the defined limits laid down by the 'middle' band of selection criteria whose general practitioners requested hospital admission were included.

Hospital Care of Stroke Patients

The pattern of care for stroke patients admitted to hospitals of the Lothian Health Board which served the defined population was compared with the pattern of stroke care in all Scottish hospitals in 1976-77 (MORA 8/217D, 8/217E, Scottish Hospital Inpatient Statistics, 1979). A summary of relevant indices of hospital care is presented in Table 9.3. Hospitals of the Lothian Health Board had a higher proportion of stroke admissions to medical units and stroke patients utilise a higher proportion of all hospital bed days in the Lothian Health Board than in Scotland as a whole. In other respects, the patterns of stroke care are similar.

TABLE 9.3

INDICES OF HOSPITAL CARE OF STROKE: COMPARISONS BETWEEN THE LOTHIAN HEALTH BOARD AND SCOTLAND

Indices of Hospital Care	Lothian H.B.*	Scotland
Proportion of all Admissions (%)	2.3	2.5
Admitted as Emergencies (%)	60.5	60.1
Admitted to Medical Wards (%)	68.7	58.8
Proportion of all Hospital Bed Days (%)	14.4	11.1
Discharged Home (%)	42.6	40.3

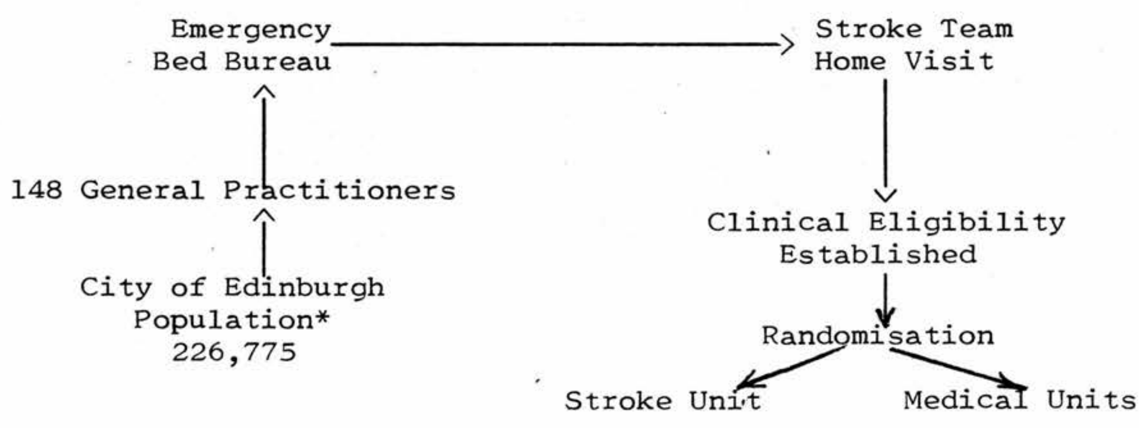
*Only hospitals within the Lothian Health Board which served the defined population of the Study are included.

Source: Scottish Hospital Inpatient Statistics adhoc tabulations MORA 8/217D, 8/217E. Information Services Division of the Common Services Agency, Scottish Health Service, Edinburgh, 1979.

Entry to the Study

Patients were seen at home by a physician in geriatric medicine following notification of the onset of a stroke by the patient's general practitioner. Notification was made directly to the on-call physician in geriatric medicine using an ex-directory telephone number issued prior to the study commencing. The telephone number was connected to the Post Office Transfer Call Service, enabling a 24-hour on-call notification service to be operated. Alternatively, general practitioners notified the Emergency Bed Bureau who would immediately contact the physician in geriatric medicine on call. Figure 9.3 summarises the entry procedure which was adopted. Eighty eight patients were referred directly to the study and a further 496 patients notified to the study by the staff of the Emergency Bed Bureau. The mean delay between notification and the home visit commencing was 40.1 minutes. Input of patients to the study was stopped on only three occasions, for a combined duration of less than six days during the entry period of 31 months from October 3, 1975 - April 30, 1978. The purpose of the home visit was to determine if the criteria of stroke required to participate in the study could be met.

FIGURE 9.3 ENTRY TO THE STUDY



*Refers to persons resident within the 12 Electoral Wards of the City of Edinburgh which were located within the North District of the Lothian Health Board

Of the 584 patients visited, 39 were found not to have had a stroke at all. Of the remaining 548 patients, 118 were placed in the 'upper' band and 116 in the 'lower' band of strokes and were ineligible to participate. The remaining 311 'middle' band stroke patients (or their next of kin if the patient could not give informed consent), were given an outline of the study objectives and invited to participate. No patients (or their next of kin) declined at this stage. Establishing study eligibility took a mean period of 20.3 minutes.

Randomisation

Allocation of patients into the two methods of stroke care was performed by a system of restricted randomisation ensuring that the patients were evenly divided between the two options throughout the study. The options of admission to the stroke unit or a medical unit were allocated at the start of the project by Dr. R. J. Prescott and remained unknown to the other investigators until a patient was accepted into the trial. Each study code number with its allocation was contained in a sealed envelope held in numerical order by the physician 'on call' for stroke notifications. If a patient was eligible and agreed to participate, the allocation was drawn by the physician and the patient transferred by ambulance either to the stroke unit or placed in a medical unit by the Emergency Bed Bureau. All patients with a 'middle' band stroke were admitted to the study, irrespective of whether their home circumstances were thought suitable for subsequent home care or not. At the time of allocation, there was no way of determining what a patient's post-rehabilitation situation might be. Patients seen at home who did not satisfy the entry criteria were referred back to their general practitioner with a report suggesting lines of therapy which might be followed. Patients found to be unconscious at the time of assessment were admitted to a medical unit through the Emergency Bed Bureau with the prior consent of the referring general practitioner.

The Acute Phase of Rehabilitation

The acute phase of rehabilitation was defined as the period from hospital admission to the point at which a decision to discharge a patient was made, or a period of 16 weeks after admission had passed, whichever was the sooner. No effort was made to restrict the clinical freedom of any medical, nursing or therapy staff in the study with regard to any form of treatment. Each physician was free to discharge patients to any level of continuing care. In order to maintain a satisfactory throughput in the stroke unit, a maximum stay of 16 weeks was imposed although it was recognised that some improvement in residual disability could be expected to occur in a few patients beyond this point. Patients were followed during the acute phase of rehabilitation by a clinical research fellow who carried out a standard neurological examination at weekly intervals. The definitions, instructions and interpretation of findings were predetermined for this clinical assessment which collected data based on a series of quantitative scales for tests of mental, sensory, motor, and communication function. Details of this clinical assessment are presented in Appendix (i).

In addition to details of personal characteristics such as age, sex, marital status, etc., and the duration of hospital stay, data on other variables which might contribute to the outcome of the acute phase of stroke rehabilitation were obtained by the following methods:

1. Medical Investigations, Diagnoses and Drug Therapy. Information on these variables was obtained by examining patients' medical records. Details of drug therapy were obtained from the nursing cardex. Abstraction of data was undertaken by the clinical research fellow following notification that hospital discharge was imminent.

2. Nursing Dependency. A study of the dependency of patients in the stroke unit, and of patients in a sample of three medical wards, drawn randomly from wards which contained patients in the study at the beginning of the period of observation was undertaken during a period of two weeks in July 1977, under the direction of Dr. Lisbeth Hockey. A daily assessment was made by three nursing research assistants trained to record dependency on a modified version of the Dundee Chart (Eastern Regional Hospital Board, 1973). An Activity Coding Sheet was used to obtain data on the time taken by patients to perform the daily activities of washing, feeding and toileting. These activities were chosen because they constitute 'basic nursing care', and demand the highest proportion of nursing time and effort. This data was collected in the stroke unit only, information on activity times in medical wards being derived from a nursing study being undertaken concurrently with this project (Grant, 1977).

3. Social Work. Each medical social worker based in hospitals containing the stroke unit and medical units kept a record of

referrals from patients in the study. A logbook was maintained by the social worker in which details of all contacts made with, or on behalf of study patients were recorded. The logbooks were maintained up to the patient's discharge from hospital or until the 16 week cut-off point, and were then returned to the research office for collation.

4. Therapy. Departments of physiotherapy, occupational therapy and speech therapy in Edinburgh hospitals maintain registers of their activities. The registers include details of when treatment commences and is completed, and the number of therapy units provided to individual patients. Each therapy unit is the equivalent of 30 minutes of time. Access to the registers was arranged prior to the study commencing. When all patients had been discharged from their admitting or affiliated hospital, each therapy department was visited and details of therapy extracted for all study patients from the appropriate registers.

5. Aids and Adaptations. All aids, adaptations to patients' homes or other living situations prescribed during the acute phase of rehabilitation, together with accessory aids such as spectacles, hearing aids and dentures which received attention were recorded upon notification of patients' impending discharge from hospital.

6. Communication. Community health and social services agencies contacted at the time of hospital discharge were recorded from the discharge summary and/or the copy of the general practitioner's letter contained within the patient's medical records and/or the nursing cardex. Whether hospital follow-up following discharge

was intended was noted and the interval between patient discharge and the general practitioner's letter being sent was recorded. The patient, and his nearest relative or friend were interviewed at the point of hospital discharge by an independent social worker seconded to the study, and details of contact which had occurred with various members of hospital staff were recorded.

The Outcome of Stroke Rehabilitation

Activities of Daily Living (A.D.L.) indices have achieved almost universal acceptance as the appropriate outcome measure for stroke rehabilitation. After a careful examination of all existing A.D.L. indices, it was concluded that none were entirely suitable for this study, and it was decided to devise an outcome classification based on A.D.L. to meet the following criteria:

(i) The A.D.L. index had to be comprehensive in covering the basic daily activities essential for an elderly person to maintain life on their own at home. The activities are defined in Table 9.4. Activities such as bathing, provision of a main meal, laundry and shopping were excluded as these could be met by outside sources of help from relatives, friends and/or community health or social services.

(ii) It had to be simple enough to be carried out by any member of the research staff.

(iii) It had to be suitable to assess the degree of handicap defined in Table 9.5. These were arranged in such a way that an approximation could be made with the Rankin Disability Index (1957), a more subjective assessment which had been widely used in other studies. The criteria of the Rankin Index are contained in Table 9.6 together with a comparison of the A.D.L. Index used in this study.

TABLE 9.4

ACTIVITIES OF DAILY LIVING ON WHICH THE OUTCOME OF STROKE REHABILITATION WAS BASED

Getting in and out of bed
Dressing with clothes for indoor wear
Indoor mobility
Toileting and personal hygiene
Cooking a simple hot meal
Feeding
Controlling indoor environment (heat, light, power, etc.)

TABLE 9.5

THE A.D.L. ASSESSMENT INDEX USED TO MEASURE THE OUTCOME OF STROKE REHABILITATION

GRADE ONE*	Independent
GRADE TWO*	Independent using prescribed aid(s) and/or adaptation(s)
GRADE THREE‡	Requires light help to perform activity (one person)
GRADE FOUR‡	Requires heavy help to perform activity (two persons)
GRADE FIVE‡	Failure to perform activity

*Patients in these categories were classified as INDEPENDENT: if they performed ALL activities without human assistance using prescribed aid(s) and/or adaptation(s) where applicable.

‡Patients in these categories were classified as DEPENDENT: if they required human assistance to perform AT LEAST ONE activity or failed to perform the activity at all, even with help.

TABLE 9.6

THE A.D.L. ASSESSMENT INDEX AND THE RANKIN DISABILITY INDEX - COMPARISON OF GRADES

A.D.L. Assessment Index		Rankin Disability Index	
GRADE ONE:	Independent	GRADE ONE:	Independent
GRADE TWO:	Independent using prescribed aid(s) and/or adaptation(s)	GRADE TWO:	Slight disability but requires no assistance
GRADE THREE:	Help from one person but independent in mobility	GRADE THREE:	Moderate disability, walks without assistance but requires some help
GRADE FOUR:	Help from one or two persons involving mobility	GRADE FOUR:	Moderately severe, unable to walk or attend to needs without assistance
GRADE FIVE:	Failure to perform activity	GRADE FIVE:	Incontinent, requires constant nursing care

Source: Rankin, J. (1957) Scott.Med.J; 2 : 200-215

(iv) It had to be completely objective, and not exhibit major inter- or intra-observer variation in use.

(v) The assessment had to be carried out in a setting which would constitute either their intended or actual home or other situation following hospital discharge, or in an accurate replication of this discharge situation.

(vi) The assessment had to incorporate all prescribed aids and adaptations, including the use of accessory aids where appropriate, but excluding the level of human help at home in order to establish the independence level which a patient could achieve.

An Activities of Daily Living (A.D.L.) Assessment Unit was designed to meet these criteria which were similar to those subsequently suggested by Nichols (1976). The Unit was situated in accommodation at the Royal Victoria Hospital located separately from the stroke unit and the A.D.L. unit used by the Department of Occupational Therapy. The aim of the research A.D.L. Unit was to give an accurate replication of a patient's home or other discharge situation. The advantages of bringing patients to the research A.D.L. Unit for assessment under simulated home conditions was to eliminate the influence of such factors as the emotional and psychological effects of returning home, the temperature and conditions of homes which may have been unoccupied for some weeks or months and the presence of relatives who might have been anxious or overprotective.

The basic design of the Unit was undertaken by an ergonomist, Mr.C.J.A. Andrews, and Industrial Design students from the Napier

College of Commerce and Technology, in conjunction with the research occupational therapist. A system of construction using adjustable shelving wall brackets was devised. In order to meet the requirements of flexibility demanded by the criteria established for the outcome measurement, the brackets were mounted on blockboards using long 'spur' uprights to support them. All kitchen equipment, including sink, work tops, cupboards and cooker base, were attached to the 'spur' brackets which were slotted into the wall uprights at any height or in any position required. The provision of moveable walls was built into the construction of the unit, so that very confined kitchen and bathroom areas, narrow passageways and doorways could also be simulated. Figure 9.4(i) illustrates an example of a home simulation set up in the research A.D.L. Unit and Figure 9.4(ii) gives some examples of the range of flexibility in type and position of the household fixtures and fittings which could be achieved in the A.D.L. Assessment Unit.

Patients only visited the Unit for assessment following notification of impending hospital discharge. Screening in the ward was carried out to ensure that completely bedfast patients were not sent to the Unit. No training was given to any patient in the Unit prior to the outcome assessment, and no patients visited the Unit until the completion of the acute phase of rehabilitation. The components of the A.D.L. Unit were rearranged for each outcome assessment, using information which the research occupational therapist obtained from a visit to the patient's home. The assessment of each patient was carried out in a predetermined order, using a standard set of instructions and interpretations for the performance of each activity. A therapist or nurse from the patient's hospital was encouraged to attend the A.D.L. assessment,

FIGURE 9.4 (i)

SIMULATION OF A HOME SITUATION IN THE A.D.L. ASSESSMENT UNIT

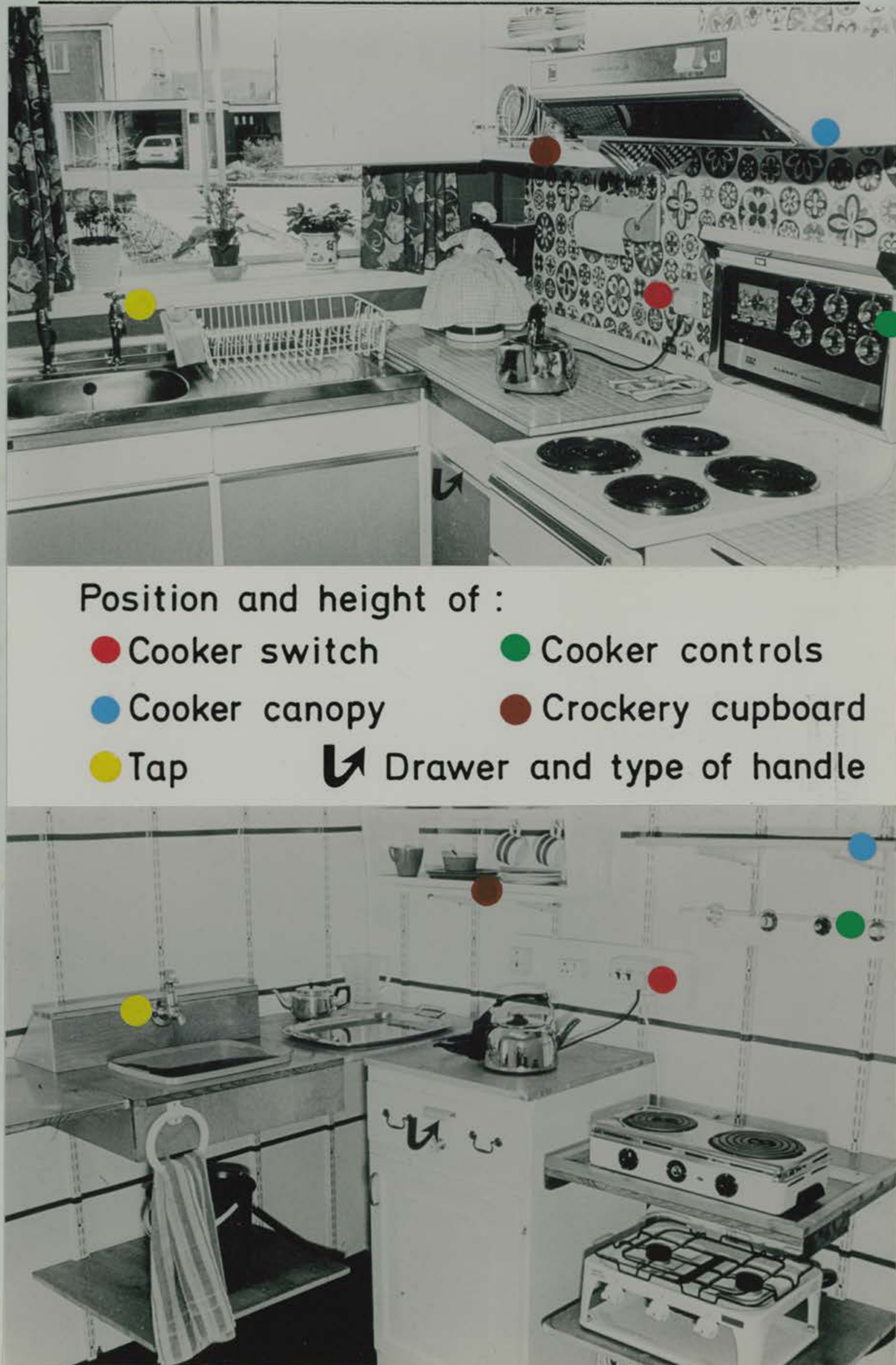
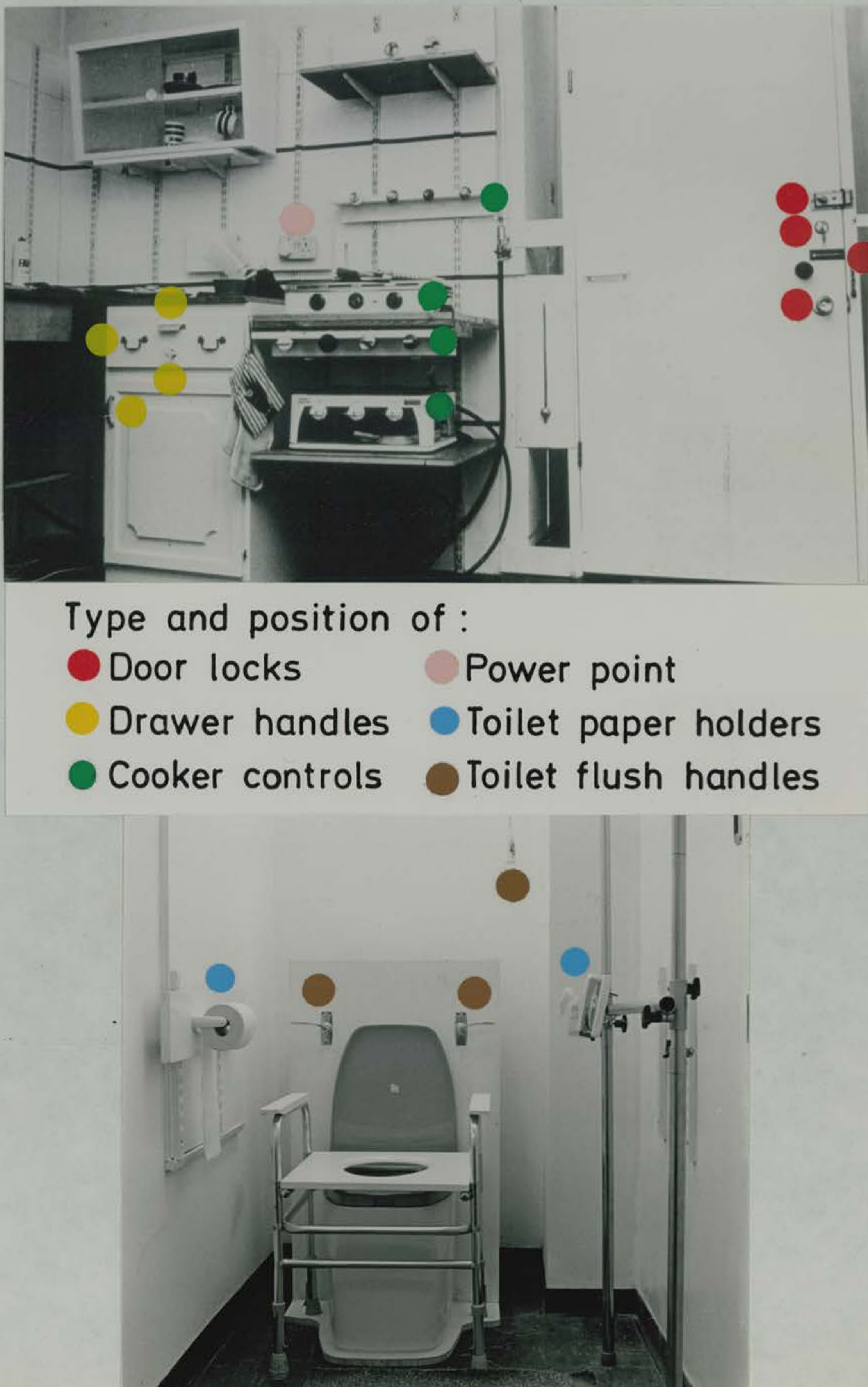


FIGURE 9.4 (ii)

SOME EXAMPLES OF THE RANGE OF FLEXIBILITY IN TYPE AND POSITION OF HOUSEHOLD FIXTURES AND FITTINGS WHICH COULD BE ACHIEVED IN THE A.D.L. ASSESSMENT UNIT



both to act as a monitor of the research occupational therapist's assessment and to provide human assistance for the patient to complete activities which he/she was unable to perform independently. Each of the seven activities was graded separately, the patient's overall outcome category being the highest grade achieved in one (or more) of the seven Activities of Daily Living defined in Table 9.4. Patients underwent the A.D.L. assessment in their own homes when it was not possible to arrange a visit to the unit because of pressures of time between notification and discharge or where notification of discharge was made too late to set up the unit.

Two hundred and thirty-four patients underwent the A.D.L. assessment at the end of the acute phase of rehabilitation at a mean interval from hospital admission of 60.4 days. The mean duration of the assessments was 53.4 minutes. There were no differences between allocations in the mean intervals from hospital admission to the A.D.L. assessment being carried out, or in the duration of these assessments. A detailed account of the design, construction and working of the A.D.L. assessment unit has been described elsewhere (Smith, Garraway, Akhtar et al, 1977).

The Continuing Phase of Rehabilitation

The continuing phase of rehabilitation was defined as the period of one year which commenced with the end of the acute phase of rehabilitation, i.e. from the time of initial hospital discharge or when a period of 16 weeks following onset had passed.

A Nursing Dependency Index was devised as an extension of the A.D.L. assessment for the continuing phase of rehabilitation in collaboration with Dr.Lisbeth Hockey, Director of the Nursing Research Unit. The Index consisted of 20 items, each of which constituted a measure of nursing care. The Index is summarised in Appendix (ii). Patients were scored on a five point scale arranged in a similar manner to the outcome scale used in the A.D.L. assessment, but with one important difference. Whereas the A.D.L. assessment was designed to measure what patients were actually able to do, the Nursing Dependency Index reflected what patients were permitted to do. The Nursing Dependency Index was arranged so that the contribution which relatives and friends made in supporting patients could be compared with the contribution being made by staff of the various health and social services. The Index was administered every month during the continuing phase of rehabilitation. Patients were assessed on the level of assistance which they received during the 24-hour period prior to the home visit during which the Nursing Dependency Index was being administered. The day in the week on which the Index was administered during the first month following discharge was randomly allocated in order to restrict the effect of bias produced by hospital discharge policies. Thereafter, the home visit on which nursing dependency was assessed was advanced by one day on each occasion, so that at the end of the continuing phase of rehabilitation, a record of nursing dependency was available for each day of the week.

Resource Allocation

The direct and indirect financial costs of resources utilised in the study could not be assessed by any of the established methods such as that of Russell (1974) as had been undertaken in a previous health care trial (Prescott, Garraway, Ruckley et al, 1978). This was because the distribution of patients in medical units was too diffuse to enable an accurate direct costing of the contribution which stroke patients made to the case mix of participating wards to be carried out. But it was essential to compare the utilisation of community services during the continuing phase of rehabilitation BETWEEN patients who were admitted to the stroke unit and medical units. A comparison was also made between resources utilised during the acute and continuing phases of rehabilitation WITHIN each allocation. Only in the utilisation of hospital bed days and the use of physiotherapy, occupational therapy and speech therapy was it feasible to complete the equation of stroke rehabilitation.

A log book was kept by all patients during the continuing phase of rehabilitation in which all contacts which occurred with members of the health and social services were recorded. Details from the log book were checked on each monthly visit to administer the Nursing Dependency Index. Changes in location, including periods of hospital readmission were noted. At the end of the one year follow-up, the assessment undertaken in the A.D.L. Unit to establish the outcome of the acute phase of rehabilitation was repeated in the patient's own home or other current location in order to compare what the patients were actually able to do at the end of the acute and continuing periods of rehabilitation.

Social Consequences of Stroke

The study afforded an opportunity to study the social consequences of stroke in some detail. Information was obtained from surviving patients and their relatives on prestroke home and family circumstances, opinions about hospital stay, contact with health and social service staff and family adjustment following hospital discharge. The longer term social consequences of stroke were also established. The data, which does not form part of the hypothesis being tested in this thesis, was collected by a Senior Social Worker on secondment from the Social Work Department, Lothian Regional Council.

Completing the Picture of Stroke Rehabilitation

A major emphasis in the study was the selection of stroke patients from a defined population. This approach would enable estimates of resources such as the number of beds in a stroke unit to be calculated per unit of population should the hypothesis being tested in this thesis be accepted. These estimates could form an important baseline for planning the future organisation of stroke rehabilitation. In order to complete the picture of stroke rehabilitation necessitated looking for all cases of stroke which were not offered to, or accepted by the study during the patient intake period. It was particularly important to identify middle band strokes who were not offered to the study during this period but were admitted to hospital. This could have occurred if patients were admitted directly to hospital by their general practitioners or through an Accident and Emergency Department. Accordingly, permission was sought and granted by the Ethics

Committee of the Information Services Division, Common Services Agency to obtain adhoc case listings of Scottish Hospital Inpatients Statistics of all stroke admissions amongst patients aged 60 years and over from the defined population during the period of the study. A one in three simple random sample of names on the case listings for the years 1976 and 1977 was drawn and the medical records of patients in the sample were examined. Experience gained in a previous study (Haslett, Baird, Chestnut et al, 1976) suggested there was sufficient detail in the case notes to provide reliable estimates of whether such patients could be placed in 'upper', 'middle' or 'lower' bands at the time of hospital admission. The functional outcome at the time of hospital discharge was based on the more subjective Rankin Disability Index (Rankin, 1957). This was not a major handicap because the A.D.L. Assessment Scale could be related to the Rankin Index (Table 9.6). There was no way of identifying stroke patients retained at home by general practitioners within the constraints imposed by the resources available to conduct the study.

Public Relations

Notification of stroke patients immediately or shortly following onset was crucial to the success of the study and the role of the general practitioners was central to the entire project. Therefore, great emphasis was placed on ensuring that all general practitioners were familiar with the aims and objectives of the study, and with the system of notifying suitable patients through the Emergency Bed Bureau or directly by using the ex-directory telephone number. Every single group, partnership and single handed practice in Edinburgh was contacted personally by one of the investigators and the great majority followed up by a visit to their practice premises. A newsletter was sent to general practitioners at regular intervals during the study informing them of progress in the study and other items of interest about stroke. Altogether, 146 out of 148 general practitioners practising in or on the borders of the electoral wards of the City of Edinburgh which contained the defined population, agreed to participate.

A wide range of other staff were involved either directly, or indirectly in the care of patients in the stroke unit or medical units. The refusal of any one group could have resulted in the exclusion of data on one or more variables which might have made an important contribution to the acceptance or rejection of the hypothesis which was being tested. Consequently, considerable efforts were made to secure the co-operation of all professional groups and organisations who would be involved in the study. An exhibition of the different facets of the project was held. Visits to the exhibition were subsequently reinforced by social evenings to which members of all the caring professions were invited, and which provided further opportunities for the investigators to explain the aim, objectives and workings of the study.

Ethics and Confidentiality

Evaluation studies of health care must be subjected to the same rigorous standards of ethics as laid down for clinical research. The guidelines suggested by the Medical Research Council

(1964) were followed. Details of the study were submitted and approved by the Ethical Committees of the North and South Districts of the Lothian Health Board prior to the study commencing. The usual precautions with respect to the collection, storage and processing of records containing medical information was observed in accordance with the code of practice recommended by the Medical Research Council (1973).

Size of the Study

Table 9.7 lists the relevant factors which determined the rate at which patients could be entered into the study. In the absence of prior knowledge on the variability likely to be shown by the variables under study, it was not possible to assess the magnitude of differences between the groups which were likely to be detected. The proportion of patients aged 60 years and over discharged following hospital admissions for stroke (ICD 430-438) from the defined population in 1973 were 40 per cent to home care, 19 per cent to residential home or long stay hospital care and 41 per cent deaths. For the stroke unit to increase the proportion of patients suitable for home care to 60 per cent (Adams, 1971) would require 232 patients to survive the acute phase of rehabilitation in order to have an 80 per cent chance of detecting a statistically significant difference at the 5 per cent level.

Independent Nature of the Study

When a decision to evaluate health care has been made, adequate funds should be made available so that the evaluation can

TABLE 9.7

CALCULATION OF PATIENT THROUGHPUT IN THE STUDY

Number of beds available for the stroke unit = 15

Number of bed weeks of occupancy available per year = 15 x 52 = 780

Assuming a bed occupancy of 85%*

Number of occupied bed weeks available per year = 780 x 0.85 = 663

Assuming a mean stay in the stroke unit of 12 weeks; throughput‡ = $\frac{663}{12}$ = 55 patients per year

Minimum number of patients required to be admitted to the stroke unit in order to be able to demonstrate a statistically significant difference at the 5% level with 80% probability between the proportion of patients discharged home in the experimental group (60%) and control group (40%) = 116

Allowing for a case fatality ratio of 0.05

Time required to achieve minimum stroke unit throughput = $\left(\frac{116 \times 12}{55}\right) + (116 \times 0.05) = 27$ months.

Therefore, number of cases required per year (experimental and control groups) = $\frac{116 \times 2 \times 12}{27} = 103$

* Bed occupancy = $\frac{\text{average number of occupied beds}}{\text{average number of available beds}} \times 100$

‡ Throughput = $\frac{\text{deaths and discharges per unit of time}}{\text{average number of available beds in the same unit of time}}$

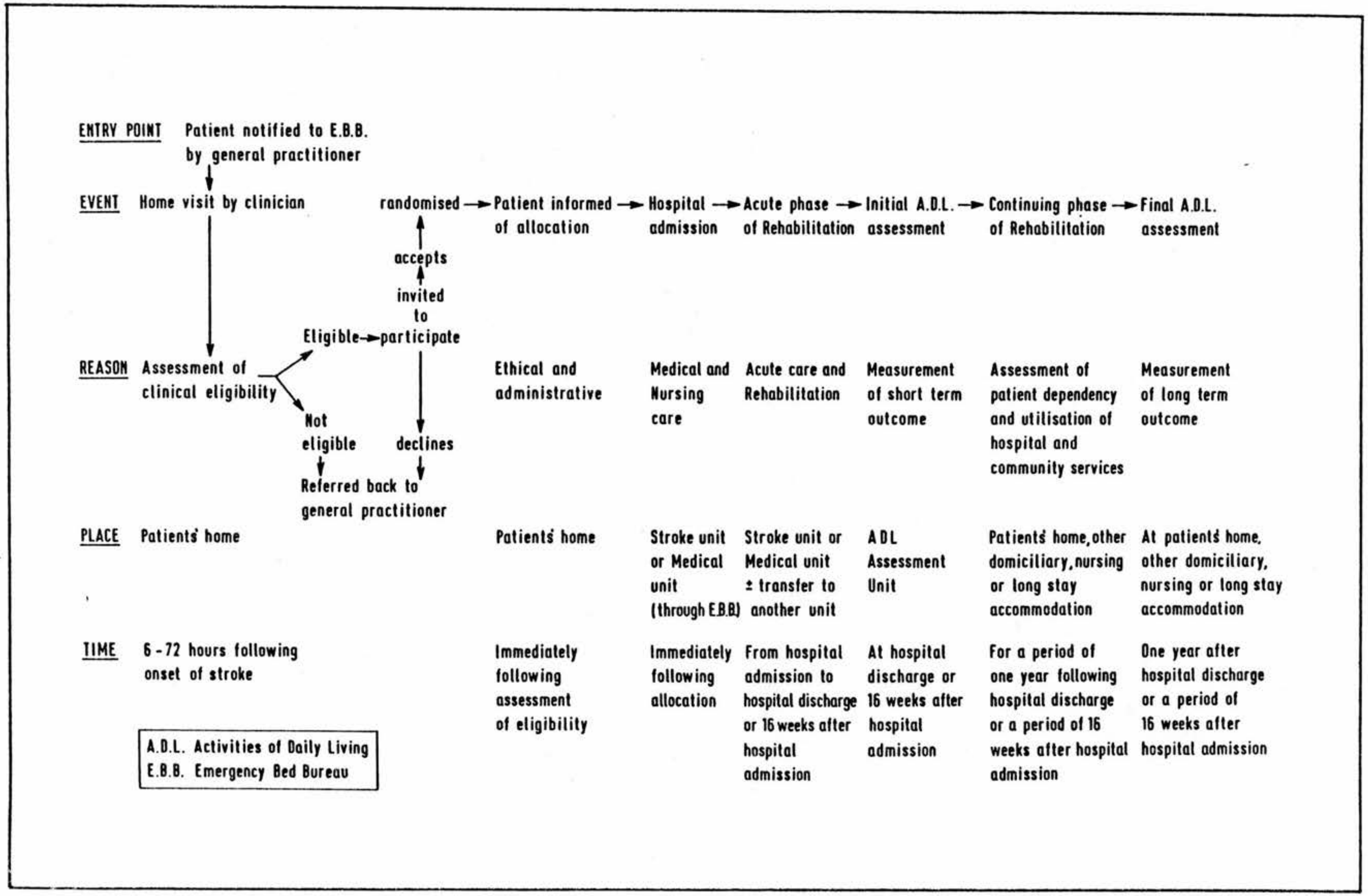
be conducted by appropriate independent observers in a manner which does not impose undue burdens on health service personnel involved in the clinical and allied care of patients (Garraway, 1976). The study secured funds from the Scottish Home and Health Department through the Chief Scientist's Organisation, and this enabled the data to be collected by independent staff whose allegiance was to the study and not to any service commitment. The aim in selecting different members for the research team was to create a multidisciplinary group where each member could contribute knowledge from their discipline to particular aspects of the study. The composition of the research team together with a brief description of their job specifications is summarised in Appendix (iii).

Timing of the Study

The time schedule for the study, together with an organisational flow diagram is shown in Figure 9.5. It was envisaged that the pilot study would begin on 1st January, 1975, the main study on 1st July, 1975 and completion of the 12 month follow-up of the last patient at the end of the continuing phase of rehabilitation would occur in August, 1978. The actual timing of events which was achieved in the study is presented in the next chapter which deals with the progress achieved in the study, and the problems encountered in its execution.

FIGURE 9.5

FLOW DIAGRAM OF STAGES IN THE STUDY



CHAPTER 10

PROBLEMS AND PROGRESS OF THE STUDY

Summary

A shortfall in patient input occurred because the incidence of strokes which satisfied the selection criteria was lower than expected. This was corrected by extending the defined population. A higher case fatality ratio than expected was encountered amongst patients admitted to the study. An extension in the time allowed for patient throughput was required to compensate for this, and ensure that the minimum sample size required to test the hypothesis was reached. Validation of measurements, assessing observer variation and in the absence of blindness, monitoring for bias in the data collection was carried out. Additional problems were encountered due to the misclassification of stroke in Hospital Inpatient Statistics and in the manipulation of data because of the size and complexity of data processing.

Incidence of 'Middle' Band Strokes in the Population

A major shortfall in the number of patients who were eligible for the study using the selection criteria adopted to identify the 'middle' band of strokes occurred. Table 10.1 summarises discharges from Edinburgh hospitals from persons resident in Edinburgh City Wards of the North District of the Lothian Health Board with a diagnosis of stroke. Having excluded secondary or subsequent episodes of stroke, the average annual incidence rate of hospital

TABLE 10.1

DISCHARGES FROM EDINBURGH HOSPITALS, 1969-71, IN PERSONS AGED 60 YEARS AND OVER FOLLOWING A FIRST EPISODE OF STROKE

	Males	Females	Total
Number of cases discharged from hospital with stroke as first diagnosis[1]	333	556	889
Average annual number of cases discharged from hospital with stroke as first diagnosis	111	185	296
Population of the defined study area[2]	105,830	120,945	226,775
of whom, persons aged 60 years and over	17,550	31,079	48,629
Average annual incidence of stroke discharges per 1,000 person-years	6.32	5.95	6.09

NOTES: 1. Discharges from Edinburgh hospitals listed in Table 9.1 and assumes that all cases with stroke as the first diagnosis are new episodes.

2. Comprises the 12 electoral wards of the City of Edinburgh contained within the North District of the Lothian Health Board. Population data abstracted from General Register Office, Edinburgh. Census 1971, Scotland, Population Tables, Edinburgh, H.M.S.O., 1974.

discharges following a first episode of stroke amongst persons aged 60 years and over from the defined population in 1969-71 was 6.1 per 1,000 person-years.

An estimate of the incidence of 'middle' band strokes was obtained during the prepilot phase of the study by examining a non-random sample of medical records of 100 patients with a first stroke who had been admitted during 1973 to one of the participating hospitals (Western General Hospital). This produced an incidence rate of 3.7 per 1,000 person-years for stroke in persons aged 60 years and over, conscious on admission with mention of hemiplegia or hemiparesis. The data used in calculating this rate is given in Table 10.2. This incidence rate would provide 180 'middle' band strokes per annum in the Edinburgh City wards of the North District of the Lothian Health Board. One hundred and three cases per annum were required to achieve the minimum sample size (Table 9.7). This would be obtained if 57 per cent of the estimated cases were notified to the study.

A more extensive search of medical records was undertaken in order to test the assumptions about the likely number of eligible strokes available when only 10 instead of an anticipated 45 cases of 'middle' band strokes were notified from the defined population during the first three months of the pilot study. A further adhoc case listing of Scottish Hospital Inpatient Statistics was obtained (MORA 6/139B, Information Services Division, Common Services Agency, 1975). Details of the specification, and accuracy of the case listing are given in Table 10.3.

TABLE 10.2

ESTIMATED INCIDENCE OF 'MIDDLE' BAND STROKES DERIVED FROM A NON-RANDOM SAMPLE OF MEDICAL RECORDS

	Males	Females	Total
Number of consecutive case records of stroke patients discharged from the Western General Hospital aged 60 years and over	50	50	100
Number of cases who were conscious at onset and had a record of hemiplegia	27	34	61
Average annual incidence of stroke discharges per 1,000 person-years (from Table 10.1)	6.32	5.95	6.09
Estimated incidence rate of 'middle' band strokes per 1,000 person-years	3.41	4.05	3.71

TABLE 10.3

ACCURACY OF CASE LISTING FROM SCOTTISH HOSPITAL INPATIENT STATISTICS USED TO REVISE ESTIMATE OF 'MIDDLE' BAND STROKES

	RIE	NGH	WGH	EGH	LEITH	TOTAL
Number of cases on the S.H.I.P.S. case record listing	121	11	52	39	37	260
Number of case records not found on hospital search	9	0	3	3	0	15
Number of diagnostic discrepancies uncovered which excluded case record from search	8	0	3	0	1	12
Number of records on S.H.I.P.S. case listing validated and examined	104	11	46	36	36	233

NOTES: Specification of case listing was discharges from medical units in the listed hospitals of persons aged 60 years and over, resident in the electoral wards of the City of Edinburgh contained within the North District of the Lothian Health Board with stroke (I.C.D. 430-438) as the primary diagnosis in 1972.

S.H.I.P.S. - Scottish Hospital Inpatient Statistics

RIE - Royal Infirmary of Edinburgh
NGH - Northern General Hospital
WGH - Western General Hospital
EGH - Eastern General Hospital
Leith - Leith Hospital

An incidence rate of 1.5 per 1,000 person-years was obtained for 'middle' band strokes occurring in persons aged 60 years and over in this larger and more representative sample of cases. This revised incidence rate would only produce 74 suitable cases per annum in the defined population. The data is summarised in Table 10.4. Difficulty was encountered because of the lack of uniformity in the method of recording and in the interpretation of terminology used in the medical records. Accordingly, confirmation of the revised estimate of the incidence of 'middle' band strokes was sought. This was obtained from data provided by the Frimley Stroke Register Project (Weddell, 1975). The incidence of 'middle' band strokes among persons aged 60 years and over in the Frimley catchment population, using the Edinburgh selection criteria, was 1.7 per 1,000 person-years. This confirmed that there would be insufficient cases from the defined population to reach the minimum sample size required to test the hypothesis in the time allotted for completion of the study. The options were either to increase the time allowed or to increase the size of the defined population in order to achieve a sufficient number of suitable cases in the planned time schedule. The latter option was exercised by incorporating the population of the Edinburgh City electoral wards of the South District of the Lothian Health Board, and the population of Musselburgh, giving a revised defined population of 470,435, of whom 97,355 persons were aged 60 years and over. This extended population which had the same population characteristics as the 12 electoral wards of the North District of the Lothian Health Board which comprised the initial defined population (Table 9.2) was expected to yield 148 cases of 'middle' band strokes per annum from which to obtain the 103 cases required for entry to the study.

TABLE 10.4

REVISED ESTIMATED INCIDENCE OF 'MIDDLE' BAND STROKES IN THE DEFINED POPULATION

Number of records on S.H.I.P.S. case listing validated and examined	= 233
Number of patients unconscious on admission	= 36
Number of patients conscious on admission	= 197

OF CONSCIOUS PATIENTS

Number of patients with NO mention of hemiplegia or hemiparesis or specific mention of NO hemiplegia or hemiparesis	= 109
Number of patients with mention of hemiplegia or hemiparesis (of which number were FIRST EPISODES only = 58)	= 88

Considering only the first episodes of stroke, the incidence rate of 'middle' band strokes in persons aged 60 years and over is reduced to 1.52 per 1,000 person-years. This would yield only 74 cases per year in the defined population from which to obtain the patient throughput of 103 cases per year required to achieve the minimum sample size (Table 9.7). This assumes the same relative proportion of clinical presentations were contained in untraced records.

Shortfall in Throughput created by the Case-Fatality Ratio

The allowance for case-fatality up to the end of the acute phase of rehabilitation was five per cent. This allowance was included in the calculation of the time required to reach the minimum sample size (Table 9.7) and was based on an estimate derived from the study of Marquardsen (1969). A low case-fatality ratio was expected as a result of excluding cases who were not likely to survive the early high period of mortality. But in practice, the case-fatality ratio of patients selected for the study was 0.25. This occurred because of the early notification of cases by general practitioners and the quick response of the study physicians on call for home visits. Whilst this created a favourable relationship between the study and general practitioners who referred cases, it meant that strokes were sometimes being assessed before their level of consciousness had stabilised. Clarification of details given in Marquardsen's study (1969) subsequently established that the level of consciousness in his study was usually assessed several hours later than in this study. The net result was a need to increase the number of patients entering the study in order to achieve the minimum sample size. This led to an extension in the time of the study by six months. The basis upon which this estimate was calculated is summarised in Table 10.5.

Checking the reliability of the Randomisation

Randomisation is a way of trying to reduce or eliminate bias in allocating treatment options in a study. In theory, all variables which might influence the hypothesis being tested

TABLE 10.5

CALCULATION OF ADDITIONAL THROUGHPUT TIME REQUIRED TO COMPENSATE FOR THE HIGHER CASE-FATALITY RATIO

Number of patients entered into the study at 30 April,1977 =199

Input of patients during the first 19 months of the study (3.10.75-30.4.77) = $\frac{199}{19}$ = 10.4 patients per month

But number of patients still in the acute phase of rehabilitation = 19

Number of deaths during the acute phase of rehabilitation = 45

$\therefore$ case fatality ratio = $\frac{45}{199 - 19}$ = 0.25

$\therefore$ number of patients surviving the acute phase of rehabilitation and having their outcome assessed = 180 - 45 =135

Minimum number of patients required to accept or reject the hypothesis =232

$\therefore$ number of patients still required to achieve minimum sample size = 232 - 135 = 97

Assuming the case-fatality ratio of 0.25 continues to apply and the rate of patient input is maintained, additional time required to achieve minimum sample size = $\frac{97 + (97 \times 0.25)}{10.4}$ = 11.6

Present input of patients planned to be completed in 5 months on 30 September, 1977.

$\therefore$ extension of input time beyond 30 September, 1977 = 6.6 months*

* The input of patients was completed on 30 April, 1978.

should be equally distributed amongst the different groups apart from the actual patterns of care or treatments being compared. In practice, it is always desirable to test this assumption. Accordingly important factors for survival during the early period of high mortality, and for subsequent functional recovery were recorded one week after admission, or earlier if death had occurred. These factors are listed in Table 10.6.

TABLE 10.6.

FACTORS OF PROGNOSTIC IMPORTANCE FOLLOWING STROKE*

For Immediate Survival	For Functional Recovery
Changing level of consciousness	Initial level of consciousness
Pupillary abnormalities	Initial severity of the motor deficit
Paralysis of ocular muscles	Rate of recovery of motor deficit
Bilateral extensor plantar response	Spatial neglect
Respiratory abnormalities	Bilateral neurological signs
Presence of cardiovascular disease	Aphasia or dysphasia
Presence of pulmonary disease	Presence of recurrent stroke
Presence of renal disease	Laterality of the lesion
	Mental abnormalities
	Urinary or faecal incontinence

*Adapted from: Marquardsen (1969) The Natural History of Cerebrovascular Disease. Copenhagen, Munksgaard.

The intention was to compare the number and distribution of factors present to confirm that randomisation had entered cases of similar severity in the stroke unit and medical units. A preliminary study investigating the validity of using medical records for this purpose found that the recording of prognostic factors for functional recovery by medical staff of Edinburgh hospitals was unreliable (Haslett, Baird, Garraway et al, 1976). Therefore, only the analysis of factors for immediate survival was undertaken and as the results in Table 10.7 demonstrate, there was an even distribution of patients between the two allocations as regards the number of such factors recorded. The conclusion reached was that the randomisation procedure had worked reliably.

TABLE 10.7

TESTING THE RELIABILITY OF THE RANDOMISATION

Number of factors of prognostic importance for immediate survival present in the two allocations

	Stroke Unit	Medical Unit
Number of patients	155	152
Mean ($\pm$ SE) numbers of prognostic factors per patient	2.10 ± 0.09	2.18 ± 0.11
Median number of prognostic factors per patient	1.96	1.98
Range of prognostic factors present for all patients	0-7	0-8

S.E. = Standard Error

Validating Selection Criteria, Outcome and Dependency Measurements

An important aspect of any evaluation is the development and use of valid criteria and measurements. Validity implies that measurements being used must be seen to be doing the job they are supposed to do. Criteria adopted to select patients, define disease or determine end points must be seen to be relevant. Ready-made indices are not usually available and have to be developed and tested prior to being used. An example of this in the study is the A.D.L. assessment for measuring outcome. In practice however, it may not be possible to assess the validity of measurements chosen or criteria used until a study is completed. For example, the validation of criteria used to determine patient eligibility and the partial validation of the nursing dependency index developed for this study.

a) Selection of Patients for the Study A register of patients who receive home visits but were ineligible to participate in the study was maintained. There were 118 rejected patients in the 'upper' band of strokes who were too severe to benefit from rehabilitation, and 116 rejected patients in the 'lower' band of strokes who were too mild to need it (Figure 9.2). All these patients were subsequently admitted to hospital. The medical records of all rejected patients were examined by a member of the research team who, without knowing whether the patient had been placed in the 'upper' or 'lower' band, graded their outcome using the Rankin Disability Index (Table 9.6). The results are presented in Table 10.8; 93 per cent of the 'upper' band were discharged from hospital dependent or dead, compared with only 28 per cent in the 'lower' band, 72 per cent of whom were independent at the time of discharge. This confirms that the criteria used to establish the triage of stroke rehabilitation were valid.

(b) A.D.L.Assessment Criteria. Outcome was assessed by patients carrying out activities of daily living in a purpose built A.D.L. Unit. The validity of this approach was established during the

TABLE 10.8

VALIDATION OF THE SELECTION CRITERIA

	N	INDEPENDENT[‡] %	DEPENDENT[‡] %	DEAD %
Upper Band (Excluded)	118	7	34	59
Lower Band (Excluded)	116	72	12	16

‡ Based on the Rankin Disability Index (Table 9.6)
Independent = Rankin grade 1 & 2; Dependent = Rankin grade 3, 4 and 5

pilot study by testing a series of 20 patients in the A.D.L. Unit and then retesting them the following day for the same activities in their own homes, the tests being administered by the same occupational therapist in the same order and using the same set of instructions and interpretations. The results showed only minor discrepancies which might have been due to subject variation, no difference in overall outcome occurring.

(c) Nursing Dependency Index. The Nursing Dependency Index was developed primarily as a measure of what patients were permitted to do whereas the A.D.L. assessment measured what patients were able to do. The latter measurement was used to partially validate the former. The Nursing Dependency Index consisted of 20 items, the first seven of which correspond to the seven daily living activities assessed in the A.D.L. assessment Unit (Table 9.4).

The validity of this part of the Nursing Dependency Index was tested by comparing the results of these activities at the first monthly follow-up visit with the outcome assessment made in the A.D.L. Unit at the end of the acute phase of rehabilitation; and the results of the same activities taken at the final monthly visit with the A.D.L. assessment carried out in the patient's home at the one year visit. These comparisons were made in the 37 patients discharged from hospital to live alone at home, and the 36 patients who were living alone at home at the end of the follow-up, the assumption being made that there was no difference between what these patients were permitted to do and what they were able to do. The results of these comparisons are presented in Table 10.9. There was virtually no disagreement between the results of the A.D.L. assessment which established what activities patients were able to do at the end of the acute phase of rehabilitation and what activities they reported to be doing themselves, or were receiving assistance with at the first monthly visit of the follow-up. Minor discrepancies occurred in cooking, feeding and control of environment in the comparisons made between the results of the final monthly follow-up visit and the A.D.L. assessment carried out in the patient's own home at the end of the continuing phase of rehabilitation.

Observer Variation

With the increasing application of the scientific method to medicine, the importance of recognising and measuring observer variation in clinical practice is now readily accepted. Particular attention must be paid to the problem in evaluation studies where

TABLE 10.9

VALIDATION OF THE NURSING DEPENDENCY INDEX

A.D.L. Assessment and Nursing Dependency Index Scores Amongst Patients Living at Home Alone

Comparison of: (i) A.D.L. outcome at the end of the acute phase of rehabilitation and nursing dependency index at the first monthly visit; (ii) A.D.L. outcome at the end of the continuing phase of rehabilitation and nursing dependency index at the final monthly visit

	ADL	(i) NURSING DEPENDENCY I	(i) NURSING DEPENDENCY D	(ii) NURSING DEPENDENCY I	(ii) NURSING DEPENDENCY D
BED	I	35	0	36	0
	D	0	2	0	0
DRESSING	I	36	0	35	0
	D	0	1	0	1
MOBILITY	I	36	0	35	0
	D	0	1	0	1
HYGIENE	I	36	0	35	0
	D	0	1	1	0
COOKING	I	33	1	28	4
	D	1	2	2	2
FEEDING	I	34	2	33	2
	D	0	1	0	1
ENVIRONMENT	I	35	1	28	5
	D	0	1	0	3

A.D.L. Activities of Daily Living Assessment
I = Independent. Able to carry out activity without human assistance using prescribed aid(s) and/or adaptation(s) where applicable.
D = Dependent. Unable to carry out activity without human assistance or failed to perform the activity at all, even with help.

practice demands precise measurement and knowledge of the source and extent of systematic variation. This is particularly important when clinical assessments have to be used to establish diagnosis, outcome or record events in the natural history of disease in the absence of more objective measurement tools. The extent of observer variation in this study was assessed in the measurement of outcome and in the use of the clinical examination which was used to establish levels of neurological function following stroke.

(i) A.D.L.Assessment

During the pilot study, a series of 20 consecutive patients were assessed in the A.D.L. Unit with another observer present as well as the occupational therapist who was making the assessment. The second observer, who was familiar with testing Activities of Daily Living, was a different person on each occasion. Members of the following disciplines acted as monitors: physiotherapy, occupational therapy, medicine, nursing and social work. The monitor would record the outcome category for the particular activity following the completion of each part of the assessment, and also the overall outcome category, using the same interpretations of performance as the assessor. On no occasion was the overall outcome category on which the hypothesis was being tested different. Intraobserver variation in conducting the A.D.L. assessment was more difficult to estimate because of patient variability in performing the activities, changes in patients' neurological function, and the learning effect on patients of undergoing the assessment on more than one occasion. However, on eight occasions the same patients were sent to the A.D.L. Unit in two consecutive weeks as they were coming up to hospital discharge. No variation in recording any of the activities of daily living occurred in these patients tested by the same occupational therapist.

(ii) Clinical Examination

Whilst the problems created by observer variation in conducting the A.D.L. assessment were minimal, the difficulties created by observer variation in the clinical examination used to record levels of neurological function were considerable. The clinical examination consisted of tests for mental, sensory, motor and communication function. The definitions, instructions and interpretations for the clinical tests are presented in Appendix (i). All definitions and instructions were constructed using criteria and examination techniques which were widely used in clinical practice, but whose accuracy and precision had never been established. The initial plan of the study called for three consultants with wide experience in geriatric medicine to form a rota for home visits to assess patient eligibility for the study, and subsequently to undertake clinical examinations of all patients at weekly intervals during the acute phase of rehabilitation. The three consultants were joined by an external clinical assessor from another University Department of Geriatric Medicine (who was subsequently intended to monitor for bias in the conduct of the clinical examinations), to form the panel of examiners whose observer variation in conducting the clinical examinations was to be established.

Twelve patients were selected from amongst those in geriatric assessment or long-stay wards who had an established and stable stroke. The order in which and time at which patients were assessed by different examiners was determined by a randomised block design in the form of three latin squares. This was designed to balance any possible fatigue effect on the patient and any carry-over effect which might arise as a result of the order in which the patients were tested. Four series of assessments were carried out, at each of which functions were graded on a simple quantitative scale. At the first assessment (the predefinition assessments), examiners were asked to exercise their own clinical judgement in examining and recording levels of individual function. The following day, definitions about the grading of different levels of function and instructions about the examination techniques were employed in the same group of patients rearranged in a different order of examination (the post-definition assessments). Ten days later, a third series of assessments were carried out using the same definitions and instructions on the same set of patients (the repeatability assessments). A preliminary analysis of the data revealed considerable observer variation in several of the functions being assessed. Collaboration between the clinical assessors was arranged so that definitions could be clarified further. Interpretations of the examination techniques were discussed and demonstrated, each member of the panel participating in joint teaching sessions in which adjustments to technique were made and practised by each member of the panel. A period of readjustment to the modified measurement techniques was allowed before a fourth series of clinical assessments (the post-interpretation assessments) were carried out on a different group of 12 patients, some members of the original group of patients having died during the interim period. The results of the four series of examinations are summarised in Figure 10.1. The proportion of examinations where total agreement was reached rose from 41 per cent to 68 per cent, and the overall mean difference in scores of all functions tested was reduced to one quarter of the predefinition figure (Table 10.10).

A measure of the intra-observer variation in the clinical assessment was obtained by comparing the number of disagreements between the postdefinition assessments and the repeatability assessments, using the same four observers, twelve patients, definitions and instructions. The results in Table 10.11 show that the overall intra-observer variation was 17, 26, 26 and 30 per cent for observers A, B, C and D respectively. Mental function testing produced the largest intra-observer variation. The largest reductions in inter-observer variation secured by the panel between the third and fourth series of examinations were in motor function and proprioception. Considerable room for improving the group performance of the panel remained at the completion of the four series of examinations. It was necessary to repeat these observer variation assessments later following the appointment of a clinical research fellow. Similar measures of intra- and inter-observer variation were obtained to those encountered during the initial series of examinations.

FIGURE 10.1

INTER-OBSERVER VARIATION IN THE CLINICAL ASSESSMENT OF STROKE. PROPORTION OF EXAMINATION WITH TOTAL AGREEMENT BETWEEN FOUR OBSERVERS AND 12 PATIENTS

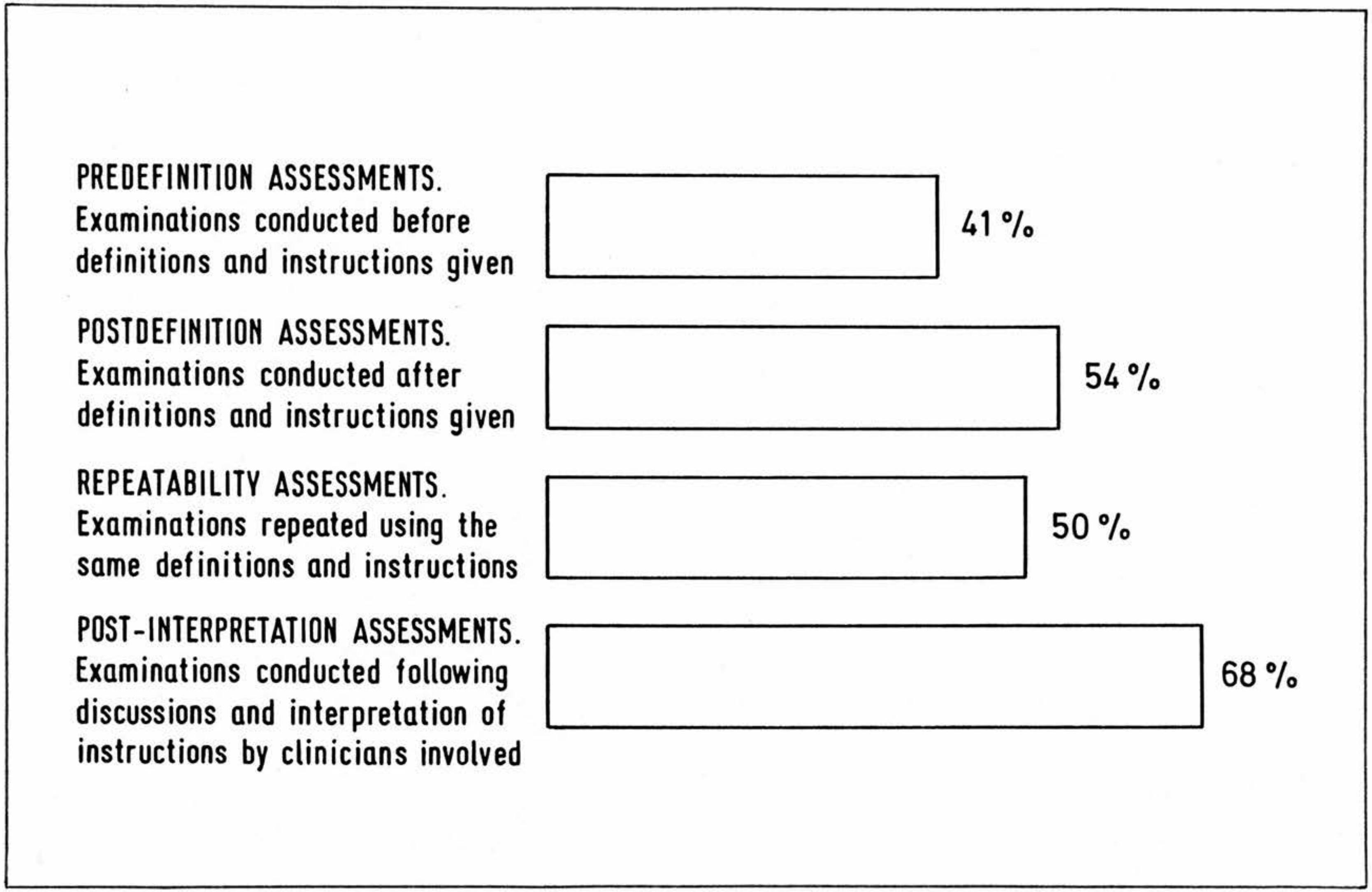


TABLE 10.10

INTER-OBSERVER VARIATION IN THE CLINICAL ASSESSMENT OF STROKE: MAXIMUM DIFFERENCE IN MEAN SCORES BY FUNCTION TESTED IN 12 PATIENTS BY FOUR EXAMINERS

	Mental Function	Proprio-ception	Spatial Neglect	Motor Function	Postural Function	Compre-hension	Express-ion	Over Mean Difference
PREDEFINITION ASSESSMENTS								
Examinations conducted before definitions and instructions given	0.6	0.8	0.2	0.6	0.8	0.3	0.3	0.27
POSTDEFINITION ASSESSMENTS								
Examinations conducted after definitions and instructions given	0.3	0.4	0.2	0.3	0.7	0.3	0.2	0.13
REPEATABILITY ASSESSMENTS								
Examinations repeated using the same definitions and instructions	0.3	0.8	0.2	0.6	0.4	0.1	0.2	0.15
POST-INTERPRETATION ASSESSMENTS								
Examinations conducted following discussion and interpretation of instructions by clinicians involved	0.1	0.3	0.0	0.3	0.7	0.1	0.1	0.05

TABLE 10.11

INTRA-OBSERVER VARIATION IN THE CLINICAL ASSESSMENT OF STROKE

Observer	Number of Disagreements between Post-Definition and Repeatability Series of Assessments							
	Mental Function	Proprio-ception	Spatial Neglect	Motor Function	Postural Function	Compre-hension	Expression	Overall % of Intra-observer variation
A	4	2	0	3	2	0	0	16.8
B	5	4	0	3	4	1	0	26.2
C	5	4	0	4	0	2	2	26.2
D	6	5	0	5	3	0	1	30.8
Total	20	15	0	15	9	3	3	100.0

Observer Monitoring

A major problem encountered in controlled trials in health care is the difficulty of applying blindness to the allocations in order to reduce or eliminate bias. The only substitute for lack of blindness is to monitor for actual or potential bias which could arise as a result of either patients or the independent observers being aware of the option to which a patient had been allocated. But it is impossible to make allowances for all potential sources of bias which might arise in a health care trial, and a compromise has to be reached whereby key variables which have a direct bearing on the hypothesis being tested are monitored. This was attempted in the study by monitoring the independent occupational therapist during the A.D.L. assessment and by monitoring selected clinical examinations which were being conducted by the independent clinical research fellow to measure the level of neurological function in the two groups of patients.

(i) Monitoring the A.D.L.Assessment

The intention was to randomly select a predetermined number of patients from the stroke unit and medical units and monitor the independent occupational therapist performing the assessment by having a member of the therapy staff from the patient's hospital attend the A.D.L. assessment. This was impossible to achieve in practice, either because no attending therapist was present or the preselected patient died.

(ii) Monitoring the Neurological Examinations

It was recognised from the beginning that a major potential source of bias could arise as a result of the clinical assessors having responsibilities for patient care in the stroke unit. Accordingly, it was planned to monitor for bias by arranging for a random subsample of patients from each group to be examined by an external assessor practising outside Edinburgh. This was the reason for including an external assessor in the panel used to estimate observer variation in conducting the clinical examination. The plan was not feasible for two reasons. First of all, an apparent difference in interpretation was maintained between the three clinicians based in Edinburgh and the external clinical assessor in scoring levels of mental, sensory and motor function throughout the panel assessment of observer variation. The external assessor also exhibited the highest level of intra-observer variation. These differences could be explained on the basis of differing practice over a long duration in the two centres represented on the panel. It implied that employment of the external assessor to monitor members of the panel might not result in comparing like with like. The other reason why the use of the external assessor was not feasible was the difficulty of arranging for patients to be examined twice in rapid succession in various locations. The arrangements broke down on all three occasions on which it was attempted because patients were otherwise engaged in ward or rehabilitation activities. The role of the external assessor was finally abandoned with the appointment of the clinical research fellow who took over responsibility for carrying out neurological examinations. Instead, another consultant physician in geriatric medicine practising in Edinburgh, who played no part in the study, was substituted and a series of examinations (each of 10 functions) were carried out on 18 patients, the assessor and monitor examining the patients consecutively on the same occasions, but recording their findings separately. Eleven patients were located in medical units and seven in the stroke unit. No systematic bias was revealed with the assessor scoring higher levels of function on 10 occasions, and lower levels of function on 16 occasions, the remaining 154 assessments being recorded at similar levels by the clinical research fellow and the monitoring physician.

The Miscoding of Cerebrovascular Disease

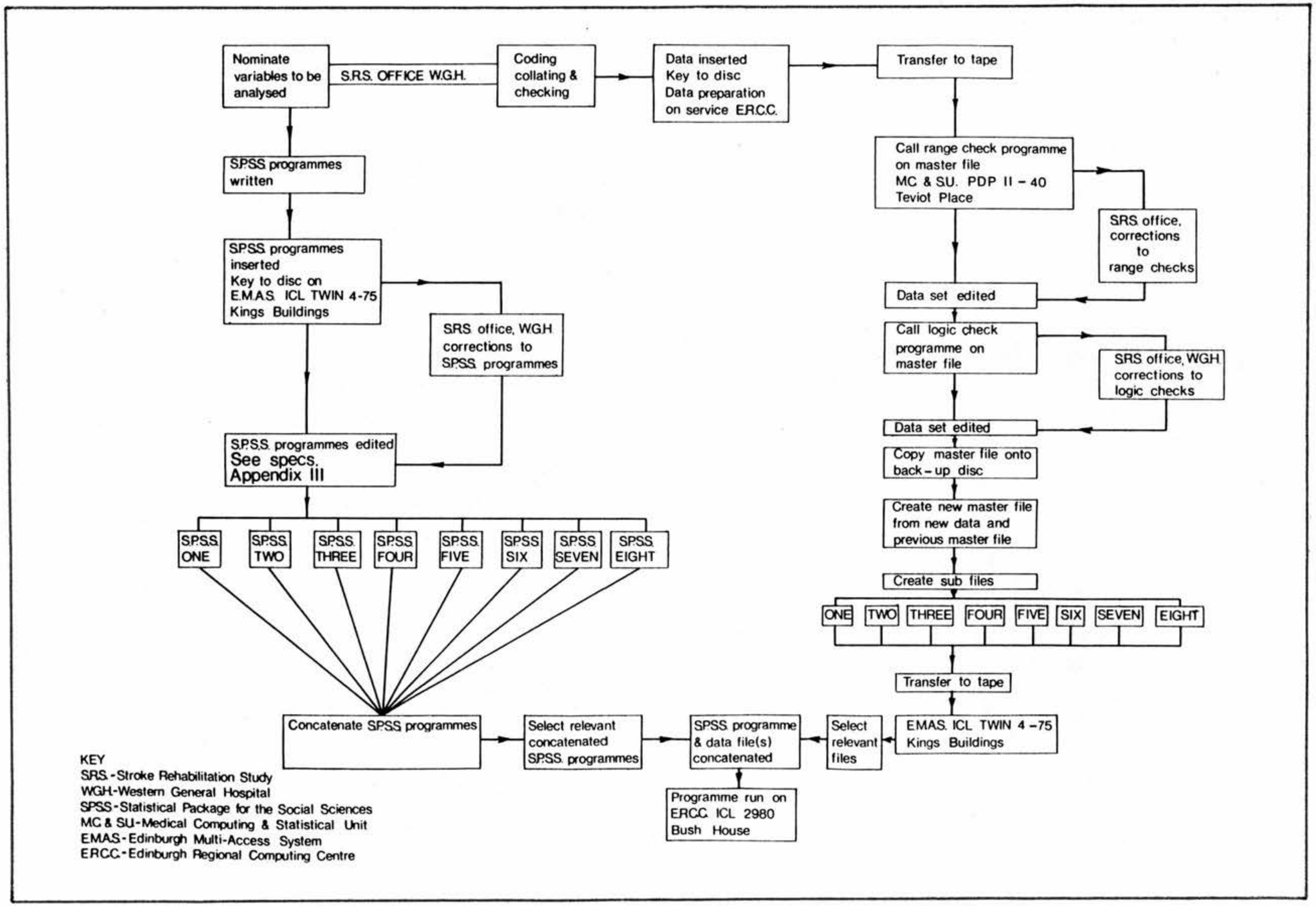
It was intended to complete the picture of stroke rehabilitation by identifying all stroke patients living in the defined population who had bypassed the notification procedure and been admitted to hospital. It was planned to examine the extent of this problem whilst the validation of the selection criteria was being carried out. This involved examining the medical records of a random sample of strokes drawn from a Scottish Hospital In-patient case listing of patients aged 60 years and over entered with a diagnosis of cerebrovascular disease (I.C.D. 430-438); admitted to the defined group of Edinburgh hospitals utilised in the study; for areas of residence within the defined population. A problem of misclassification was first noticed amongst patients admitted to the stroke unit. Almost one half of these patients with bona fide strokes had not been classified as 'cerebrovascular disease' (I.C.D. 430-438). This finding was confirmed amongst study patients discharged from other hospitals. This occurred because patients with stroke were being assigned a discharge diagnosis of 'hemiplegia' by the medical staff completing the medical discharge summary. This resulted in patients being classified under I.C.D. Rubric 344, 'other Cerebral Paralysis'. Accordingly, revised case listings containing all entries coded as I.C.D. 344 were obtained, and included in a sampling frame with the case listing of patients entered as cerebrovascular disease (I.C.D. 430-438). A one in three random sample was drawn and the appropriate medical records examined.

Data Manipulation

Computer programming for the study was undertaken using the Statistical Package for the Social Sciences (S.P.S.S.). This package is an efficient means of handling the type of data which is collected in health services research. Although S.P.S.S. was the most efficient means of processing the type of data required, problems arose in using this package to process the amount of data which was available. The difficulty arose because the computer package limitations of factors such as the number of variables allowed, collating and computing options etc., were such that the S.P.S.S. programmes to analyse the data set could only accommodate some of the variables at any one time. Accordingly, eight S.P.S.S. programme files were written to include the 1,500 variables which were available on each patient admitted to the study. A diagrammatic representation of the steps involved in the data processing of the study is shown in Figure 10.2. Undertaking analysis of data involving variables WITHIN each of the S.P.S.S. programme files created no difficulty, the problems arose when data analysis involved variables located BETWEEN the programme files. The editing of the S.P.S.S. programmes to create files to handle the detailed data analysis in these cases was very time consuming, but no alternative solution to handling the quantity of data collected was available.

FIGURE 10.2

THE ORGANISATION OF DATA PROCESSING FOR THE STUDY



P A R T III

RESULTS OF THE STUDY

CHAPTER 11

THE OUTCOME OF THE ACUTE PHASE OF REHABILITATION

Summary

Three hundred and seven patients with a mean age of 73 years were randomly allocated to the stroke unit or a medical unit. There were no differences between patients in the two allocations as regards age, sex, social class, marital status, duration of stroke on admission, or type of neurological impairment present. A higher mean duration of stay occurred in medical units as a result of more patients having an extended hospital stay. A significantly higher proportion of patients discharged from the stroke unit were assessed as independent compared with patients discharged from medical units.

Patients Characteristics

Three hundred and eleven patients presented with "middle" band strokes and were eligible for entry to the study. They were randomised, 155 patients drawing the stroke unit allocation and 156 patients being admitted to medical units. Post-randomisation drop-out was restricted to four patients, all of whom had been allocated to medical units. The reasons for withdrawing these patients were refusal to co-operate in two instances, diagnostic confirmation that the presenting neurological deficit was not due to cerebrovascular disease in one case, and a request from the attending medical staff to withdraw a patient on ethical grounds. The mean age of the remaining 307 patients who completed the study was 72.9 years, the youngest patient being 60 years and the oldest, 91 years. The age distribution of patients in the two allocations is presented in Table 11.1.

TABLE 11.1

AGE DISTRIBUTION OF PATIENTS IN THE STUDY

		AGE (IN YEARS)		
	N	Mean $\pm$ S.E.	Median	Range
Stroke Unit	155	72.8 $\pm$ 0.5	72.3	60 - 91
Medical Units	152	73.0 $\pm$ 0.6	73.4	60 - 89

S.E. = Standard error

Overall, 47 per cent of patients were males and 53 per cent were females, the relative proportions not differing from the sex distribution of persons aged 60 years and over in the defined population, or between the allocations. The distribution of patients' social class and marital status at the time of admission to the study are summarised in Tables 11.2 and 11.3 respectively.

TABLE 11.2

SOCIAL CLASS OF PATIENTS IN THE STUDY

Social Class	Stroke Unit	Medical Units
One	6	7
Two	30	24
Three (Non-Manual)	31	29
Three (Manual)	49	54
Four	22	29
Five	14	7
Not Recorded	3	2
TOTAL	155	152

TABLE 11.3

MARITAL STATUS OF PATIENTS IN THE STUDY

Marital Status	Stroke Unit	Medical Units
Single	15	18
Married	81	78
Widowed	54	49
Divorced	5	7
TOTAL	155	152

The values of these variables were equally distributed between allocations and were representative of the distribution of these characteristics in the defined population. Overall, 48 per cent of patients were single, widowed or divorced and 52 per cent were married. There was no discrepancy in the relative proportion of patients from each District of the Lothian Health Board who were admitted to the stroke unit or medical units.

Stroke Characteristics

The mean duration of strokes from onset to the time of admission to the study was 25.8 hours, with a median duration of 10.3 hours. The skew distribution was due to a small number of strokes who were admitted to the study when the neurological deficit had been present for more than 72 hours. This group, which satisfied the entry criteria in all other respects, comprised 23(seven per cent) of patients accepted. There was no difference in duration of strokes allocated to the stroke unit or medical units. Fifty-three per cent of patients had a right hemiplegia, the remaining 47 per cent of patients presenting with a left hemiplegia.

Neurological Function on Entry to the Study

(i) Mental Function

The results of the clinical examination of memory recall and problem solving ability which was carried out at the time of entry to the study are presented in Table 11.4.

TABLE 11.4

MENTAL FUNCTION ON ENTRY TO THE STUDY

	Memory Recall		Problem Solving Ability	
Degree of Impairment*	Stroke Unit	Medical Units	Stroke Unit	Medical Units
Severe	2	2	4	6
Moderate	2	7	27	32
Slight	21	12	2	4
None	92	81	52	30
Not recorded	38	50	70	80
TOTAL	155	152	155	152

* The definitions of the grades of impairment are presented in Appendix (i)

The most prominent features of these results are the high proportions of patients in both allocations whose clinical assessments could not be completed because of their inability to carry out the tests. This applied to 25 per cent and 33 per cent of stroke unit and medical unit patients in the assessment of memory recall; the proportions being 45 per cent and 53 per cent respectively when problem solving ability was assessed. Amongst patients who could complete the tests, 21 per cent of each patient allocation had some loss of memory recall. But a higher proportion of patients who subsequently drew the medical unit allocation exhibited loss of problem solving ability, 58 per cent having a deficit compared with 39 per cent of patients who were subsequently allocated to the stroke unit.

(ii) Sensory Function

The problem of patients not being able to co-operate was also present in the assessment of proprioception, as Table 11.5 demonstrates.

TABLE 11.5

SENSORY FUNCTION ON ENTRY TO THE STUDY

Degree of Impairment*	Proprioception Stroke Unit	Proprioception Medical Units
Severe	23	31
Moderate	32	37
Slight	38	18
None	23	20
Not Recorded	39	46
TOTAL	155	152

* The definitions of the grades of impairment are presented in Appendix (i)

Twenty-five per cent of stroke unit and 30 per cent of medical unit patients were in this category. Of the remainder, 86 per cent of stroke unit and 81 per cent of medical unit patients had some proprioceptive loss on admission to the study. Although the overall proportions of patients in each allocation who had proprioceptive loss were similar, more medical unit patients had their loss graded as moderate or severe compared with stroke unit patients. Spatial neglect had a much lower prevalence amongst patients admitted to the study. Amongst the patients with left hemiplegia in whom it was tested, only 17 (22 per cent) stroke unit patients and 18 (23 per cent) medical unit patients demonstrated the presence of spatial neglect.

(iii) Motor Function

All patients were able to co-operate in the assessment of motor function as Table 11.6 demonstrates.

TABLE 11.6

MOTOR FUNCTION ON ENTRY TO THE STUDY

STROKE UNIT		UPPER LIMB		
		Paralysed or severe	Moderate or Slight	TOTAL
LOWER LIMB	Paralysed or Severe	63	9	72
	Moderate or Slight	27	56	83
	TOTAL	90	65	155

MEDICAL UNITS		UPPER LIMB		
		Paralysed or Severe	Moderate or Slight	TOTAL
LOWER LIMB	Paralysed or Severe	65	7	72
	Moderate or Slight	32	48	80
	TOTAL	97	55	152

NOTE: The definitions of the grades of impairment are presented in Appendix (i)

Overall, 60 per cent of patients had severe weakness or complete paralysis of their upper extremity compared with 47 per cent who had a similar level of deficit of their lower limb. As Table 11.6 illustrates, patients were remarkably well balanced between the two allocations with respect to the distribution of the degree of motor weakness present at the time of admission to the study.

(iv) Postural Control

The assessment of postural control was completed in all patients at entry to the study. No patients could walk on entry, and the distribution of patients whose postural control was limited to lying, sitting or standing was 56 per cent, 38 per cent and six per cent respectively for the stroke unit allocation; and 66 per cent, 30 per cent and four per cent respectively for the medical unit allocation.

(v) Communication Function

Table 11.7 summarises the assessment of communication function in patients at entry to the study.

TABLE 11.7

COMMUNICATION FUNCTION ON ENTRY TO THE STUDY

Degree of Impairment*	COMPREHENSION	
	Stroke Unit	Medical Units
Impossible	13	26
Difficult	27	26
Easy	115	100
TOTAL	155	152

Degree of Impairment*	EXPRESSION	
	Stroke Unit	Medical Units
Absent	20	35
Impaired	17	12
Normal	118	105
TOTAL	155	152

* The definitions of the grades of impairment are presented in Appendix (i)

Overall, 25 per cent of stroke unit and 34 per cent of medical unit patients had some loss of comprehension; 24 per cent and 31 per cent of patients in these respective allocations had impaired or absent speech expression on entry to the study.

Entry to the Study

One hundred and sixty-three out of the 275 general practitioners practising within the catchment area of the study who agreed to participate in the study had at least one referred patient accepted for the study. Only 15 per cent of patients who were accepted were referred directly from general practitioners through the ex-directory telephone link, the remaining 85 per cent being referred by the Emergency Bed Bureau of the Lothian Health Board. Table 11.8 emphasises the relatively short time interval which passed between notification of these patients and their acceptance for the study.

TABLE 11.8

NOTIFICATION OF PATIENTS TO THE STUDY

		MEAN DURATION ± S.E. (IN MINUTES)		
	N	Notification to Home Visit	Home Visit to Hospital Placement	TOTAL
Stroke Unit	155	40.8 ± 2.6	20.8 ± 2.7	61.6 ± 2.8
Medical Units	152	39.4 ± 2.3	19.6 ± 2.3	59.0 ± 2.4

S.E. = Standard error

Only 40 minutes passed between notification by a general practitioner and the arrival of the on-call physician at the patient's home to begin the domiciliary visit. Establishing that a patient was eligible for the study, briefly explaining the nature of the study, obtaining consent and opening the allocation envelope took a further 20 minutes, resulting in an overall delay of one hour before hospital admission was arranged. There was no evidence that this delay had any detrimental effect on any of the patients who were subsequently admitted to the study or were rejected as unsuitable. Despite the fact that study physicians were on call 24 hours a day to undertake domiciliary visits, 70 per cent of notifications were received between 8 a.m. and 4 p.m., only eight patients admitted to the study were notified between midnight and 8.00 a.m. Monday and Tuesday were the busiest days of the week for notifications. The pattern which emerged when admissions to the study were analysed by season of the year is summarised in Table 11.9.

TABLE 11.9

ADMISSIONS TO THE STUDY BY SEASON OF THE YEAR

SEASON	STROKE UNIT	MEDICAL UNITS
Winter[1]	44	45
Spring[2]	42	41
Summer[3]	32	33
Autumn[4]	37	33
TOTAL	155	152

1. December, January, February
2. March, April, May
3. June, July, August
4. September, October, November

The input of patients into the study occurred over a period of 31 months from October 3, 1975 - April 30, 1978. The rate at which patients were entered into the study was constant, averaging 8.0, 10.6, 9.8 and 10.0 patients entered per month for the years 1975, 1976, 1977 and 1978 respectively. All 155 patients allocated to the stroke unit were admitted to Ward 2B, Royal Victoria Hospital. The distribution of the 152 patients admitted to hospitals with medical units is presented in Table 11.10. Seventy per cent of patients were admitted to six medical units in three hospitals (Royal Infirmary, Western General Hospital and Eastern General Hospital); the remaining 30 per cent of patients being admitted to medical units in five smaller hospitals. There was no major difference in the mean admission time between any of the hospitals.

TABLE 11.10

TIME FROM NOTIFICATION TO PLACEMENT BY INDIVIDUAL HOSPITAL

HOSPITAL	N	MEAN DURATION ± S.E. (IN MINUTES)
STROKE UNIT		
Royal Victoria Hospital	155	61.6 ± 2.8
MEDICAL UNITS		
Royal Infirmary	47	59.7 ± 5.3
Eastern General Hospital	36	61.4 ± 5.4
Western General Hospital	24	58.5 ± 4.6
Deaconess Hospital	13	54.6 ± 5.8
City Hospital	12	50.8 ± 6.3
Leith Hospital	12	63.5 ± 6.1
Chalmers Hospital	6	62.0 ± 9.7
Edenhall Hospital	2	45.0 ± 5.0

S.E. = Standard error

Duration of Hospital Stay

The total duration of hospital stay was recorded for all patients and is presented in Table 11.11.

TABLE 11.11

DURATION OF HOSPITAL STAY

Allocation	Condition at Discharge	N	DURATION OF STAY (IN DAYS) Mean ± SE	Range
STROKE UNIT	Alive	125	61.8 ± 3.8	9-251
	Dead	30	24.7 ± 3.9	1-73
	TOTAL	155	54.6 ± 3.4	1-251
MEDICAL UNITS	Alive	104	93.1 ± 9.6	7-456
	Dead	48	26.0 ± 8.9	1-303
	TOTAL	152	75.1 ± 7.5	1-456

S.E. = Standard error

The mean duration of stay was significantly higher ($p < 0.05$) for the medical unit patients. This significance increased when only patients who survived the acute phase of rehabilitation were considered ($p < 0.01$). The duration of stay of patients who died during the acute phase of rehabilitation did not differ significantly between allocations ($p > 0.05$). Thirty-four (22 per cent) medical unit patients were in hospital for more than 16 weeks (the pre-determined cut-off point for the acute phase of rehabilitation), compared with only 14 (nine per cent) stroke unit patients ($p < 0.01$). The 34 medical unit patients included five very late deaths. Duration of stay did not differ between sexes, but went up with increasing age. It was higher in single and widowed patients compared with those who were married, but the difference did not reach statistical significance ($p > 0.05$).

Patients admitted to the stroke unit received all their care in one location during the acute phase of rehabilitation, but 32 (21 per cent) medical unit patients were transferred from their admitting hospital during the acute phase of rehabilitation. The mean interval from admission to transfer was 33 days and the reason for transfer in all cases was to obtain further rehabilitation. A mean duration of stay of 75 days occurred in the transfer hospital, making an overall length of stay of 108 days for these patients, compared with 87 days amongst patients who were not transferred from medical units. No patients transferred for further rehabilitation died. If the deaths that occurred in medical units are excluded, the mean duration of stay amongst non-transferred survivors was higher at 96 days. The Royal Infirmary, which had the highest number of initial admissions also had the highest number of subsequent transfers. The characteristics of transfer patients did not differ from those retained in the admitting hospital with respect to age, sex, marital status or social class. There was no change in policy amongst admitting medical units with respect to the transfer of patients for further rehabilitation throughout the period of the study.

Outcome at the End of the Acute Rehabilitation Phase

One hundred and twenty-five patients from the stroke unit and 109 patients from medical units survived to complete the acute phase of rehabilitation and had their outcome assessed at a mean interval of 55.8 days and 65.7 days respectively following admission. The difference in these intervals is not statistically significant ($p > 0.05$). Table 11.12 summarises the type of outcome assessment which was undertaken.

TABLE 11.12

TYPE OF A.D.L. ASSESSMENT CARRIED OUT

TYPE OF ASSESSMENT	STROKE UNIT	MEDICAL UNITS
Attendance at ADL Assessment Unit	102	37
Home	3	36
Hospital Ward only	20	36
TOTAL	125	109

A.D.L. = Activities of Daily Living

Assessments which were undertaken in the ward only comprised those patients who failed the "screening test" designed to establish whether they could safely attend the Activities of Daily Living Unit. The discrepancy between allocations with regard to the number of patients who were assessed in the A.D.L. Unit and at home is a reflection of the lack of notice of intent to discharge amongst certain participating medical units. The outcome assessment in the A.D.L. Unit or at home took a mean period of 54 minutes to complete.

Table 11.13 summarises the outcome at the end of the acute phase of rehabilitation.

TABLE 11.13

OUTCOME AT THE END OF THE ACUTE PHASE OF REHABILITATION

Allocation	N	Independent	Dependent	Dead
Stroke Unit	155	78 (50%)	47 (31%)	30 (19%)
Medical Units	152	49 (32%)	60 (40%)	43 (28%)
$p < 0.01$: χ^2 10.49 on 2df				

Seventy-eight (50 per cent) patients from the stroke rehabilitation unit were assessed as independent compared with 49 (32 per cent) patients from medical units. The difference is significant ($p < 0.01$: χ^2 10.49 on 2df) and enables the hypothesis being tested in this thesis to be accepted. Cooking a simple hot meal was the activity which carried the highest proportion of dependency assessments. The highest level of independence in both allocations was achieved in self-feeding. The data was carefully examined to determine if any subconscious bias occurred as a result of conducting functional assessments on medical unit patients in the two settings of the A.D.L. Unit and at home. There was no difference in the timing or duration of assessments carried out in the A.D.L. Unit and at home, and no difference in the proportion of patients who were classified as independent or dependent in the assessments carried out in these two settings.

The difference in the proportions of patients in the two allocations who died during the acute phase of rehabilitation was unexpected. The distribution of these deaths over time is summarised in Table 11.14.

TABLE 11.14

DISTRIBUTION OF DEATHS OVER TIME DURING THE ACUTE PHASE OF REHABILITATION

Length of Stay (in days)	STROKE UNIT	MEDICAL UNITS
0 - 3	3	6
4 - 10	6	15
11 - 20	9	11
21 - 60	9	8
61 - 120	3	4
> 120	0	4
TOTAL	30	48

Although the numbers of deaths in each grouped interval of hospital stay was small, there was a difference between deaths occurring in the stroke unit and medical units from four to 10 days after hospital admission. The underlying and associated causes of death recorded on the death certificates of these patients were similar in the two allocations.

Age was an important factor in outcome, the proportion of independent patients declining with age in both allocation groups. Sex, social class and marital status were not important factors in determining outcome. Total duration of hospital stay was related to outcome, with a high proportion of patients classified as independent being discharged within one month of admission, and a high residue of dependent patients remaining beyond the 16 week cut-off point for the acute phase of rehabilitation.

The outcome of the 32 patients admitted to medical units who were subsequently transferred for further rehabilitation after a mean interval of 33 days was interesting when compared with patients who remained in their admitting medical units throughout. Exactly the same proportion of patients in these two groups were assessed as independent, after excluding patients in the non-transfer group who died. The outcome was assessed over time by dividing the period of the study into three equal intervals: October 1975 - July 1976 (the initial period); August 1976 - May 1977 (the middle period); and June 1977 - April 1978 (the final period). There was no change in the proportion of patients in medical units assessed as independent in these periods, but the proportion of stroke unit patients assessed as independent improved from 42 per cent in the initial period to 60 per cent in the final period. There was no significant change in the performance of medical units in particular hospitals over time, neither was there any marked difference between medical units within hospitals, although the numbers of patients in each unit were too small to exclude chance fluctuations.

Neurological Function following Entry to the Study

It was intended to analyse the results of the standard neurological examination which was conducted every week on all patients whilst they were in the acute phase of rehabilitation to determine the relationship between the degree and rate of recovery of each function, and of different combinations of functions and the outcome of rehabilitation, expressed as the ability to perform the defined activities of daily living. This part of the analysis was abandoned after the throughput of patients was complete when it was found that up to 40 per cent of clinical assessments carried out during certain weeks of the acute phase of rehabilitation were incomplete, usually because patients were unable to co-operate because of confusion, disorientation or poor conscious level.

Disposal of Patients

The locations to which patients who survived the acute phase of rehabilitation were discharged are summarised in Table 11.15. Although there were no major differences in the timing of discharge between allocations in the distribution of patients who were discharged home, there was an important difference between allocations in the transfer of patients to long stay hospitals. Thirteen out of the 18 patients discharged from the stroke unit to long stay hospital care were transferred before the cut-off point of 16 weeks, whereas 12 out of 16 such patients were still in medical units at this point.

TABLE 11.15

DISCHARGE OF PATIENTS ACCORDING TO DURATION OF STAY

DISCHARGE ARRANGEMENTS	STROKE UNIT		MEDICAL UNITS	
	Duration of Stay		Duration of Stay	
	$<$16 Weeks	$\geqslant$16 Weeks	$<$16 weeks	$\geqslant$16 weeks
Home, to live alone	30	1	14	4
Home, to live with relatives	67	8	57	11
Part IV accommodation	1	0	0	2
Long Stay Hospital	13	5	4	12
Dead	30	0	43	5
TOTAL	141	14	118	34

This helps to explain why there was a significantly higher proportion of patients still in medical units at the cut-off point compared with stroke unit patients. A further difference between allocations was in the proportion dependent. Table 11.16 summarises the situation. A higher proportion of dependent patients from medical units were discharged home to live alone or to live with relatives compared with the stroke unit.

TABLE 11.16

DISCHARGE ARRANGEMENTS OF SURVIVORS ACCORDING TO OUTCOME

DISCHARGE ARRANGEMENTS	STROKE UNIT		MEDICAL UNITS	
	Independent	Dependent	Independent	Dependent
Home to live alone	29	2	11	7
Home, to live with relatives	48	27	37	31
Part IV accommodation	1	0	1	1
Long Stay Hospital	0	18	0	16
TOTAL	78	47	49	55

CHAPTER 12

RESOURCES USED DURING THE ACUTE PHASE OF REHABILITATION

Summary

Differences in the use of resources between the stroke unit and medical units which could have contributed to the acceptance of the hypothesis were identified. These differences included nursing dependency, social work involvement, provision of aids/adaptations, use of physiotherapy and occupational therapy, and communication between hospital staff and the families of patients. The intensive use of therapy that might have been implied by the creation of a stroke unit did not occur. What was achieved by the stroke unit was almost universal coverage of physiotherapy and occupational therapy and shorter delays before commencing treatment.

Medical Diagnosis, Investigation and Treatment

Data was collected on three aspects of medical work: diagnoses made, drug therapy prescribed and stroke-related investigations performed. The stroke-related diagnoses coded in patients' medical records were examined for each allocation group. In 150 out of 155 patients from the stroke rehabilitation unit and 147 out of 152 patients in medical units, the diagnosis was recorded as cerebrovascular disease and coded as acute but ill defined cerebrovascular disease (I.C.D. 436). The remaining 10 patients were all discharged with another stroke-related diagnosis recorded (I.C.D. 430-435, 437, 438). Seventy-seven per cent of stroke unit patients and

72 per cent of medical unit patients had firm, supplementary diagnoses recorded in the case notes. The mean number of supplementary diagnoses were 1.4 for each allocation. Specific diagnoses were similar for each allocation, with ischaemic heart disease, congestive cardiac failure and respiratory tract infections predominating. A mean number of 4.1 courses of drug therapy were prescribed to the 91 per cent of patients in the stroke unit who received any drugs, compared with a mean of 3.7 courses prescribed to the 86 per cent of medical unit patients who received any drug therapy. The difference is not statistically significant ($p > 0.05$). Neither the names of individual drugs nor details of the timing of drug therapy were recorded in the study. Ninety-nine per cent of stroke unit patients and 97 per cent of medical unit patients had at least one stroke-related investigation performed. The mean number of investigations in stroke unit patients was 4.6 and in medical unit patients, 3.8; a highly significant difference ($p < 0.001$). Table 12.1 summarises the differences in stroke-related diagnostic investigations performed between the two allocations.

TABLE 12.1

STROKE-RELATED DIAGNOSTIC INVESTIGATIONS PERFORMED

Investigation	% of all Patients		Significance of
	Stroke Unit	Medical Units	Difference
Blood Sugar	94	47	$p < 0.001$
Skull X-ray	41	21	$p < 0.001$
Wasserman	20	8	$p < 0.01$
Chest X-ray	97	87	$p < 0.01$
Lumbar Puncture	0	5	$p < 0.05$
Blood Urea	99	97	N.S.
Electrocardiogram	91	86	N.S.
Electroencephalogram	5	6	N.S.
Brain Scan	4	8	N.S.
Computer Assisted Tomography	1	2	N.S.

N.S. - Not Significant ($p > 0.05$)

Five out of the 10 investigations listed show statistically significant differences between the proportion of patients in each allocation who had them carried out. A very low proportion of patients in either allocation received any specialised neurological investigations. No patient in the study had cerebral angiography performed. There was no difference in diagnostic investigations for stroke, or the prescribing of drugs between the eight hospitals containing medical units.

Nursing Dependency

Table 12.2 summarises the results of the observations made on nursing staff during a two-week period of observation in the stroke unit and in the random subsample of medical wards, designated ward A, B and C.

TABLE 12.2

NURSING DEPENDENCY IN THE ACUTE PHASE OF REHABILITATION

Level of Dependency	Stroke Unit	Medical Wards Ward A	Ward B	Ward C
Low	1	4	3	1
Medium	12	18	28	16
High	0	3	2	2
Bed occupancy of the stroke unit and medical wards	87%	92%	99%	67%

Note: Bed occupancy = $\dfrac{\text{average number of occupied beds during the two-week period of observation}}{\text{average number of available beds during the same two-week period}} \times 100$

Numbers represent the mean daily number of patients in each ward.

The number of patients observed was very small. Patients in the stroke unit were concentrated in the middle band of nursing dependency. Medical units contained patients spread over all three bands of nursing dependency, although the nursing dependency of most patients in these units were also in the middle band. Nursing activity times were collected for patients in the stroke unit during the two-week period of observation and compared with similar activity times collected in medical and surgical units during a previous study. Table 12.3 demonstrates that more time was being spent on average by nursing staff in the stroke unit on the basic activities of feeding and toileting patients than by nursing staff in medical and surgical units in the previous study.

TABLE 12.3

NURSING ACTIVITY TIMES

	Activity Times (in minutes)	
	Stroke Unit	Medical & Surgical Units*
Breakfast	19	4
Lunch	23	9
Supper	17	11
Toilet	10	5

* Based on Grant, N. (1977) Unpublished Ph.D. Thesis. University of Edinburgh

Social Work

Table 12.4 summarises the involvement of social workers during the acute phase of rehabilitation.

TABLE 12.4

SOCIAL WORK DURING THE ACUTE PHASE OF REHABILITATION

	Stroke Unit	Medical Units	Significance of Differences
Patients receiving ANY Social Work	105 (68%)	55 (36%)	$p < 0.001$
Mean Interval ($\pm$ SE) from Admission to Social Work Referral (in days)	19.2 ± 1.6	22.3 ± 3.3	N.S.
Mean Number ($\pm$ SE) of Contacts for each Referred Patient	7.8 ± 0.6	7.3 ± 0.8	N.S.
Mean Time ($\pm$ SE) Consumed for each Referred Patient (in minutes)	53.7 ± 6.5	89.5 ± 15.7	$p < 0.05$

N.S. Not significant ($p > 0.05$)

S.E. Standard error.

Overall, 68 per cent of stroke unit patients received social work compared with only 36 per cent of medical unit patients, a highly significant difference ($p < 0.001$). There was no difference between the two groups of patients in the mean number of social work contacts or in the delay which occurred between hospital admission and social work referral, but there was a significant difference in the amount of time used by social workers with, or on behalf of patients in medical units ($p < 0.05$). Table 12.5 shows that the increased amount of time spent on behalf of referred patients in medical units was spread throughout the entire content of social work.

TABLE 12.5

THE CONTENT OF SOCIAL WORK

Content	Stroke Unit			Medical Units		
	n	Mean Number of Contacts For each referred patient	Mean time consumed (in mins.) For each referred patient	n	Mean Number of Contacts For each referred patient	Mean time consumed (in mins.) For each referred patient
Any Social Work Referral	105	7.8	53.7	55	7.3	89.5
Interview	94	3.4	31.6	45	4.0	76.3
Telephone	42	2.8	12.4	29	2.6	17.1
Letter(s)	21	1.6	5.7	10	1.2	10.7
Case Discussion	77	2.4	12.8	44	2.8	15.5
Ward Rounds	49	3.4	21.4	4	2.8	50.3

The difference was particularly marked in the mean time taken by interviewing and ward rounds. This trend persisted when the nature of the contacts which social workers had with patients was examined. These are summarised in Table 12.6. The personal nature of the social workers' role in stroke rehabilitation can be seen, no less than 58 per cent of stroke unit and 72 per cent of medical units' social work time was spent in direct contact with patients or their relatives. A higher proportion of patients transferred for further rehabilitation received social work referrals compared with those who remained in the admitting hospital. Dependent patients at the end of the acute phase of rehabilitation had higher rates of referral in both allocation groups of patients, but particularly in the stroke unit where 94 per cent of dependent patients had a social work referral. Higher referral rates occurred amongst patients in both allocations who were discharged home to live alone, or who were discharged to long-term hospital care. There was no evidence that a higher rate of referral was occurring in patients with long durations of stay. In particular, the data did not support the idea that long durations of stay were associated with delays in arranging social work for these patients. Nor was there any evidence that social workers were being used as substitutes for physiotherapists or occupational therapists in the provision of aids or adaptations.

Physiotherapy

Table 12.7 summarises the use of physiotherapy by patients in the stroke unit and medical units during the acute phase of rehabilitation.

TABLE 12.6

THE CONTACTS OF SOCIAL WORK

Contact	Stroke Unit			Medical Units		
	n	Mean Number of Contacts (For each referred patient)	Mean Time Consumed (in mins.) (For each referred patient)	n	Mean Number of Contacts (For each referred patient)	Mean Time Consumed (in mins.) (For each referred patient)
Any Social Work Referral	105	7.8	53.7	55	7.3	89.5
Patient	90	2.6	20.6	40	2.8	44.7
Relative(s)	82	2.2	17.0	31	3.1	56.9
Hospital Staff	100	2.6	14.9	46	3.0	18.9
Domiciliary Occupational Therapy	31	1.9	7.6	11	1.7	14.9
Other Local Authority Agencies	8	2.0	8.3	6	2.0	27.5

TABLE 12.7

PHYSIOTHERAPY IN THE ACUTE PHASE OF REHABILITATION

	Stroke Unit (n = 155)	Medical Units (n = 152)	Significance of Differences
Patients receiving any physiotherapy	149 (96%)	134 (88%)	$p < 0.05$
Mean interval ($\pm$ SE) from admission to referral (in days)	3.0 ± 0.3	3.8 ± 0.2	$p < 0.05$
Mean duration($\pm$ SE) of therapy (in days) for each referred patient	49.3 ± 3.3	70.5 ± 7.8	$p < 0.05$
Mean amount ($\pm$ SE) of time used (in hours) for each referred patient	21.0 ± 1.5	36.4 ± 4.0	$p < 0.001$

SE = Standard Error

There were significant differences present. A higher proportion of stroke unit patients were receiving physiotherapy at a lower mean interval from admission to commencement. Medical unit patients who received physiotherapy had a longer duration of treatment and used a much larger amount of physiotherapy time. This was a consequence of the longer duration of hospital stay of these patients. If only patients with durations of stay less than the 16 week cut-off point were compared, the differences in duration of treatment and amount of physiotherapy used disappear, although the earlier commencement of physiotherapy in favour of stroke unit patients persisted. Overall, the 22 per cent of medical patients with hospital stays greater than 16 weeks used no less than 57 per cent of the physiotherapy used by this group (Table 12.8), including 36 per cent which was used after the 16 week cut-off point had passed.

TABLE 12.8

PHYSIOTHERAPY AMONGST PATIENTS WITH AN EXTENDED HOSPITAL STAY

	n	% of all Patients	% of all Therapy used	Time used by extended stay Patients (in hours) $\leqslant$ 16 weeks	$\geqslant$ 16 weeks	Total
Stroke unit	14	9	23	597 (83%)	120 (17%)	717 (100%)
Medical units	34	22	57	1779 (64%)	1017 (36%)	2796 (100%)

A further difference emerged amongst survivors in medical units when the distribution of physiotherapy utilised by patients transferred for further rehabilitation was compared with that consumed by patients who remained in their admitting medical units. Table 12.9 summarises the situation.

TABLE 12.9

PHYSIOTHERAPY ACCORDING TO THE MANAGEMENT OF SURVIVORS

	Stroke Unit	Medical Units		Significance of Differences		
		Transferred for Rehabilitation	Remained in Admitting Hospital	Stroke Unit v Transferred	Stroke Unit v Remaining	Transferred v Remaining
	(n = 125)	(n = 32)	(n = 72)			
Patients receiving any physiotherapy	125 (100%)	32 (100%)	67 (93%)	N.S.	$p < 0.05$	N.S.
Mean interval ($\pm$ SE) from admission to referral (in days)	2.9 ± 0.3	4.5 ± 0.6	3.5 ± 0.3	$p < 0.05$	N.S.	N.S.
Mean duration ($\pm$ SE) of therapy (in days) for each referred patient	54.6 ± 3.6	92.3 ± 15.3	79.2 ± 12.4	$p < 0.05$	N.S.	N.S.
Mean amount ($\pm$ SE) of time used (in hours) for each referred patient	23.5 ± 1.7	51.4 ± 6.8	38.5 ± 6.0	$p < 0.001$	$p < 0.05$	N.S.

N.S. = Not significant ($p > 0.05$)

S.E. = Standard error

Patients transferred had 100 per cent coverage of physiotherapy, had a longer mean duration and used a much higher amount of therapy time. The delay in commencement of physiotherapy was longer in the transferred group. Seventy-three per cent of physiotherapy used by the 32 patients transferred for further rehabilitation occurred after transfer.

Occupational Therapy

Major differences in the use of occupational therapy occurred between patients in the stroke unit and medical units. These are illustrated in Table 12.10.

TABLE 12.10

OCCUPATIONAL THERAPY IN THE ACUTE PHASE OF REHABILITATION

	Stroke Unit (n = 155)	Medical Units (n = 152)	Significance of Differences
Patients receiving any occupational therapy	136 (88%)	71 (47%)	$p < 0.001$
Mean interval ($\pm$ SE) from admission to referral (in days)	6.4 ± 0.5	21.1 ± 3.8	$p < 0.001$
Mean duration ($\pm$ SE) of therapy (in days) for each referred patient	46.9 ± 3.2	68.6 ± 10.3	$p < 0.05$
Mean amount ($\pm$ SE) of time used (in hours) for each referred patient	33.3 ± 2.4	48.2 ± 6.1	$p < 0.05$

S.E. = Standard error

A highly significant difference in the proportions of all patients in these two allocations receiving any occupational therapy occurred. A striking difference in the interval which elapsed before occupational therapy commenced was also present between allocations. These differences were such that one week after admission, 66 per cent of all patients admitted to the stroke unit had commenced occupational therapy compared with only 18 per cent of all patients admitted to medical units. The pattern of a longer duration and greater number of therapy hours which applied to the use of physiotherapy by medical unit patients was repeated, but the difference in occupational therapy time used was not as significant ($p < 0.05$). As in the case of physiotherapy, the longer mean duration of treatment and higher number of therapy hours can be explained by the high use of occupational therapy amongst patients with hospital stays of 16 weeks or longer. The use of occupational therapy by patients transferred from medical units to a second hospital for further rehabilitation is even more striking than their use of physiotherapy. Table 12.11 shows that amongst survivors of the acute phase of rehabilitation, the transfer group of patients approached the proportion of stroke unit patients who received occupational therapy. But the stroke unit still retained a highly significant lead over transferred medical unit patients in introducing occupational therapy ($p < 0.001$). No less than 65 per cent of all occupational therapy amongst medical patients was consumed by the transfer patients. Of this, 89 per cent was used after the transfers had taken place at a mean interval of 33 days after hospital admission. Examining the personal characteristics of patients in using occupational therapy revealed an unexpected

TABLE 12.11

OCCUPATIONAL THERAPY ACCORDING TO THE MANAGEMENT OF SURVIVORS

	Stroke Unit	Medical Units		Significance of Differences		
		Transferred for Rehabilitation (n = 125)	Remained in Admitting Hospital (n = 72)	Stroke Unit v Transferred	Stroke Unit v Remaining	Transferred v Remaining
Patients receiving any occupational therapy	121 (97%)	29 (91%)	35 (49%)	N.S.	$p < 0.001$	$p < 0.001$
Mean interval ($\pm$ SE) from admission to referral (in days)	6.5 ± 0.6	22.6 ± 4.2	21.2 ± 6.9	$p < 0.001$	$p < 0.05$	N.S.
Mean duration ($\pm$ SE) of therapy (in days) for each referred patient	49.7 ± 3.6	78.8 ± 16.7	69.5 ± 15.4	N.S.	N.S.	N.S.
Mean amount ($\pm$ SE) of time used (in hours) for each referred patient	35.7 ± 4.4	76.1 ± 11.6	31.5 ± 5.5	$p < 0.01$	N.S.	$p < 0.01$

N.S. = Not significant ($p > 0.05$)

S.E. = Standard error

trend in stroke unit patients; the amount of therapy time falling sharply with increasing age. This trend was not repeated in patients admitted to medical units. One important finding elicited by looking at the use of occupational therapy by individual hospitals was that patients admitted to medical units in the Royal Infirmary which had no department of occupational therapy at the beginning of the period of the study did not fare much worse than other medical patients, 39 per cent of all such admissions receiving occupational therapy, mainly through transfers to second hospitals.

Speech Therapy

There were no differences in the use of speech therapy between allocations to match those seen for physiotherapy or occupational therapy. Table 12.12 presents the salient features. Only 13 per cent of stroke unit and 18 per cent of medical unit patients received any speech therapy, with the latter commencing therapy earlier. Patients from medical units who were transferred for further rehabilitation did utilise more speech therapy, but the difference was not significant ($p > 0.05$). Similarly, the group of patients with durations of stay greater than 16 weeks did not exert the same influence on the distribution of speech therapy that they had on the distribution of physiotherapy and occupational therapy.

TABLE 12.12

SPEECH THERAPY IN THE ACUTE PHASE OF REHABILITATION

	Stroke Unit (n = 155)	Medical Units (n = 152)	Significance of Differences
Patients receiving any speech therapy	20 (13%)	27 (18%)	N.S.
Mean interval ($\pm$ SE) from admission to referral (in days)	8.7 $\pm$ 1.3	6.1 $\pm$ 1.0	N.S.
Mean duration ($\pm$ SE) of therapy (in days) for each referred patient	61.4 $\pm$ 7.8	64.9 $\pm$ 12.5	N.S.
Mean amount ($\pm$ SE) of time used (in hours) for each referred patient	16.9 $\pm$ 2.3	11.2 $\pm$ 1.9	N.S.

N.S. = Not significant ($p > 0.05$)

S.E. = Standard error

Aids and Adaptations

Table 12.13 is a summary of the provision of aids and/or adaptations to the survivors of the acute phase of rehabilitation, and reveals important differences in the performance of staff of the stroke unit and medical units. A highly significant difference ($p < 0.001$) was present between allocations in the proportion of patients who were prescribed aids and/or adaptations during the hospital stay. It is important that patients' accessory "aids" such as spectacles, hearing aids and dentures are working satisfactorily if they are to cope with daily living activities to the best of their ability. All patients had at least one accessory "aid" on admission to the study. The performance of these accessory aids was tested in a uniform manner, using eye charts, a tuning fork and manual/visual examination of the gums and palate with and without dentures in place.

TABLE 12.13

AIDS AND ADAPTATIONS IN THE ACUTE PHASE OF REHABILITATION

	Stroke Unit (n = 125)	Medical Units (n = 109)	Significance of Differences
Aids and/or adaptation(s) prescribed during hospital stay	103 (82%)	61 (56%)	$p < 0.001$
Accessory "aids" modified or replaced by hospital staff	68 (54%)	12 (11%)	$p < 0.001$
Accessory "aids" satisfactory at hospital discharge (spectacles, hearing aids, dentures)	94 (75%)	48 (44%)	$p < 0.001$

A further highly significant difference ($p < 0.001$) in favour of the stroke unit in the proportion of patients with satisfactory accessory aids at the end of the acute phase of rehabilitation occurred. Another aspect of the difference in prescribing aids and/or adaptations between the allocations can be seen in Table 12.14.

TABLE 12.14

OUTCOME AND THE PRESCRIBING OF AIDS AND ADAPTATIONS

	Stroke Unit			Medical Units			Significance of Differences
	n	Aids $\pm$ Adaptations	%	n	Aids $\pm$ Adaptations	%	
Independent	78	58	74	49	20	41	$p < 0.001$
Dependent	47	44	94	60	41	68	$p < 0.01$

Amongst survivors who were assessed as independent, 74 per cent of stroke unit patients and 41 per cent of medical unit patients had prescribed aids and/or adaptations, a highly significant difference ($p < 0.001$). The proportion of dependent patients with aids and/or adaptations was higher, 94 per cent in stroke unit patients and 68 per cent in medical unit patients ($p < 0.001$). There is no data on the number of patients from medical units who might have attained independence if appropriate aids and/or adaptations had been provided. Adaptations to patients' homes were recommended by hospital staff in 62 per cent and 27 per cent of patients from the stroke unit and medical units respectively who were being discharged home, either to live alone or to live with relatives or friends.

Communication

Family members of stroke patients are an important resource which should be used by hospital staff. To make full use of this resource requires the active involvement of all members of the hospital rehabilitation team in reassuring, discussing the prognosis and describing the plan of treatment to key family members. Table 12.15 summarises the communication which occurred between various members of hospital staff and the closest relative of survivors who had been designated the caring person. There were significant differences between the allocations in the proportion of caring persons who reported that they had contact with members of the hospital staff, particularly medical consultants and the three types of therapy staff. These differences were much less pronounced when the contacts were separated into those initiated by the caring person themselves, and those in which the hospital staff made the initial approach.

TABLE 12.15

COMMUNICATION BETWEEN HOSPITAL STAFF AND THE FAMILIES OF SURVIVORS

Member of Hospital Staff	Stroke Unit %	Medical Units %	Signifance of Differences
Medical Consultant	65 (125)	16 (104)	$p < 0.001$
Junior Medical Staff	67 (125)	56 (104)	N.S.
Ward Sister	90 (125)	72 (104)	$p < 0.01$
Social Worker	58 (96)	48 (46)	N.S.
Physiotherapist	61 (125)	31 (99)	$p < 0.001$
Occupational Therapist	63 (121)	31 (64)	$p < 0.001$
Speech Therapist	68 (19)	30 (20)	$p < 0.05$

N.S. = Not significant ($p > 0.05$)

Figures in parenthesis are the actual numbers of families who could have reported contact with different members of the hospital staff.

CHAPTER 13

COMPLETING THE TRIAGE OF STROKE REHABILITATION

Summary

Identifying all strokes occurring in persons aged 60 years and over from the defined population who were admitted to hospital during the period of the study, enabled the triage of stroke rehabilitation in the elderly to be completed. During 1976-77, 43 per cent of all strokes were in the upper band; 24 per cent were in the middle band and 33 per cent were in the lower band. Seventy-one per cent of middle band strokes were referred to the study. The average annual age and sex adjusted incidence rates in persons aged 60 years and over for hospital admission of upper, middle and lower bands of stroke were 3.1, 1.8 and 2.4 per 1000 person-years respectively. The number of beds required in a stroke unit to serve the defined population would be 31, comprising 12 male beds and 19 female beds.

The Number of Strokes occurring in the Defined Population

An aim of the study was to complete the picture of stroke rehabilitation by identifying as far as possible all strokes in the upper, middle and lower bands. The total number of strokes occurring in patients aged 60 years and over who were admitted to hospital in 1976-77 was 1,429. Table 13.1 summarises their distribution according to whether patients were admitted to the study, were ineligible to participate when seen, or were not referred to the study at all. Overall, 71 per cent of all middle band strokes were referred compared with only 18 per cent of upper and 23 per cent of lower band strokes. Upper band strokes comprised 43 per cent of all strokes, middle band strokes were 24 per cent and lower band strokes accounted for the remaining 33 per cent. Table 13.2 shows the distribution of admissions by individual hospital. One hospital, the Royal Infirmary, admitted 36 per cent of all strokes during 1976-77, followed by the Western General Hospital with 22 per cent and the Eastern General Hospital with 11 per cent. The distribution of upper, middle and lower band admissions was remarkably similar between hospitals. Excluding hospitals with numbers of admissions in single figures, the proportion of middle band strokes admitted to any hospital ranged from 14 per cent to 25 per cent.

TABLE 13.1

COMPLETING THE TRIAGE OF STROKE REHABILITATION IN 1976-77

	Band of Stroke			
	UPPER	MIDDLE	LOWER	TOTAL
Admitted to the study	-	244	-	244
Seen by the study but not eligible to participate	112	-	110	222
Not referred to the study	501	99	363	963
TOTAL	613 (43%)	343 (24%)	473 (33%)	1429 (100%)

TABLE 13.2

THE TRIAGE OF STROKE REHABILITATION BY ADMITTING HOSPITAL

	Band of Stroke							
	UPPER		MIDDLE		LOWER		TOTAL	
	N	(%)	N	(%)	N	(%)	N	(%)
Western General Hospital	117	(53)	38	(17)	67	(30)	222	(100)
Eastern General Hospital	66	(41)	40	(25)	56	(34)	162	(100)
Northern General Hospital	6	(67)	3	(33)	0	(0)	9	(100)
Leith Hospital	52	(48)	21	(19)	35	(33)	108	(100)
Edenhall Hospital	5	(71)	2	(29)	0	(0)	7	(100)
East Fortune Hospital	6	(67)	0	(0)	3	(33)	9	(100)
Royal Infirmary	247	(48)	73	(14)	199	(38)	519	(100)
Deaconess Hospital	44	(35)	19	(15)	61	(50)	124	(100)
Chalmers Hospital	21	(46)	7	(15)	18	(39)	46	(100)
City Hospital	49	(50)	16	(16)	34	(34)	99	(100)
Royal Victoria Hospital	N.A.		124	(100)	N.A.		124	(100)
T O T A L	613	(43)	343	(24)	473	(33)	1429	(100)

N.A. Not Applicable

Type of Hospital Admission

Before the study began, it was thought that the Emergency Bed Bureau of the Lothian Health Board were notified about virtually all elderly stroke patients who were admitted to hospital. Table 13.3 demonstrates the extent to which this actually occurred for stroke patients aged 60 years and over in the defined population.

TABLE 13.3

THE TRIAGE OF STROKE REHABILITATION BY THE TYPE OF HOSPITAL ADMISSION

	Band of Stroke			
	UPPER	MIDDLE	LOWER	TOTAL
Emergency Bed Bureau, Lothian Health Board	259 (42%)	277 (80%)	251 (53%)	787 (55%)
Directly to hospital by general practitioner	123 (20%)	27 (8%)	114 (24%)	264 (19%)
To Accident and Emergency Departments by ambulance	141 (23%)	24 (7%)	93 (20%)	258 (18%)
Strokes which occurred amongst patients already in hospital	84 (14%)	9 (3%)	12 (2%)	105 (7%)
Other	6 (1%)	6 (2%)	3 (1%)	15 (1%)
TOTAL	613 (100%)	343 (100%)	473 (100%)	1429 (100%)

Just over half (55 per cent) of all cases admitted to hospital in 1976-77 were referred through the Emergency Bed Bureau. The remainder were either referred directly to hospital by general practitioners (19 per cent) or brought to Accident and Emergency Departments of the Royal Infirmary, Western General Hospital or Leith Hospital. A further group (seven per cent) consisted of patients who were already in hospital for some other reason when the stroke occurred. These strokes were predominantly in the upper band. There were marked differences in the proportions of each band of stroke who were admitted to hospital by different routes. Four out of every five middle band strokes were referred to hospital through the Emergency Bed Bureau. On the other hand, a relatively small proportion of middle band strokes in comparison with upper and lower band strokes were admitted by general practitioners directly to hospital or were taken to Accident and Emergency Departments by ambulance. Further differences were found in the distribution of upper and lower band strokes according to the reason why patients were ineligible for the study or would have been ineligible if they had been referred (Table 13.4).

TABLE 13.4

TYPE OF HOSPITAL ADMISSION FOR STROKE ACCORDING TO THE REASON WHY PATIENTS WERE INELIGIBLE FOR THE STUDY

	UPPER BAND		LOWER BAND	
	Conscious Level	Prestroke Dependency	No Hemiplegia	T.I.A.
Emergency Bed Bureau, Lothian Health Board	123 (33%)	136 (57%)	123 (68%)	128 (43%)
Directly to hospital by general practitioners	69 (18%)	54 (22%)	42 (23%)	72 (25%)
To Accident & Emergency Depts. by ambulance	126 (34%)	15 (6%)	12 (7%)	81 (28%)
Strokes which occurred in hospital	51 (14%)	33 (14%)	0	12 (4%)
Other	3 (1%)	3 (1%)	3 (2%)	0
TOTAL	372 (100%)	241 (100%)	180 (100%)	293 (100%)

T.I.A. = Transient Ischaemic Attack

The highest proportion of patients ineligible on the grounds of poor conscious level were referred through Accident and Emergency Departments. But a higher proportion of patients rejected because of prestroke dependency were referred through the Emergency Bed Bureau. As regards lower band strokes, the Emergency Bed Bureau referred the highest proportion of both those patients who had suffered a stroke by definition but who could not satisfy the criteria of hemiplegia, and those patients who presented with a transient ischaemic attack.

Outcome

The outcome of all strokes which occurred in persons aged 60 years and over in the defined population was assessed at the time of hospital discharge using the Rankin Disability Index. Table 13.5 summarises the results of this assessment for each band of stroke according to whether patients were admitted to the study, were seen but found to be ineligible, or were admitted to hospital without being referred to the study.

Two aspects of this data are of interest. The distribution of independent, dependent and dead patients amongst middle band strokes was similar amongst patients admitted to the study who were allocated to medical units, and patients who were admitted to hospital without being referred to the study. But differences were present between strokes in the upper and lower bands according to whether they occurred in patients who were or were not referred to the study. A higher proportion of upper band strokes in patients who were not referred died. A higher proportion of patients with lower band strokes who were not referred to the study

TABLE 13.5

OUTCOME ACCORDING TO THE TRIAGE OF STROKE REHABILITATION

		INDEPENDENT	DEPENDENT	DEAD	TOTAL
UPPER BAND	Seen but not eligible for the study	7 (6%)	37 (36%)	60 (58%)	104 (100%)
	Not referred to the study	21 (4%)	75 (15%)	405 (81%)	501 (100%)
MIDDLE BAND	Stroke Unit allocation	64 (52%)	39 (31%)	21 (17%)	124 (100%)
	Medical Unit allocation	38 (32%)	49 (41%)	33 (27%)	120 (100%)
	Not referred to the study	33 (33%)	45 (46%)	21 (21%)	99 (100%)
LOWER BAND	Seen but not eligible for the study	75 (72%)	13 (12%)	17 (16%)	105 (100%)
	Not referred to the study	321 (88%)	27 (7%)	15 (5%)	363 (100%)

were classified as independent compared with those who were seen but rejected. These differences could have been due to the influence of the criteria used to select patients for the study. The criteria which were used on home visits to classify patients into upper, middle and lower bands of strokes were widely distributed amongst general practitioners and staff of the Emergency Bed Bureau prior to the study commencing. Attempts to apply these criteria in deciding which patients to notify to the study could have been responsible for the very low proportions of all patients with poor conscious levels or transient ischaemic attacks who were referred to the study. This is demonstrated in Table 13.6.

TABLE 13.6

THE INFLUENCE OF SELECTION CRITERIA ON THE CHARACTERISTICS OF PATIENTS REFERRED

		Patients who were referred to the study	Patients who were not referred to the study	TOTAL
UPPER BAND	Conscious level	24 (6%)	348 (94%)	372 (100%)
	Prestroke dependent	88 (37%)	153 (63%)	241 (100%)
MIDDLE BAND		244 (71%)	99 (29%)	343 (100%)
LOWER BAND	No hemi-plegia	84 (47%)	96 (53%)	180 (100%)
	Transient ischaemic attack	26 (9%)	267 (91%)	293 (100%)
TOTAL		466 (33%)	963 (67%)	1429 (100%)

Disposal of Patients

The disposal of all patients from hospital according to the triage is summarised in Table 13.7.

TABLE 13.7

DISPOSAL OF PATIENTS AND THE TRIAGE OF STROKE REHABILITATION

	Band of Stroke							
	UPPER		MIDDLE		LOWER		TOTAL	
	N	(%)	N	(%)	N	(%)	N	(%)
Discharged home to live alone or with relatives/friends	92	(15)	223	(65)	400	(85)	715	(50)
Part IV accomodation or nursing home	3	(1)	4	(1)	17	(3)	24	(2)
Long stay hospital	37	(6)	31	(9)	17	(3)	85	(6)
Dead	464	(75)	85	(25)	32	(7)	581	(40)
Not recorded	17	(3)	0	(0)	7	(2)	24	(2)
TOTAL	613	(100)	343	(100)	473	(100)	1429	(100)

One half of all patients were discharged home, either to live alone or to live with relatives or friends. Living alone, or living with relatives or friends could not be differentiated from each other using the information available in the medical records of patients who were not referred to the study. A very low proportion (15 per cent) of upper band strokes were discharged home whereas this was the disposal of the majority of middle band (65 per cent) and lower band (85 per cent) strokes. Deaths in hospital occurred predominantly in the upper band. Discharge to any hospital or other institutional care accounted for the disposal of only six per cent of all stroke patients aged 60 years and over during 1976-77.

Age and Sex Specific Incidence Rates

The average annual age and sex specific incidence rates for hospital admission of stroke amongst persons aged 60 years and over in the defined population were calculated (Table 13.8). The overall average annual age and sex adjusted rate was 7.25 per 1,000 persons aged 60 years and over, the rate comprising 3.09, 1.76 and 2.40 per 1,000 person-years for upper, middle and lower band strokes respectively. Middle band strokes had a lower average annual incidence rate for hospital admission in all three age-specific groups and in both sexes in comparison with either upper or lower band strokes. With the exception of upper band strokes in the 60-69 year age group, the incidence rates of hospital admission were higher in males than females in all age-specific groups for each of the three bands of stroke.

The Size of a Stroke Unit

Basing the study on a defined population and subsequently completing the triage of stroke rehabilitation amongst all hospital admissions in persons aged 60 years and over formed the basis for calculating the number of beds which would be required for a stroke unit to serve the defined population used in the study. The steps taken and the assumptions made in estimating the size of a stroke unit required to admit acute strokes in the elderly for the defined population is presented in Table 13.9.

A total of 31 beds would be required for a stroke unit to serve the defined population. The stroke unit in the study consisted of patients of both sexes but if the beds were to be designated according to sex, 12 would be required for male patients and 19 beds for female patients. Assuming the same mean duration

TABLE 13.8

AVERAGE ANNUAL AGE AND SEX SPECIFIC INCIDENCE RATES PER 1,000 PERSONS AGED 60 YEARS AND OVER FOR HOSPITAL ADMISSION OF STROKE, EDINBURGH 1976-77

	BAND OF STROKE											
Age group (in years)	UPPER			MIDDLE			LOWER			ALL BANDS		
	M	F	TOTAL	M	F	TOTAL	M	F	TOTAL	M	F	TOTAL
60 - 69	1.28 (60)	1.42 (90)	1.36 (150)	1.13 (53)	0.92 (58)	1.01 (111)	1.43 (67)	1.25 (79)	1.33 (146)	3.84 (180)	3.59 (227)	3.70 (407)
70 - 79	4.78 (98)	3.98 (163)	4.25 (261)	3.27 (67)	2.29 (94)	2.62 (161)	4.05 (83)	2.27 (93)	2.86 (176)	12.10 (248)	8.54 (350)	9.73 (598)
$\geqslant$ 80	11.24 (66)	7.87 (136)	8.73 (202)	4.43 (26)	2.61 (45)	3.07 (71)	7.33 (43)	6.25 (108)	6.53 (151)	23.00 (132)	16.73 (292)	18.33 (424)
All persons, aged $\geqslant$ 60	3.06 (224)	3.20 (389)	3.15 (613)	1.99 (146)	1.62 (197)	1.76 (343)	2.64 (193)	2.30 (280)	2.43 (473)	7.69 (560)	7.12 (869)	7.34 (1429)
Age and sex adjusted *			3.09			1.76			2.40			7.25

M. Male
F. Female

Figures in parenthesis are the actual number of hospital admissions for age, sex and band of stroke.

*Age and sex adjusted to the Scottish population aged 60 years and over at the 1971 census.

TABLE 13.9

ESTIMATED SIZE OF A STROKE UNIT

1. Number of middle band strokes in persons aged 60 years and over from the defined population admitted to hospital in the study during 1976-77 = 244

2. Number of middle band strokes in persons aged 60 years and over from the defined population NOT referred to the study, but admitted to hospital during 1976-77 = 99

3. Total number of middle band strokes in persons aged 60 years and over from the defined population admitted to hospital in 1976-77 = 343

4. Number of persons aged 60 years and over in the defined population = 97,355

5. Average annual incidence of hospital admission for middle band strokes in persons aged 60 years and over in 1976-77 $= \frac{343 \times 1{,}000}{97{,}355 \times 2} = 1.76$ per 1,000 person-years

6. Assuming the mean duration of hospital stay in the stroke unit of 55 days and a bed occupancy° rate of 85%; the number of bed weeks per year required $= \frac{55 \times 1.76}{7 \times 0.85} = 16.27$ per 1,000 persons aged 60 years and over per annum

7. Number of beds required for a stroke unit to serve the defined population of the study $= \frac{16.27 \times 97{,}355}{1{,}000 \times 52} = 31$ beds*

8. Age and sex adjusted average annual incidence rate of hospital admission of middle band strokes in persons aged 60 years and over in 1976-77 = 1.76 per 1,000 person-years‡

9. Assuming the mean duration of hospital stay was 55 days, and a bed occupancy rate of 85% applied; the number of beds required to serve a standard population of 10,000 persons aged 60 years and over $= \frac{55 \times 17.6}{7 \times 52 \times 0.85} = 4$ beds*

°Bed occupancy $= \frac{\text{average number of occupied beds} \times 100}{\text{average number of available beds}}$

(85% is based on bed occupancy of medical units in Scotland, 1976)

*Rounded up to the nearest whole number

‡Age and sex adjusted to the Scottish population aged 60 years and over at the 1971 Census

of stay and bed occupancy rate, the number of beds which would be required for a stroke unit in a standard population would be 4 beds per 10,000 persons aged 60 years and over, or 14 beds for a stroke unit located in a District General Hospital serving a population of 250,000, 18 per cent of whom were aged 60 years and over.

CHAPTER 14

OUTCOME OF THE CONTINUING PHASE OF REHABILITATION

Summary

The difference in functional outcome between stroke unit and medical unit patients which was present at hospital discharge had disappeared by the end of one year, leaving one third of patients independent, one third dependent and one third dead. This was the result of a higher number of stroke unit patients losing their independence and more dependent medical unit patients gaining independence during the continuing phase of rehabilitation. Factors which might have contributed to this situation were 'overprotection' of stroke unit patients living at home who were not permitted to carry out activities for which they had been assessed as independent; and less therapy used during a shorter period of hospital stay by the group of dependent medical unit patients who were subsequently assessed as independent. The burden of dependency amongst stroke patients living at home was predominantly carried by family sources of assistance, community health and social services only making a major contribution to supporting the dependency of patients living alone at home, and then only during weekdays.

Patient Characteristics

Two hundred and thirty-four patients entered the continuing phase of rehabilitation which lasted for a period of one year from the point of hospital discharge or the 16 week cut-off point

TABLE 14.1

NUMBER OF PATIENTS IN THE CONTINUING PHASE OF REHABILITATION

Month of follow up	Stroke Unit				Medical Units			
	Survivors	Died	Lost to* Follow-up	Total	Survivors	Died	Lost to* Follow up	Total
1	121	2	2	125	102	4	3	109
2	117	3	1	121	99	1	3	103
3	113	3	1	117	98	0	3	101
4	114	0	0	114	95	1	3	99
5	112	1	1	114	96	1	1	98
6	112	1	0	113	96	0	1	97
7	111	0	1	112	94	2	1	97
8	108	2	1	111	93	0	2	95
9	106	2	1	109	93	0	2	95
10	104	2	1	107	91	2	1	94
11	103	1	1	105	90	0	2	92
12	102	1	1	104	90	1	1	92

Note: *Includes patients who were temporarily lost to follow-up in a particular month, but also includes 6 patients in the stroke unit and 6 patients in medical units who were permanently lost to follow-up.

whichever was the sooner. Table 14.1 summarises the number of patients who participated at each stage of the follow-up. There were 18 deaths amongst patients in the stroke unit allocation compared with 12 deaths in patients admitted to medical units. A total of 34 monthly visits when the Nursing Dependency Index could not be administered were lost to the follow-up. Most of this loss was temporary, being caused by patients moving out of the area to visit relatives, friends or go on holiday. Only 12 patients (six from each allocation) were lost permanently to follow-up. The mean age and the distribution of sex, social class or marital status amongst patients surviving did not differ from those who began the continuing phase of rehabilitation.

Outcome at the end of the Continuing Phase

The final outcome at the end of the continuing phase of rehabilitation amongst patients who survived the acute phase of rehabilitation is presented in Table 14.2.

TABLE 14.2

FINAL OUTCOME OF PATIENTS WHO WERE ASSESSED AT THE END OF THE ACUTE PHASE OF REHABILITATION

Allocation	N	Independent	Dependent	Dead
Stroke Unit	119	56 (47%)	45 (38%)	18 (15%)
Medical Units	103	52 (50%)	39 (38%)	12 (12%)

The statistically significant difference in outcome present at the end of the acute phase of rehabilitation has disappeared, leaving similar proportions of patients in the stroke unit and medical unit allocations who were classified as independent, dependent or dead. This change in the distribution of outcome occurred as a result of patients previously classified as independent becoming dependent and vice versa. Table 14.3 illustrates the changes which occurred amongst survivors.

TABLE 14.3

COMPARISON OF OUTCOME FOR SURVIVORS AT THE END OF THE ACUTE AND CONTINUING PHASES OF REHABILITATION

STROKE UNIT PATIENTS		Acute Phase Independent	Acute Phase Dependent	Total
Continuing Phase	Independent	54	2	56
	Dependent	13	32	45
	Total	67	34	101

MEDICAL UNIT PATIENTS		Acute Phase Independent	Acute Phase Dependent	Total
Continuing Phase	Independent	41	11	52
	Dependent	5	34	39
	Total	46	45	91

Note: Excludes the 18 stroke unit and 12 medical unit patients who survived the acute phase of rehabilitation but who died during the continuing phase of rehabilitation.

Nineteen per cent of previously independent patients from the stroke unit became dependent compared with 11 per cent from medical units. On the other hand, 24 per cent of previously dependent patients from medical units were classified as independent at the end of the continuing phase of rehabilitation compared with only six per cent of such patients from the stroke unit. The durations of hospital stay and use of therapy during the acute phase of rehabilitation were examined in patients whose outcomes subsequently changed. Although the numbers of patients whose functional status changed during the continuing phase of rehabilitation was small, Table 14.4 illustrates that dependent medical unit patients who subsequently became independent had a much shorter mean duration of hospital stay ($p < 0.01$) than other surviving patients from medical units. This did not apply to stroke unit patients.

TABLE 14.4

MEAN DURATION OF HOSPITAL STAY (IN DAYS) FOR PATIENTS WHOSE OUTCOME CHANGED, COMPARED WITH ALL OTHER SURVIVORS OF THE CONTINUING PHASE OF REHABILITATION

Change in Outcome	Stroke Unit N	Stroke Unit Duration of stay (in days) Mean ± SE	Medical Units N	Medical Units Duration of Stay (in days) Mean ± SE
Independent to Dependent	13	55.5 ± 8.1	5	99.0 ± 49.2
Dependent to Independent	2	65.0 ± 27.0	11	48.9 ± 7.6
All other Survivors	86	61.7 ± 5.0	75	100.7 ± 12.6

S.E. = Standard error

There were no differences amongst the stroke unit patients whose outcome changed regarding the use of physiotherapy and occupational therapy during the acute phase of rehabilitation. But marked differences occurred between dependent patients from medical units who became independent and all other surviving medical unit patients.

As Table 14.5 shows, a much lower mean duration of therapy and fewer therapy hours were used by the group of patients whose outcome changed, compared with other surviving medical unit patients. This probably occurred as a result of the lower mean duration of hospital stay which was recorded for the group of dependent medical unit patients whose outcome changed. Table 14.6 summarises the final outcome for all patients admitted to the study and indicates that by the end of the continuing phase of rehabilitation, one third of patients in both allocations appeared in each of the independent, dependent and dead categories.

Location of Patients

Tables 14.7 and 14.8 summarise the location of all stroke unit and medical unit survivors during each month of the follow-up. Trends can be observed. In the stroke unit allocation, eight out of 14 patients who were still in the admitting hospital at the end of the acute phase of rehabilitation had been discharged by the time of the first monthly visit, leaving only six patients in the initial hospital. All these patients had been discharged by the fourth month of the follow-up. On the other hand, only 10 of the 34 patients still in medical units at the 16 week cut-off point which was the end point of the acute phase of rehabilitation had been discharged from their initial hospital by the time of the first monthly visit. The remaining 24 patients were discharged gradually with the exception of two patients who were still in medical units one year later at the end of the continuing phase of rehabilitation. The decrease in the number of patients remaining in medical units over time was accompanied by an increase in the number being accommodated in long stay hospitals. This occurred as a result of patient transfers from

TABLE 14.5

UTILISATION OF THERAPY AMONGST DEPENDENT MEDICAL UNIT PATIENTS WHO BECAME INDEPENDENT COMPARED WITH ALL OTHER MEDICAL UNIT SURVIVORS OF THE CONTINUING PHASE OF REHABILITATION

PHYSIOTHERAPY

	Dependent to Independent (n = 11)	All Other Survivors* (n = 75)	Significance of Differences
Patients receiving any therapy	10 (91%)	73 (97%)	N.S.
Mean ($\pm$SE) delay in commencing treatment (in days)	3.5 ± 0.9	3.9 ± 0.3	N.S.
Mean ($\pm$SE) duration of therapy (in days) for each referred patient	34.2 ± 7.4	89.2 ± 12.5	$p < 0.01$
Mean ($\pm$SE) amount of time used (in hours) for each referred patient	26.2 ± 6.5	42.4 ± 6.0	$p < 0.05$

OCCUPATIONAL THERAPY

	Dependent to Independent (n = 11)	All other Survivors* (n = 75)	Significance of Differences
Patients receiving any therapy	5 (45%)	46 (61%)	N.S.
Mean ($\pm$SE) delay in commencing treatment (in days)	11.0 ± 4.0	20.0 ± 3.8	N.S.
Mean ($\pm$SE) duration of therapy (in days) for each referred patient	31.0 ± 6.3	78.4 ± 14.6	$p < 0.01$
Mean ($\pm$SE) amount of time used (in hours) for each referred patient	40.3 ± 15.0	51.1 ± 8.3	N.S.

N.S.= Not significant ($p > 0.05$)
S.E.= Standard error

*All other survivors excludes the five medical unit patients whose outcome changed from independent to dependent during the continuing phase of rehabilitation.

TABLE 14.6

FINAL OUTCOME OF ALL PATIENTS AT THE END OF THE CONTINUING PHASE OF REHABILITATION

Allocation	n*	Independent	Dependent	Dead
Stroke Unit	149	56 (38%)	45 (30%)	48 (32%)
Medical Units	146	52 (36%)	39 (27%)	55 (37%)

* Excluding 6 patients from the stroke unit allocation and 10 patients from the medical unit allocation who were either post randomisation drop-outs or were lost to follow-up.

TABLE 14.7

LOCATION OF STROKE UNIT PATIENTS DURING THE CONTINUING PHASE OF REHABILITATION

Month of Follow up	Survivors	Home Living Alone	Home Living with Relatives	In Admitting Hospital	Hospital Readmiss-ion	Long stay Hospital	Other Residential Accommodation	Lost to Follow-up
1	121	22	70	6	10	12	1	2
2	117	24	69	2	6	15	1	1
3	113	26	67	1	5	13	1	1
4	114	27	69	0	3	13	2	0
5	112	23	67	0	5	14	3	1
6	112	23	69	0	3	14	3	0
7	111	24	68	0	1	15	3	1
8	108	23	67	0	2	13	3	1
9	106	19	68	0	3	13	3	1
10	104	19	65	0	4	13	3	1
11	103	19	60	0	7	13	4	1
12	102	21	63	0	2	12	4	1

TABLE 14.8

LOCATION OF MEDICAL UNIT PATIENTS DURING THE CONTINUING PHASE OF REHABILITATION

Month of Follow up	Survivors	Home, Living Alone	Home Living with Relatives	In Admitting Hospital	Hospital Readmiss-ion	Long stay Hospital	Other Residential Accommodation	Lost to Follow-up
1	102	15	58	24	0	4	1	3
2	99	17	54	19	1	6	2	3
3	98	16	55	18	2	5	2	3
4	95	17	54	14	1	5	4	3
5	96	16	51	12	6	6	5	1
6	16	16	52	6	6	10	6	1
7	94	15	53	5	7	9	5	1
8	93	14	53	4	7	11	4	2
9	93	15	51	3	8	12	4	2
10	91	14	50	3	6	14	4	1
11	90	16	51	2	4	12	5	2
12	90	15	52	2	4	14	3	1

the former to the latter, and to a lesser extent, to other residential accommodation such as nursing homes or old peoples' homes (Part IV accommodation). This trend did not occur in the stroke unit allocation where the number of patients in long stay hospitals was constant throughout the follow-up.

There were 29 patients (24 per cent of survivors) from the stroke unit and 22 patients (22 per cent of survivors) from medical units who had at least one hospital readmission during the continuing phase of rehabilitation. Although the proportion of hospital readmissions was similar in each allocation, the timing of readmissions differed and this was reflected in the higher number of stroke unit patients who were located in hospital as a result of readmission during the early period of the follow-up, and the larger number of medical unit readmissions which occurred from the fifth month of follow-up onwards. The relative proportion of survivors who were located at home, either living alone or with relatives or friends was stable during each month of the follow-up in both allocations. However this masked the large number of location changes which occurred during the follow-up. Table 14.9 shows the number of location changes which occurred, involving 44 stroke unit and 48 medical unit patients. One half of the location changes were due to hospital discharges, transfers or readmissions. The remaining half were the result of patients moving from one household to another within the community, for example from a relative's or friend's home used as a 'half-way house' to their own home to live alone. A number of location changes were caused by patients going to live with other friends and relatives temporarily for a holiday or actually going off on

TABLE 14.9

NUMBER OF LOCATION CHANGES DURING THE CONTINUING PHASE OF REHABILITATION

MONTH OF FOLLOW UP	STROKE UNIT	MEDICAL UNITS
1	10	0
2	10	11
3	6	8
4	4	9
5	10	10
6	7	12
7	3	8
8	4	11
9	8	10
10	4	10
11	8	11
12	4	6
TOTAL	78 (44)	106 (48)

NOTE. Figures in parentheses are the number of patients who were involved in at least one location change.

holiday themselves. At the end of the acute phase of rehabilitation, a higher proportion of patients discharged home, either to live alone, or with relatives were dependent in the medical unit allocation compared with the stroke unit allocation. As Table 14.10 demonstrates, this trend had been reversed by the end of one year, 43 per cent (27) of stroke unit patients living at home with relatives or friends being dependent compared with 36 per cent (19) of medical unit patients. The difference is not statistically significant ($p > 0.05$).

What Patients were Permitted to Do

A comparison of what activities of daily living patients were actually doing during the follow-up in relation to the outcome at the time of hospital discharge which gave an objective assessment of what patients were capable of doing was carried out. Figure 14.1 summarises the proportion of patients in each allocation who received any human assistance to carry out the activities of daily living which formed the basis of the outcome assessment, according to whether they were classified as independent or dependent at the end of the acute phase of rehabilitation. A striking feature is the high proportion of patients, particularly in the stroke unit allocation, who were independent but who received human assistance. No less than 42 per cent of stroke unit patients and 33 per cent of medical unit patients were receiving assistance at the time of the first monthly follow-up visit, and although the proportion of patients carrying out the activities of daily living increased over time, 25 per cent of independent stroke unit and 26 per cent of independent medical unit patients were still

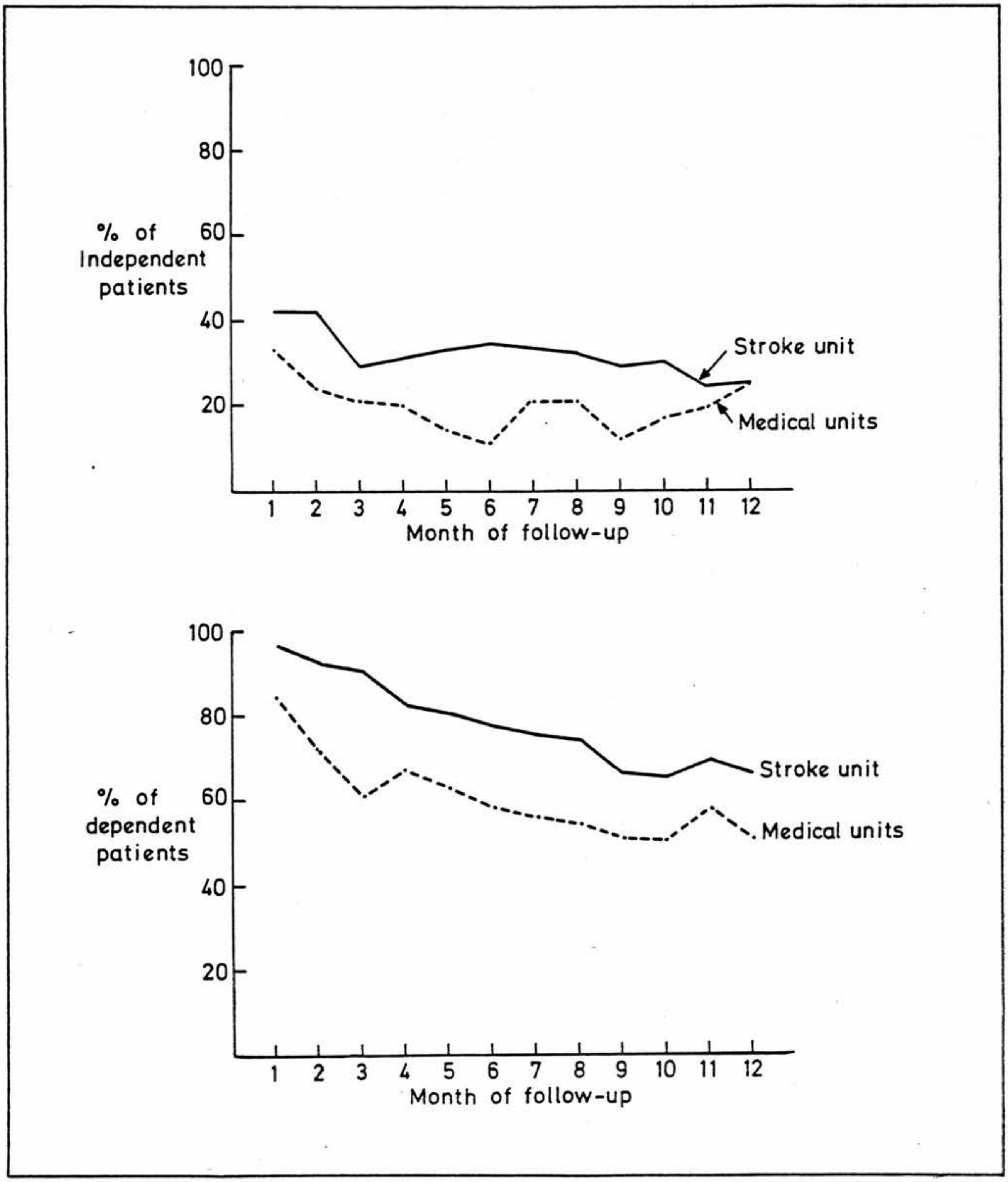
TABLE 14.10

LOCATION OF PATIENTS ACCORDING TO OUTCOME AT ONE YEAR

Location	Stroke Unit		Medical Units	
	Independent	Dependent	Independent	Dependent
Home, living alone	18	2	14	1
Home, living with relatives or friends	36	27	34	19
Still in admitting hospital	0	0	1	1
Hospital readmission	0	2	2	2
Part IV accommodation	2	2	1	2
Long stay hospital	0	12	0	14
TOTAL	56	45	52	39

FIGURE 14.1

PATIENTS RECEIVING HUMAN ASSISTANCE* DURING THE CONTINUING PHASE OF REHABILITATION ACCORDING TO WHETHER THEY WERE INDEPENDENT OR DEPENDENT



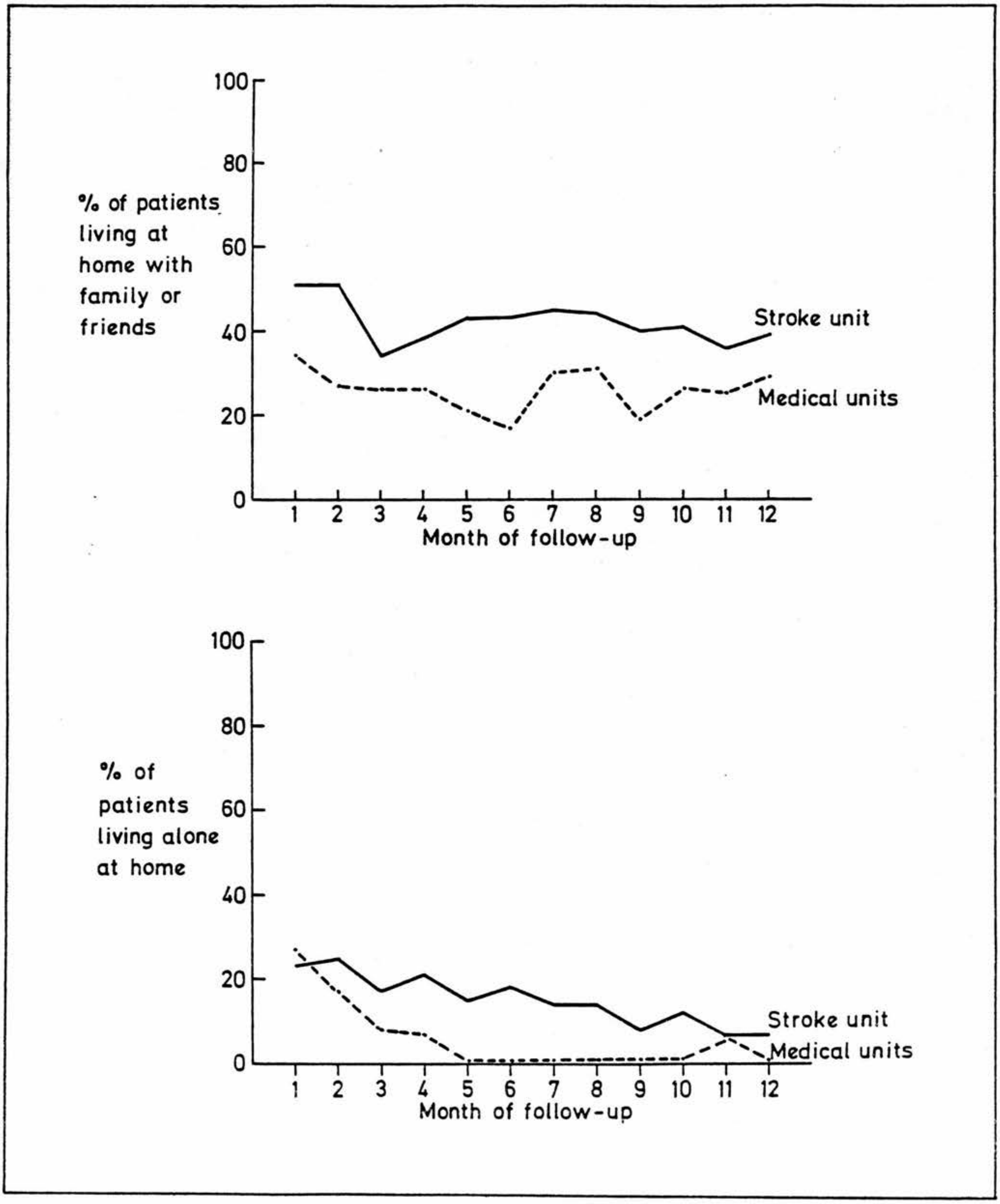
*Applies to human assistance received for the activities of daily living tested in the outcome assessment (Table 9.4) receiving human assistance at the time of the final monthly visit. On the other hand, patients with a dependent outcome at hospital discharge showed a decline in the proportion receiving human assistance. This occurred particularly amongst medical unit patients, where the proportion of initially dependent patients carrying out the activities of daily living rose from 15 per cent to 49 per cent during the follow-up.

Whilst human assistance was provided almost universally for patients living at home who were dependent, there were marked differences between the proportions of independent patients in stroke unit and medical unit allocations who received any human assistance whilst living at home. Figure 14.2 summarises these differences. Higher proportions of independent patients in the stroke unit allocation who were at home received human assistance throughout the follow-up. This applied to patients who were living alone and those who were living with friends or relatives. The differences were most marked at the beginning of the follow-up amongst patients living with relatives or friends, and from the fifth month onwards when patients from medical units living alone at home had no human assistance at all until the eleventh month of follow-up.

Human assistance being given for the individual activities of daily living at the first monthly follow-up visit was examined in relation to patients' capabilities at the completion of the acute phase of rehabilitation (Figure 14.3). With the exception of feeding, a higher proportion of independent stroke unit patients were receiving assistance compared with independent patients from medical units. However, when dependent patients are examined, the

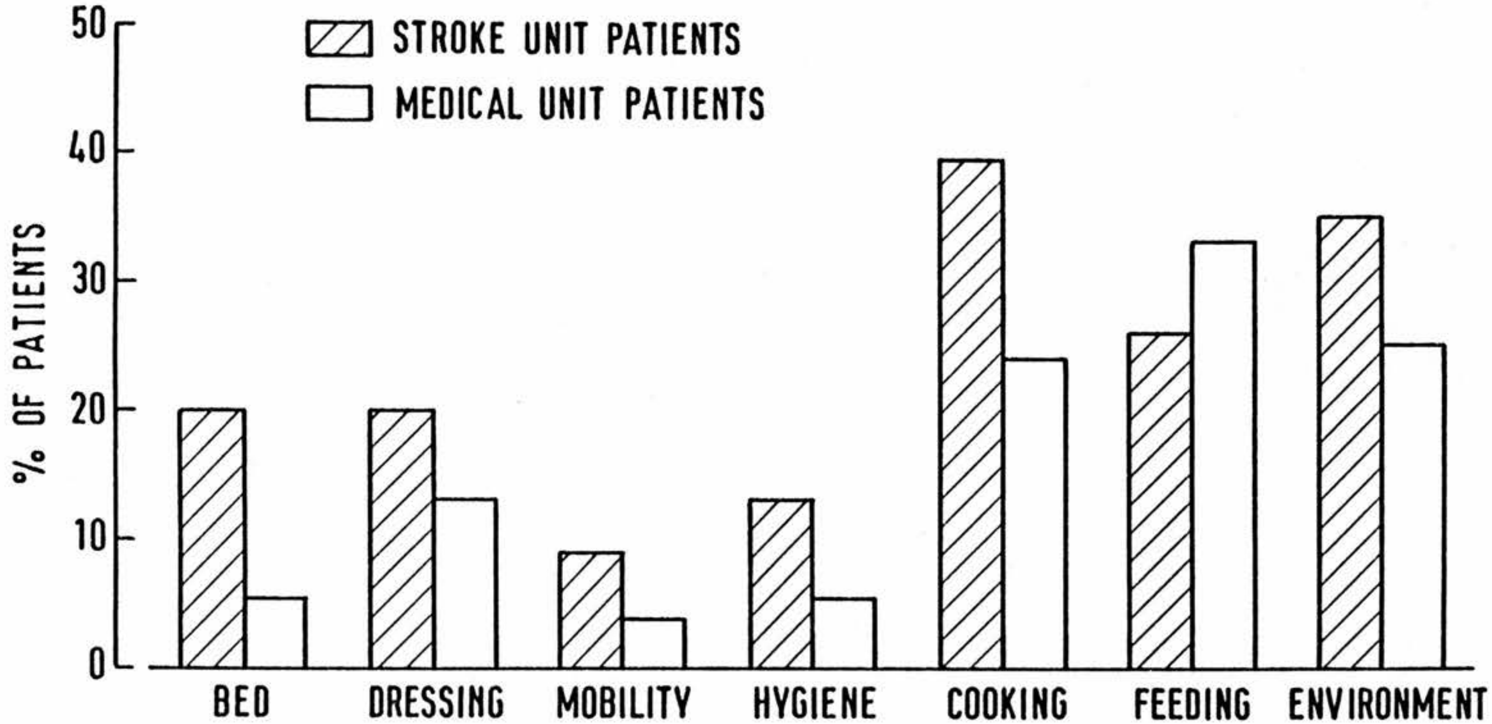
FIGURE 14.2

INDEPENDENT PATIENTS LIVING AT HOME RECEIVING HUMAN ASSISTANCE*
DURING THE CONTINUING PHASE OF REHABILITATION



*Applies to human assistance received for the activities of daily living tested in the outcome assessment (Table 9.4)

PATIENTS RECEIVING HUMAN ASSISTANCE AT THE FIRST MONTHLY FOLLOW-UP VISIT FOR THE ACTIVITIES OF DAILY LIVING IN WHICH THEY WERE INDEPENDENT AT HOSPITAL DISCHARGE



situation is reversed. As Figure 14.4 demonstrates, a higher proportion of dependent patients from medical units were carrying out the individual activities of daily living compared with dependent patients from the stroke unit. Thus, independent patients from the stroke unit were permitted to do LESS during the follow-up than independent patients from medical units; and dependent patients from the medical unit allocation were able to do MORE than similar patients from the stroke unit. No satisfactory explanation for these trends could be derived from the data. Figure 14.5 summarises the pattern of human assistance during the follow-up amongst the groups of patients who became dependent in the stroke unit allocation and independent in the medical unit allocation; and compares these groups with patients in the respective allocations who were either independent or dependent throughout the follow-up. A high level of human assistance was obtained from the beginning of the follow-up period by the stroke unit group who became dependent, increasing over time until all such patients were receiving assistance at the final monthly visit. All patients from medical units whose outcome changed from dependent to independent began the follow-up receiving human assistance, but thereafter, showed a steady decline.

The Provision of Human Assistance

The Nursing Dependency Index, the criteria for which are detailed in Appendix(ii),and whose use was described in Chapter 9, was administered on each monthly visit during the follow-up. The Index was arranged in such a way that the source of human assistance being provided could be identified for each of the 20 items of

FIGURE 14.4

PATIENTS CARRYING OUT THE ACTIVITIES OF DAILY LIVING AT THE FIRST MONTHLY FOLLOW-UP VISIT FOR WHICH THEY WERE DEPENDENT AT HOSPITAL DISCHARGE

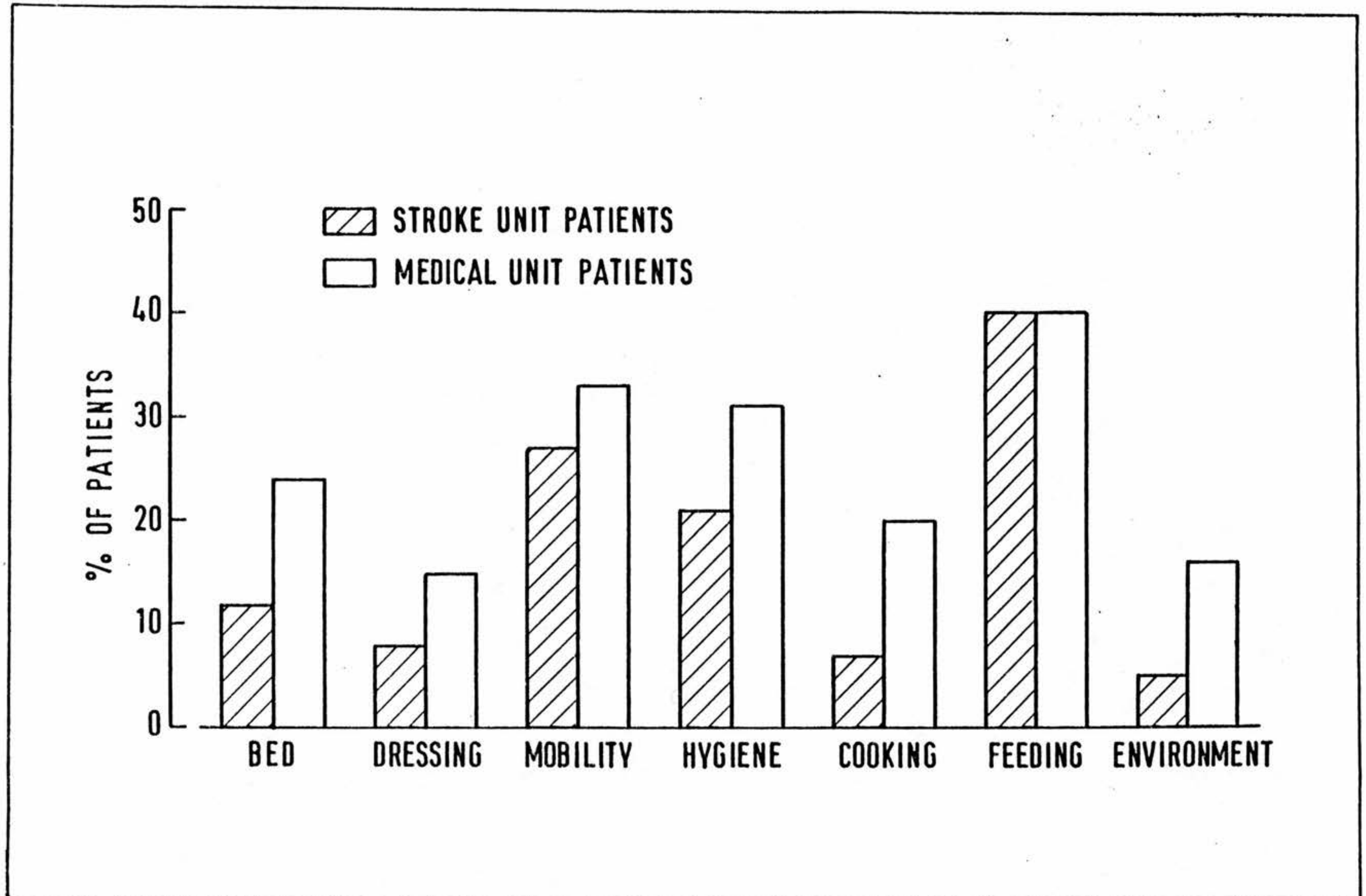
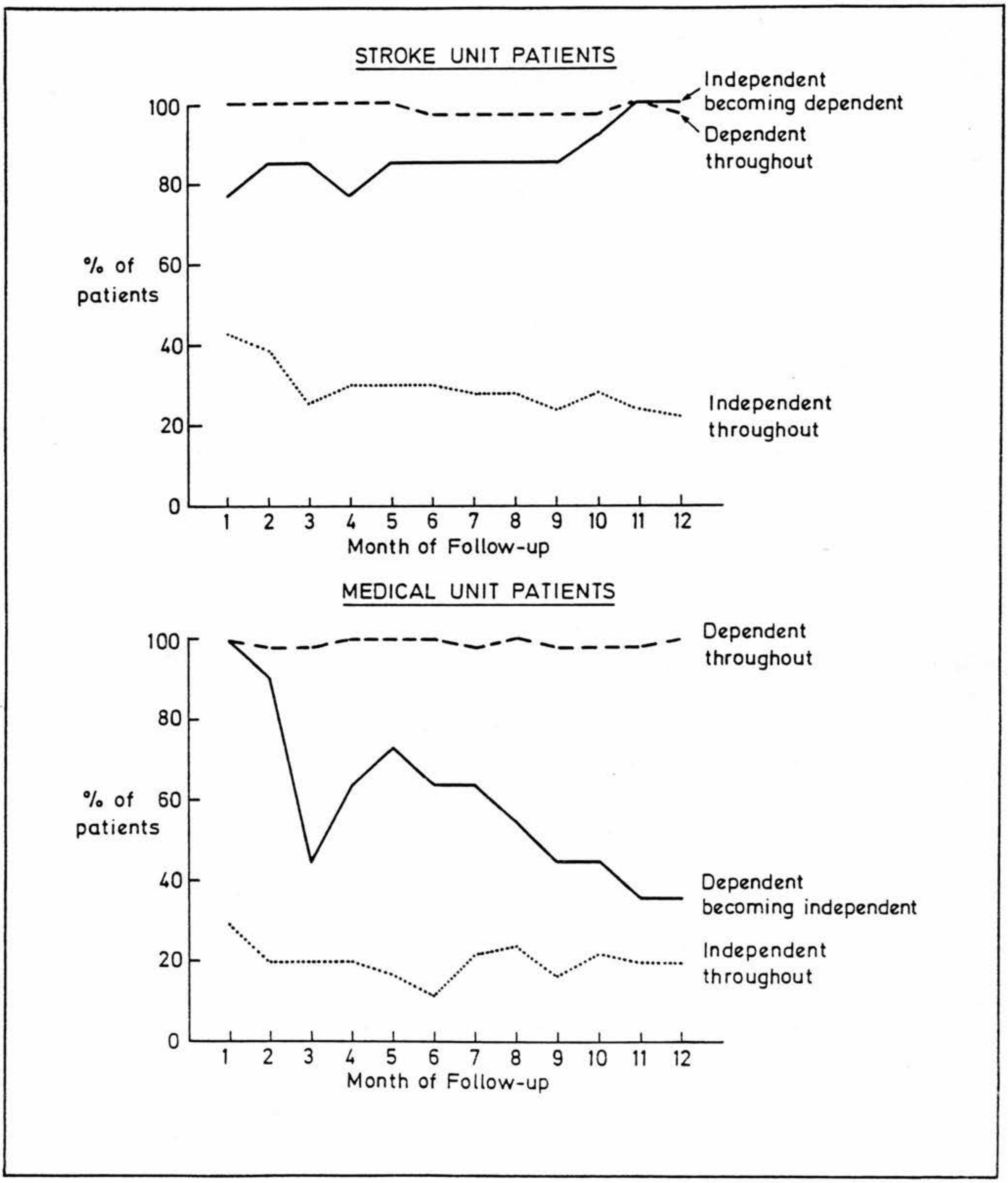


FIGURE 14.5

PROPORTION OF PATIENTS WHO RECEIVED HUMAN ASSISTANCE DURING THE CONTINUING PHASE OF REHABILITATION ACCORDING TO WHETHER THEIR OUTCOME CHANGED*



*Applies to human assistance received for the activities of daily living tested in the outcome assessment (Table 9.4).

activity in the Index. Analysis by individual source of assistance could not be carried out because too many different sources had provided assistance in relation to the number of patients contributing to the analysis. Therefore, sources of assistance were assigned to two groups which were called family and community. The former group comprised all help contributed by members of the patient's family, including those living in and out of the patient's household; and also patient's friends, neighbours and household visitors. The group designated as community assistance comprised all sources of help received from health and social services agencies, including staff providing assistance in hospital and other residential accommodation. The type of staff included in community sources is presented in Table 14.11. The proportion of patients receiving any assistance from family or community sources during the continuing phase of rehabilitation is summarised in Figure 14.6. Overall, 62 per cent and 50 per cent of stroke unit patients began the follow-up receiving assistance from family and community sources respectively and 66 per cent and 41 per cent were receiving such assistance at the end of the continuing period of rehabilitation. These proportions were very similar amongst medical unit patients, being 65 per cent and 50 per cent for family and community sources respectively at the beginning of the follow-up; and 60 per cent and 43 per cent at the end. The overall level of human assistance being provided by family and community sources was also similar in the two allocations, as Table 14.12 demonstrates. Although family sources provided assistance to a higher proportion of patients, the mean dependency of patients receiving assistance

TABLE 14.11

TYPES OF STAFF INCLUDED IN COMMUNITY SOURCES OF HUMAN ASSISTANCE

General practitioners	Staff of:	Initial admitting hospitals
Community nurses		Readmission hospitals
Health visitors		Long stay hospitals
Social workers		Partiv accommodation
Home helps		Nursing homes
Meals on wheels		Day hospitals
Voluntary agencies		Hospital outpatient clinics
Chiropodists		
Physiotherapists		
Occupational therapists		
Speech therapists		

FIGURE 14.6

PROPORTION OF ALL PATIENTS WHO RECEIVED HUMAN ASSISTANCE DURING THE CONTINUING PHASE OF REHABILITATION

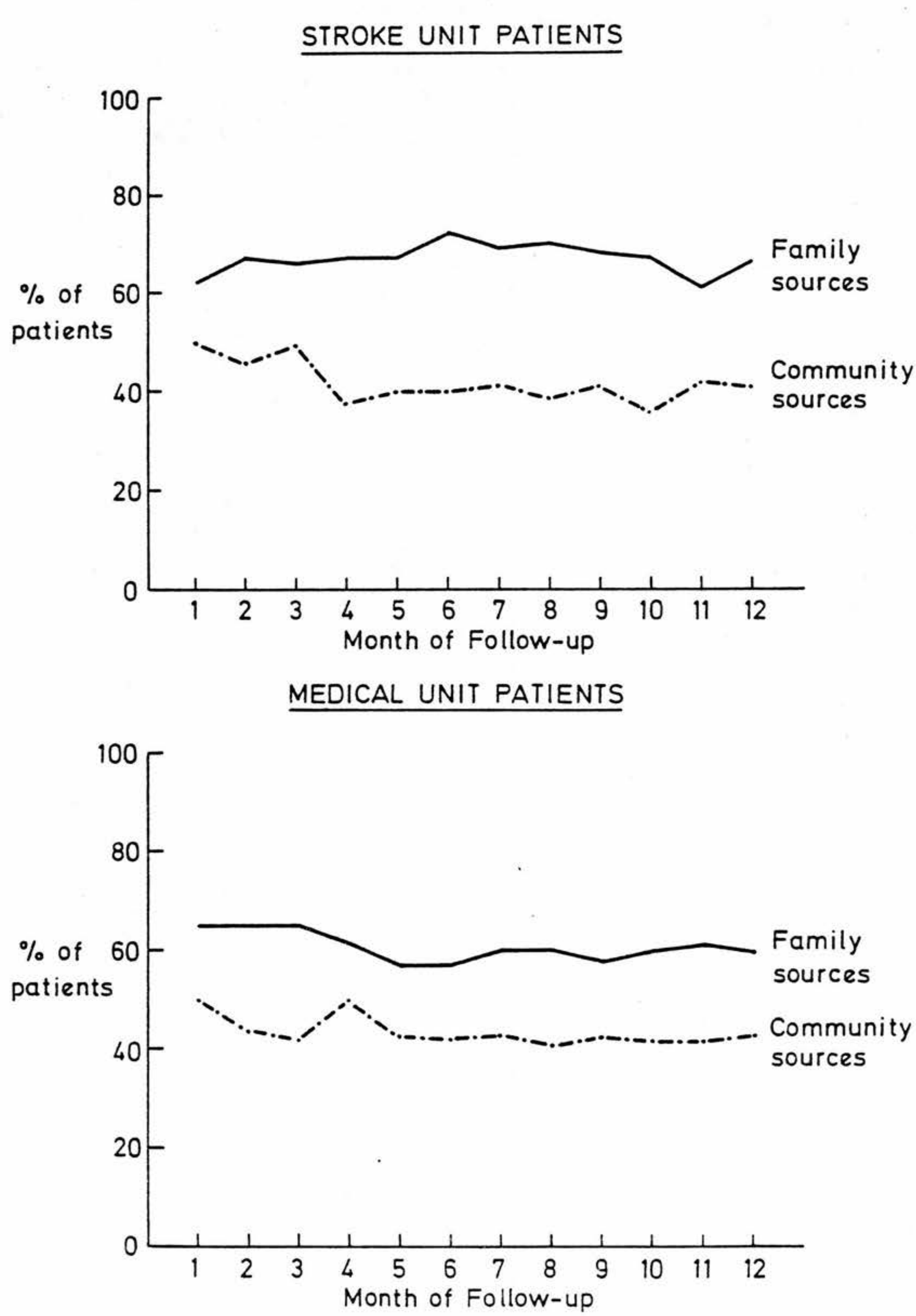


TABLE 14.12

LEVEL OF HUMAN ASSISTANCE PROVIDED DURING THE CONTINUING PHASE OF REHABILITATION AMONGST ALL SURVIVING PATIENTS

	STROKE UNIT PATIENTS				MEDICAL UNIT PATIENTS			
	FAMILY SOURCES		COMMUNITY SOURCES		FAMILY SOURCES		COMMUNITY SOURCES	
MONTH OF FOLLOW UP	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE
1	75	15.4 ± 1.1	60	28.2 ± 3.3	66	15.3 ± 1.2	51	29.3 ± 3.4
2	78	14.7 ± 1.0	54	25.3 ± 3.5	64	13.7 ± 1.2	44	32.0 ± 3.7
3	75	14.1 ± 1.1	55	21.6 ± 3.2	64	13.7 ± 1.5	41	33.7 ± 3.9
4	76	14.5 ± 1.1	43	26.0 ± 3.8	58	14.2 ± 1.4	47	25.9 ± 3.4
5	75	13.9 ± 1.0	45	26.2 ± 3.9	55	14.2 ± 1.6	41	33.8 ± 3.8
6	81	14.7 ± 1.1	45	25.6 ± 3.9	55	12.8 ± 1.3	40	34.1 ± 3.7
7	76	13.7 ± 1.1	46	24.8 ± 3.9	56	14.6 ± 1.4	40	31.1 ± 3.7
8	76	13.9 ± 1.2	42	24.4 ± 3.8	56	14.3 ± 1.6	38	32.2 ± 3.8
9	72	14.4 ± 1.4	43	24.8 ± 3.8	54	14.3 ± 1.4	40	34.6 ± 4.0
10	70	14.1 ± 1.4	37	30.0 ± 4.3	55	13.7 ± 1.5	38	34.6 ± 3.7
11	63	14.0 ± 1.3	43	27.1 ± 3.7	55	15.4 ± 1.8	38	32.9 ± 4.2
12	67	14.6 ± 1.3	42	22.8 ± 3.7	54	16.4 ± 2.0	39	32.2 ± 3.9

S.E. Standard error.

from community sources was higher. The mean dependency levels remained stable throughout the period of follow-up. Both the proportions of patients receiving human assistance and the mean dependency created were influenced by the location of patients during the continuing phase of rehabilitation.

The Provision of Human Assistance in Institutions

The number of patients who received institutional care and their mean levels of dependency are summarised in Table 14.13. The mean dependency levels for institutional care were similar in both stroke unit and medical unit patients, with a slight reduction in the mean level of dependency occurring over time in the former, but not in the latter.

The Provision of Human Assistance at Home

Figure 14.7 shows a marked change from Figure 14.6 in the proportion of patients obtaining assistance from family and community sources when the group of patients who received institutional care were excluded. A very high level of family involvement was maintained in both allocations with virtually no fall-off over time. Overall, four out of every five patients in the follow-up were receiving assistance from family sources compared with less than one in every three patients who received any assistance from community sources. The proportion of patients receiving assistance from community sources fell slightly over time in both allocations, from 34 to 29 per cent of stroke unit patients and 33 to 24 per cent of medical unit patients. The mean level of assistance being provided by family sources amongst patients living at home was approximately three times higher than the support

TABLE 14.13

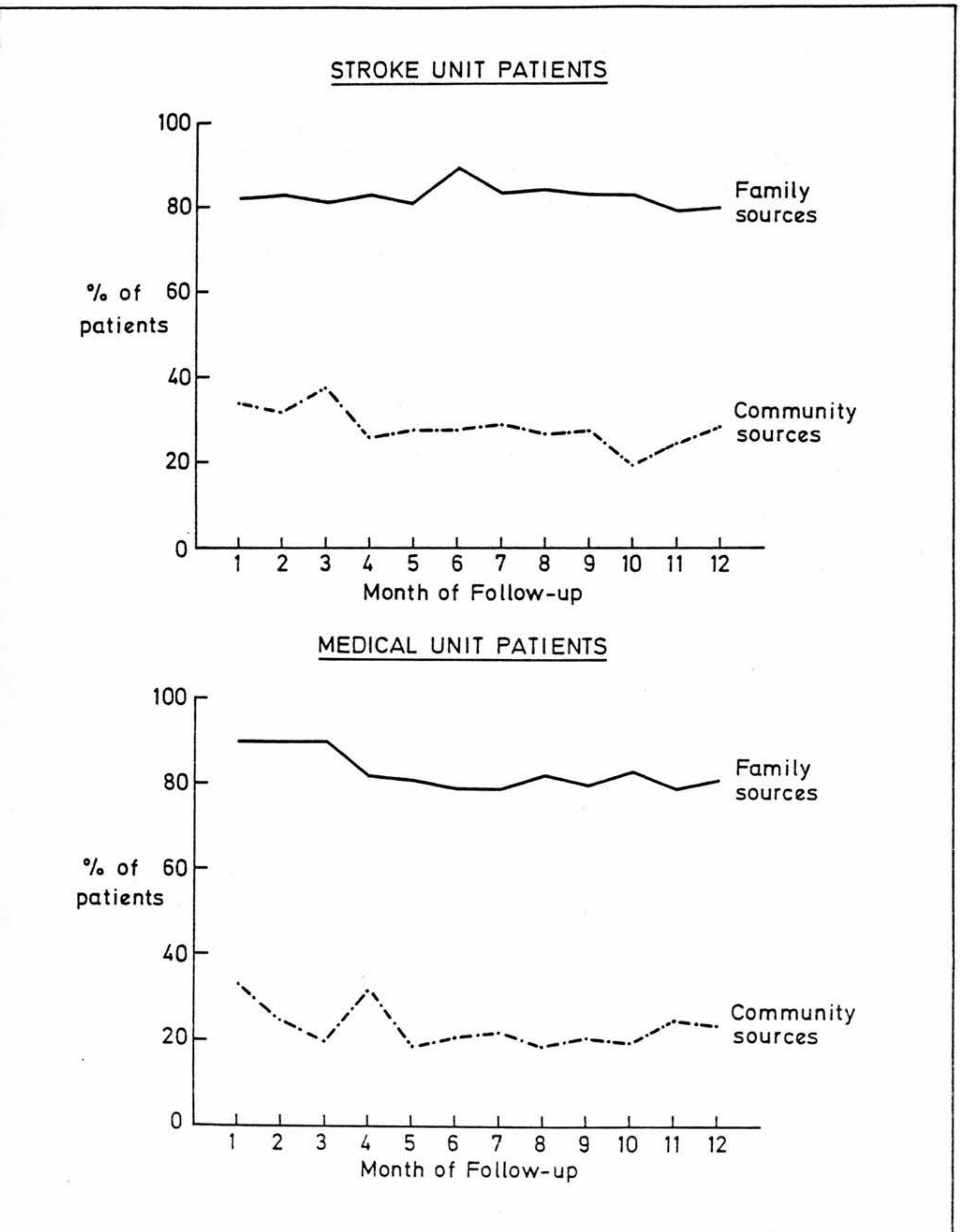
LEVEL OF HUMAN ASSISTANCE PROVIDED DURING THE CONTINUING PHASE OF REHABILITATION AMONGST ALL SURVIVING PATIENTS, ACCORDING TO THEIR LOCATION

	STROKE UNIT PATIENTS						MEDICAL UNIT PATIENTS					
	LIVING AT HOME				IN HOSPITAL OR RESIDENTIAL CARE		LIVING AT HOME				IN HOSPITAL OR RESIDENTIAL CARE	
	FAMILY SOURCES		COMMUNITY SOURCES				FAMILY SOURCES		COMMUNITY SOURCES			
MONTH OF FOLLOW UP	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE
1	75	15.4$\pm$1.1	31	5.6$\pm$1.0	29	52.3$\pm$2.3	66	15.3$\pm$1.2	24	5.3$\pm$0.6	29	50.7$\pm$2.0
2	77	14.6$\pm$1.0	30	5.1$\pm$0.7	24	51.3$\pm$3.0	64	13.7$\pm$1.2	18	5.2$\pm$0.6	26	50.5$\pm$2.4
3	75	14.1$\pm$1.1	35	5.1$\pm$0.7	20	50.6$\pm$2.7	64	13.7$\pm$1.5	14	4.8$\pm$0.6	27	48.7$\pm$3.3
4	76	14.5$\pm$1.1	25	6.0$\pm$0.8	18	53.9$\pm$2.5	58	14.2$\pm$1.4	23	4.8$\pm$0.5	24	46.2$\pm$3.1
5	74	13.9$\pm$1.0	25	5.2$\pm$0.5	21	50.9$\pm$3.6	54	14.4$\pm$1.6	13	5.5$\pm$0.9	29	45.4$\pm$3.4
6	81	14.2$\pm$1.1	25	4.3$\pm$0.3	20	52.3$\pm$3.6	54	13.0$\pm$1.3	14	6.4$\pm$0.9	28	47.4$\pm$3.1
7	76	13.7$\pm$1.1	27	4.9$\pm$0.5	19	53.1$\pm$4.0	54	14.5$\pm$1.4	15	5.9$\pm$0.8	26	45.7$\pm$3.0
8	76	13.9$\pm$1.2	24	4.8$\pm$0.4	18	50.5$\pm$3.2	55	14.5$\pm$1.6	13	5.1$\pm$1.1	26	44.7$\pm$3.4
9	72	14.4$\pm$1.4	24	4.5$\pm$0.3	19	50.4$\pm$3.0	53	14.5$\pm$1.5	14	7.0$\pm$1.3	27	47.8$\pm$3.8
10	70	14.1$\pm$1.4	17	4.9$\pm$0.5	20	51.5$\pm$3.2	53	14.1$\pm$1.5	13	5.5$\pm$0.7	27	46.3$\pm$3.1
11	62	13.8$\pm$1.3	20	4.7$\pm$0.3	24	46.0$\pm$3.2	53	15.8$\pm$1.9	17	6.8$\pm$1.3	23	49.7$\pm$4.0
12	67	14.6$\pm$1.3	24	4.3$\pm$0.3	18	47.4$\pm$3.6	54	16.4$\pm$2.0	16	6.9$\pm$1.7	23	49.7$\pm$3.1

S.E. Standard error.

FIGURE 14.7

PROPORTION OF PATIENTS LIVING AT HOME WHO RECEIVED HUMAN ASSISTANCE DURING THE CONTINUING PHASE OF REHABILITATION



being received from community sources (Table 14.13). There was no difference in the mean level of assistance from family sources in either allocation. A slow decrease in dependency from community sources over time occurred amongst stroke unit patients, whereas the opposite occurred in medical unit patients who demonstrated a minor increase in the mean level of assistance during the follow-up period. The pattern of human assistance amongst patients living at home was examined further by comparing the assistance received by patients living with family or friends, and those patients who were living alone.

(i) Patients Living with Family or Friends

Figure 14.8 shows that an even higher proportion of patients received assistance from family sources when member(s) of patients' families were residing in the same household. At no point in the follow-up did the proportion of patients receiving such assistance drop below 87 per cent. The time trend of assistance from family sources was similar in both allocations. Assistance from community sources was provided to one in every five patients throughout the follow-up period, fluctuations over time being caused by the small numbers of patients used to calculate percentages. Table 14.14 shows that assistance being provided by family sources when they were residing in patients' households was four times higher than that provided by community sources.

(ii) Patients Living Alone

One might expect community sources to have provided a larger contribution in this group of patients. Whilst a much higher

FIGURE 14.8

PROPORTION OF PATIENTS LIVING AT HOME WITH RELATIVES OR FRIENDS WHO RECEIVED HUMAN ASSISTANCE DURING THE CONTINUING PHASE OF REHABILITATION

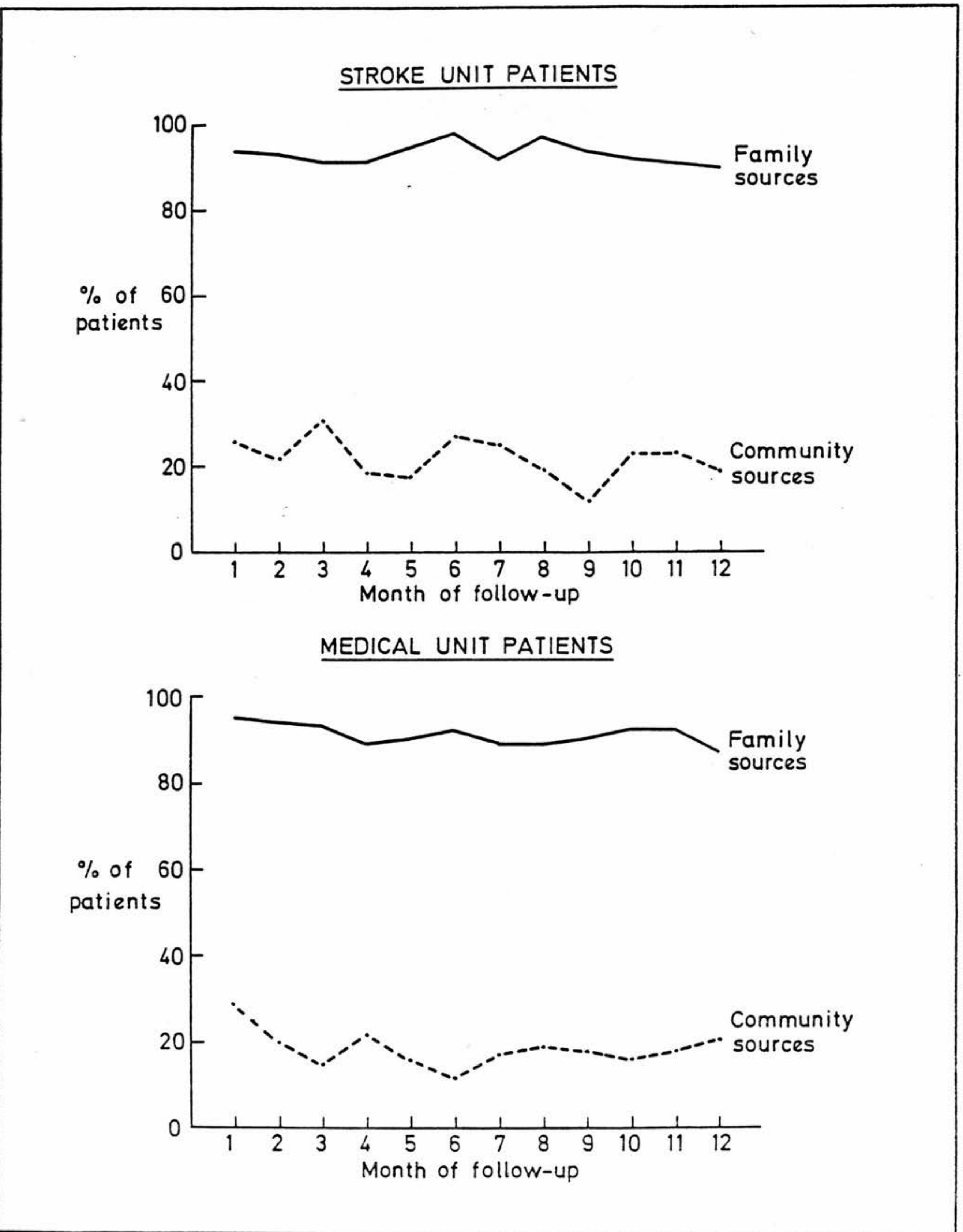


TABLE 14.14

LEVEL OF HUMAN ASSISTANCE PROVIDED DURING THE CONTINUING PHASE OF REHABILITATION AMONGST SURVIVING PATIENTS LIVING AT HOME WITH FAMILY OR FRIENDS

	STROKE UNIT PATIENTS				MEDICAL UNIT PATIENTS			
	FAMILY SOURCES		COMMUNITY SOURCES		FAMILY SOURCES		COMMUNITY SOURCES	
MONTH OF FOLLOW UP	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE
1	66	16.6 ± 1.2	18	3.6 ± 0.2	55	16.8 ± 1.3	17	4.2 ± 0.5
2	64	15.8 ± 1.1	15	4.0 ± 0.3	51	15.2 ± 1.4	11	4.2 ± 0.6
3	61	15.4 ± 1.3	21	3.9 ± 0.2	51	15.7 ± 1.8	8	4.1 ± 0.6
4	63	15.7 ± 1.2	13	3.9 ± 0.3	48	16.0 ± 1.6	12	3.8 ± 0.2
5	63	15.0 ± 1.1	12	3.8 ± 0.3	46	15.6 ± 1.8	8	4.0 ± 0.3
6	66	15.5 ± 1.3	18	4.0 ± 0.2	48	13.8 ± 1.4	6	4.3 ± 0.3
7	62	15.4 ± 1.2	17	3.7 ± 0.3	47	15.7 ± 1.5	9	5.1 ± 0.1
8	64	15.5 ± 1.3	13	4.1 ± 0.3	47	16.0 ± 1.8	10	4.8 ± 1.3
9	63	15.7 ± 1.5	13	4.2 ± 0.4	46	16.0 ± 1.6	9	6.1 ± 1.8
10	59	15.9 ± 1.5	8	4.1 ± 0.4	46	15.5 ± 1.6	8	4.4 ± 0.4
11	54	14.9 ± 1.4	14	4.3 ± 0.3	47	17.1 ± 2.0	9	4.9 ± 1.1
12	56	16.1 ± 1.4	12	3.8 ± 0.2	45	18.9 ± 2.3	11	5.1 ± 1.2

S.E. Standard error.

level of community involvement was present in both allocations as Figure 14.9 demonstrates, it was matched by the level of involvement from family sources. It was difficult to interpret the trends in assistance over time, because of the fluctuations caused by the small numbers of patients in the analysis. As Table 14.15 demonstrates, the mean level of assistance amongst patients living alone was much lower than the mean level of assistance received by patients living with family or friends. The level of assistance receiving support from family and community sources was of the same order.

Assistance Received According to the Day of the Week

The pattern of human assistance was examined for each day of the week and was found to be similar in each allocation. Whilst there was no difference in assistance rendered to patients receiving institutional care, there were marked differences in assistance received by patients living at home according to whether it was a weekday (Monday to Friday) or at the weekend (Saturday or Sunday). Figure 14.10 summarises the pattern of assistance for patients in both allocations living with relatives or friends and Figure 14.11 provides a similar summary for patients who were living alone at home. Whilst support from family sources was sustained through the weekend for patients living with family or friends, the support received from community sources during the week virtually disappeared at weekends. There was a considerable drop in the level of support at weekends from both family and community sources for patients living alone at home.

FIGURE 14.9

PROPORTION OF PATIENTS LIVING AT HOME ALONE WHO RECEIVED HUMAN ASSISTANCE DURING THE CONTINUING PHASE OF REHABILITATION

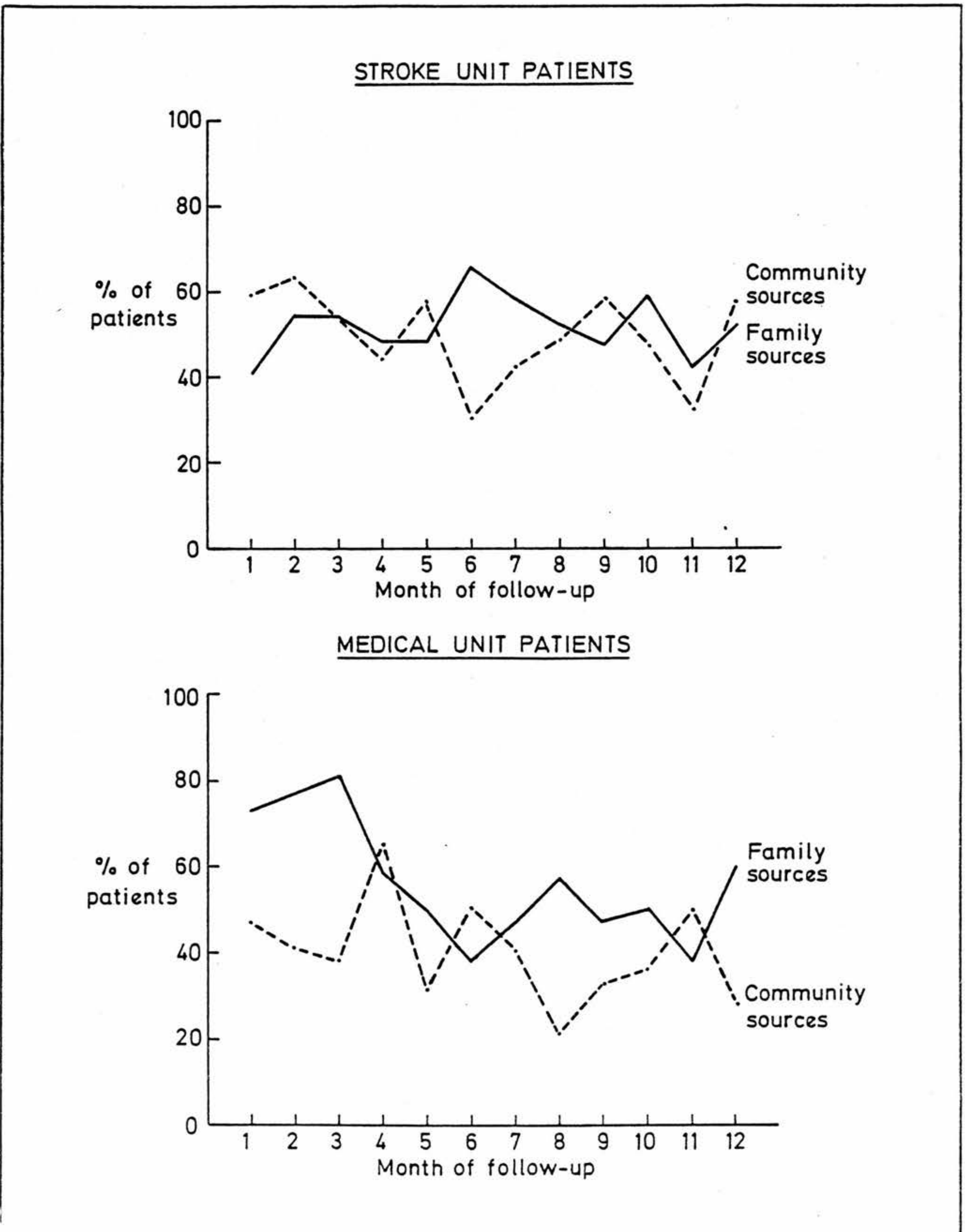


TABLE 14.15

LEVEL OF HUMAN ASSISTANCE PROVIDED DURING THE CONTINUING PHASE OF REHABILITATION AMONGST SURVIVING PATIENTS LIVING AT HOME ALONE

	STROKE UNIT PATIENTS				MEDICAL UNIT PATIENTS			
	FAMILY SOURCES		COMMUNITY SOURCES		FAMILY SOURCES		COMMUNITY SOURCES	
MONTH OF FOLLOW UP	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE	N	MEAN ($\pm$SE) LEVEL OF ASSISTANCE
1	9	6.4 ± 1.4	13	8.3 ± 2.1	11	8.3 ± 1.3	7	7.9 ± 1.2
2	13	8.5 ± 1.7	15	8.2 ± 1.2	13	8.0 ± 1.5	7	6.9 ± 1.2
3	14	8.2 ± 1.9	14	7.0 ± 1.5	13	5.8 ± 1.0	6	5.7 ± 1.2
4	13	8.5 ± 1.5	12	8.2 ± 1.5	10	5.6 ± 1.0	11	5.9 ± 0.8
5	11	7.5 ± 1.2	13	6.5 ± 1.1	8	7.5 ± 1.0	5	8.0 ± 1.9
6	15	8.5 ± 1.6	7	5.0 ± 0.8	6	6.3 ± 1.3	8	7.9 ± 1.3
7	14	6.4 ± 1.5	10	6.8 ± 1.1	7	6.6 ± 2.3	6	7.0 ± 1.0
8	12	5.5 ± 1.5	11	5.7 ± 0.8	8	5.4 ± 0.8	3	6.0 ± 2.5
9	9	5.3 ± 0.7	11	4.9 ± 0.5	7	5.0 ± 1.1	5	8.6 ± 1.9
10	11	4.9 ± 0.8	9	5.2 ± 0.8	7	4.6 ± 0.7	5	7.4 ± 1.4
11	8	6.5 ± 2.1	6	5.5 ± 0.8	6	5.3 ± 0.9	8	8.9 ± 2.4
12	11	6.8 ± 2.2	12	4.7 ± 0.5	9	4.1 ± 0.4	5	10.8 ± 4.7

S.E. Standard error.

FIGURE 14.10

PROPORTION OF PATIENTS LIVING AT HOME WITH RELATIVES OR FRIENDS WHO RECEIVED ASSISTANCE DURING WEEKDAYS AND AT WEEKENDS

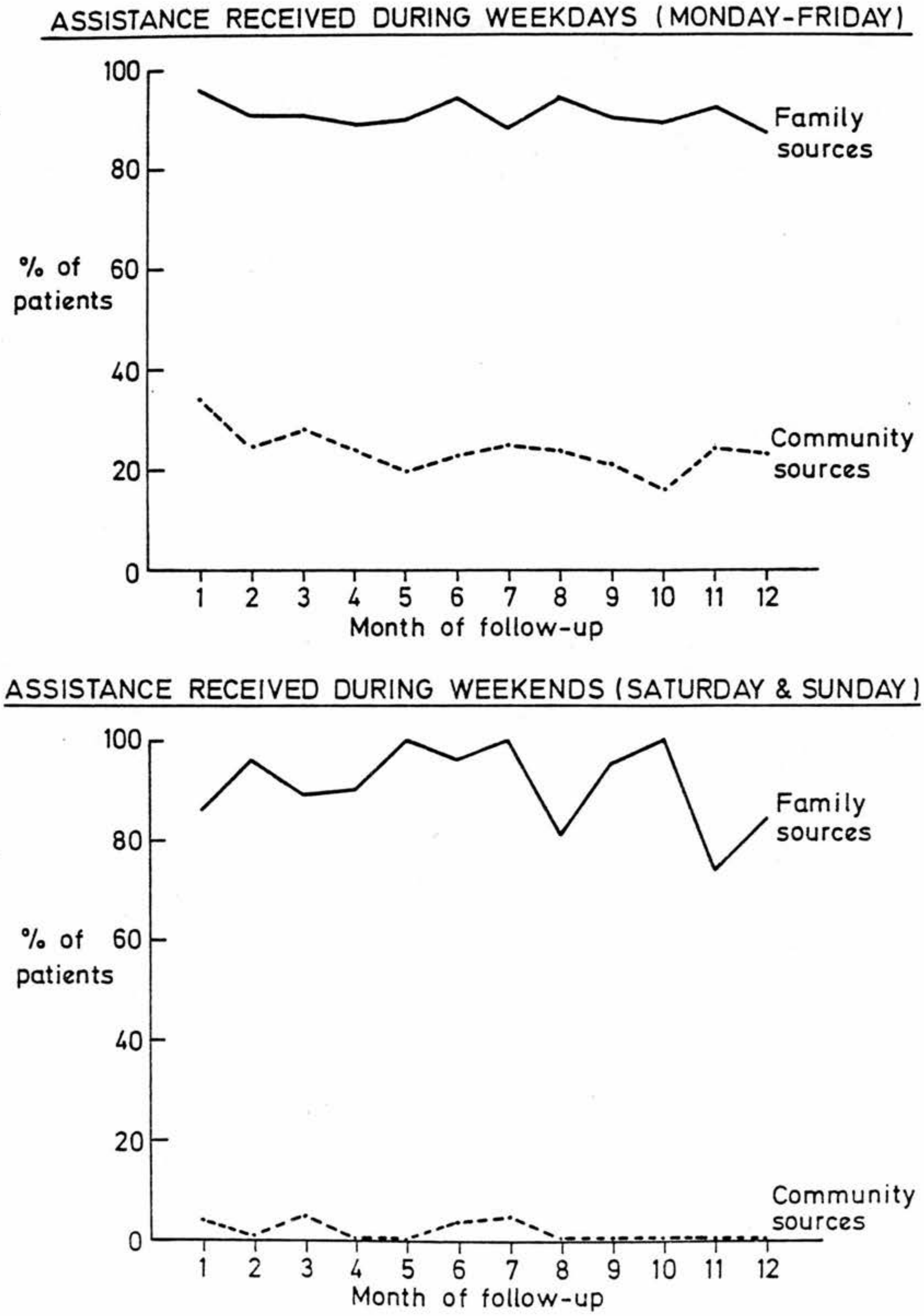
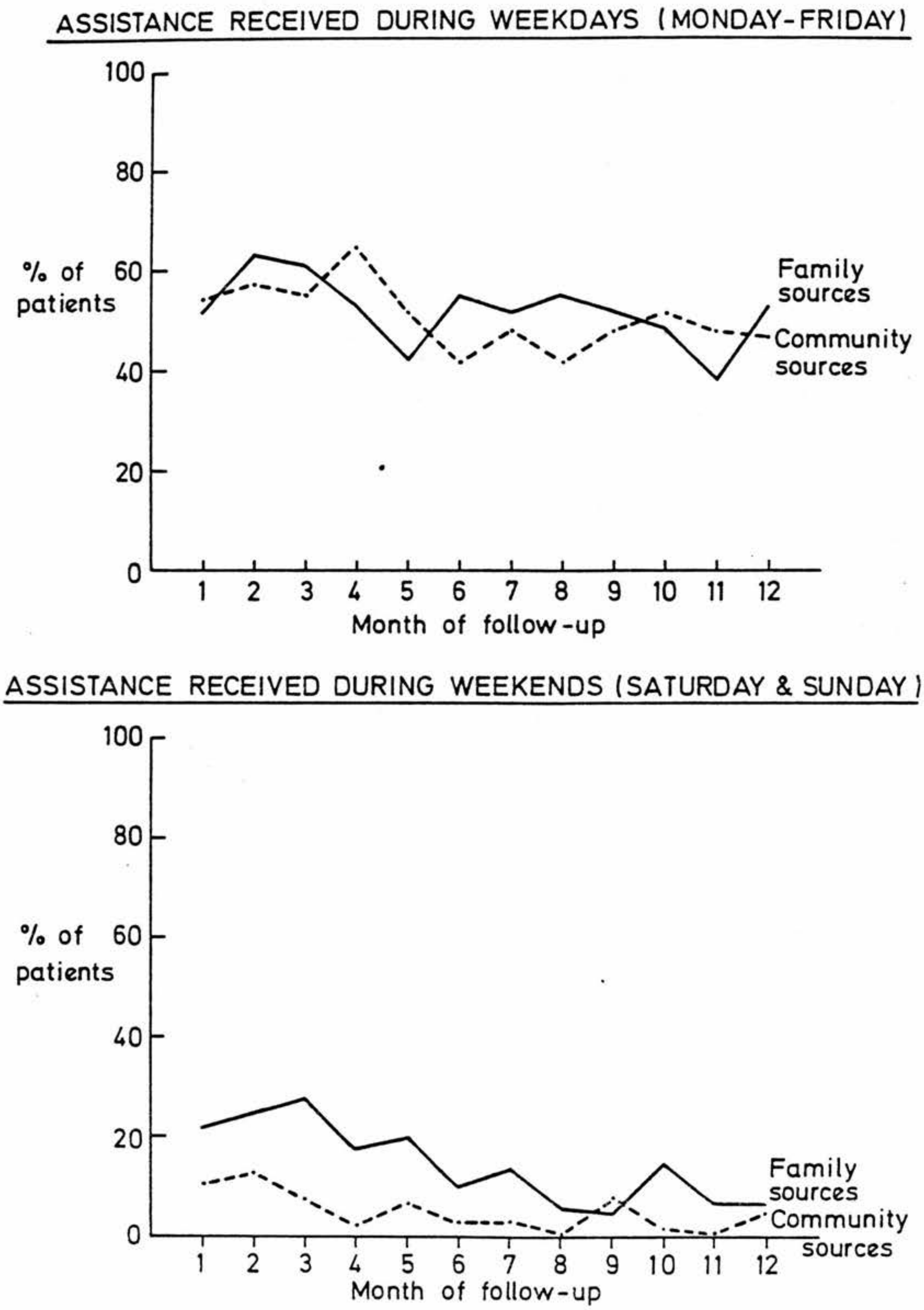


FIGURE 14.11

PROPORTION OF PATIENTS LIVING AT HOME ALONE WHO RECEIVED ASSISTANCE DURING WEEKDAYS AND AT WEEKENDS



CHAPTER 15

RESOURCES USED DURING THE CONTINUING PHASE OF REHABILITATION

Summary

Better communication occurred in the stroke unit between hospital staff and patients' families, general practitioners and community health and social services at the time of hospital discharge. Arrangements for hospital follow-up were made for a higher proportion of stroke unit patients. The use of hospital and community services, both initially, and throughout the continuing phase of rehabilitation was higher amongst patients from the stroke unit compared with medical units. The use of community services was not related to need, expressed as dependency at the end of the acute phase of rehabilitation, in either group of patients. No overall difference between stroke unit and medical unit patients occurred in the use of hospital bed days during the acute and continuing phases of rehabilitation. Whilst using slightly less physiotherapy overall, significantly more occupational therapy and speech therapy was used by stroke unit patients compared with medical unit patients.

Communication

The family is an important resource in every phase of rehabilitation and this is particularly true at the time of discharge of the stroke patient from hospital (Joint Committee for Stroke Facilities II, 1972). A successful reintegration of the stroke patient into the community may depend on the family being made aware of the patient's capabilities and being given adequate warning of the impending discharge from hospital (Joint Committee for Stroke Facilities X, 1974). This Report also emphasised the importance of continuing hospital surveillance as well as mobilising the community health team in providing support to the family as they cope with the sudden change in their life-style which the return of the stroke patient brings with him on discharge from hospital. Thus, a successful reintegration of the stroke patient into the community depends on adequate communication and comparisons of four aspects of communication were made between the stroke unit and medical units as patients entered the continuing phase of rehabilitation.

(i) <u>Warning of Discharge given to the Family</u>

The caring person (defined as the nearest relative or friend of the patient) was asked how much notice they had received from the hospital staff of the patient's impending discharge from hospital. Table 15.1 summarises the response obtained from caring persons whose patients were in the stroke unit and medical units. A highly significant difference ($p < 0.001$) occurred between the allocations in the amount of notice received by caring persons of patients' impending discharge. Two thirds of all caring persons of patients in the stroke unit received at least four days notice whereas nearly one half of caring persons of patients being discharged home from medical units received only one day's notice or were only told on the actual day of discharge. No association was found between the level of communication with any particular member of the hospital staff (Table 12.15) and the

TABLE 15.1

NOTICE GIVEN TO CARING PERSONS OF INTENTION TO DISCHARGE PATIENTS FROM HOSPITAL AT THE END OF THE ACUTE PHASE OF REHABILIATION

Amount of notice given (in days)	Stroke Unit		Medical Units	
	N	%	N	%
4 or more	69	67	17	27
3	9	9	8	13
2	10	10	8	13
1	10	10	13	20
0 (Actual day of discharge)	4	4	17	27
N.A. (Patient remaining in initial hospital)	(14)	-	(34)	-
N.R.	(9)	-	(12)	-
TOTAL	125	100	109	100

Figures in parenthesis are cases where the caring person was not applicable (N.A.) or not recorded (N.R.)

$p < 0.001$ (χ^2 32.8 on 4df)

amount of notice which caring persons received at the time of patients' discharge from hospital.

(ii) Notification of Patients' Discharge to General Practitioners

All general practitioners were notified by letter of their patients' death or discharge from hospital. The dates of the discharge letters were recorded and compared with the dates on which patients died or were discharged. The mean interval between these dates was 3.3 days for letters from the stroke unit and 7.0 days for letters referring to patients from medical units. The difference was significant ($p < 0.01$).

(iii) Mobilisation of Community Services

Table 15.2 summarises the extent to which caring persons were informed that arrangements had been made for certain hospital and community services to be involved prior to patients going home from hospital. Physiotherapy and occupational therapy included both hospital outpatient and domiciliary services. A significantly higher proportion of caring persons knew of the arrangements for day hospital attendance and community nursing in the stroke unit. In practice, a considerable number of patients from both these allocations received these services during the first month following hospital discharge despite their caring persons not being aware at the time of hospital discharge that arrangements had been made, or where services were only notified once hospital discharge had actually taken place.

(iv) Arrangements for Hospital Follow-up

Arrangements which were made to follow-up patients through outpatient clinic attendances after hospital discharge were compared with actual outpatient attendances amongst patients

TABLE 15.2

CARING PERSONS' PERCEPTION OF SERVICES BEING ARRANGED PRIOR TO HOSPITAL DISCHARGE FOR PATIENTS GOING HOME FOR THE CONTINUING PHASE OF REHABILITATION

	Stroke Unit (n = 106)		Medical Units (n = 86)		Significance of Differences
	N	%	N	%	
Day hospital attendance	33	31	4	5	$p < 0.001$
Physiotherapy	44	42	26	30	N.S.
Occupational therapy	27	25	25	29	N.S.
Community nursing	21	20	1	1	$p < 0.001$
Home help	34	32	20	23	N.S.

N.S. Not significant ($p > 0.05$)

residing at home at any point during the continuing phase of rehabilitation. This comparison is presented in Table 15.3 and shows that 67 per cent of stroke unit patients attended outpatient clinics compared with 53 per cent of medical unit patients. But a higher proportion (62 per cent) of stroke unit patients who attended had clinic appointments arranged prior to hospital discharge compared with 37 per cent of attending medical unit patients. Twenty-nine per cent and 24 per cent of stroke unit and medical unit patients respectively had follow-up arrangements made prior to hospital discharge, but never actually attended an outpatient clinic. Although reasons for these discrepancies can be found in a number of cases such as death following discharge, there was no explanation found in the data which could account for the majority of these cases.

Use of Community Services

The use of community based health and social services by patients located at home during any part of the continuing phase of rehabilitation is summarised in Table 15.4. Several facets of the data are of interest. The overall proportion of patients who used services was similar in both allocations with the exception of health visitor involvement, where there was a highly significant difference in favour of the stroke unit. The general practitioner was seen by the highest proportion of patients in both allocations, but did not have the highest frequency of contact. This was provided by the home help service, who averaged two contacts per week amongst the one third of patients from each allocation who received any home help assistance. The comparatively low involvement of social services such as social

TABLE 15.3

ARRANGEMENTS FOR HOSPITAL FOLLOW UP AMONGST PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION

STROKE UNIT

		Attended outpatient clinic(s)		
		Yes	No	Total
Follow-up arranged prior to hospital discharge	Yes	69 (62%)	32 (29%)	101 (91%)
	No	6 (5%)	5 (4%)	11 (9%)
	Total	75 (67%)	37 (33%)	112 (100%)

MEDICAL UNITS

		Yes	No	Total
Follow-up arranged prior to hospital discharge	Yes	34 (37%)	23 (24%)	57 (61%)
	No	15 (16%)	21 (23%)	36 (39%)
	Total	49 (53%)	44 (47%)	93 (100%)

TABLE 15.4

USE OF COMMUNITY SERVICES AMONGST PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION

	Stroke Unit (n = 112)			Medical Units (n = 93)			Significance of Differences
	N	%	Number of contacts Mean $\pm$ S.E.	N	%	Number of contacts Mean $\pm$ S.E.	
General Practitioner	99	88	9.4 $\pm$ 0.7	81	87	9.2 $\pm$ 0.7	N.S.
Health Visitor	85	76	4.0 $\pm$ 0.4	32	34	3.1 $\pm$ 0.7	$p < 0.001$
Community Nurse	61	54	20.7 $\pm$ 2.6	37	40	23.1 $\pm$ 3.8	N.S.
Social Worker	11	10	2.3 $\pm$ 0.5	13	14	2.5 $\pm$ 0.8	N.S.
Home Help	41	37	111.1 $\pm$ 9.9	29	31	98.3 $\pm$ 12.7	N.S.
Chiropodist	46	41	3.8 $\pm$ 0.3	30	32	2.8 $\pm$ 0.3	N.S.
Meals on Wheels	2	2	59.0 $\pm$ 9.0	6	7	61.2 $\pm$ 13.2	N.S.
Voluntary Agencies	9	8	33.7 $\pm$ 11.4	14	15	20.5 $\pm$ 11.9	N.S.

Note: The number of contacts refer only to those patients who received any contact with the relevant community service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

S.E. Standard error

work and meals on wheels was noted in comparison to the higher levels of community health services of health visiting and community nursing. The use of community health and social services was examined in relation to whether patients had hospital social work referrals during the acute phase of rehabilitation. There were no clear trends between such referrals and community services subsequently being received with one exception. A higher proportion of patients in both allocations who used the home help service had social work referrals. The use of community services was examined in relation to outcome at the end of the acute phase of rehabilitation for stroke unit patients (Table 15.5) and medical unit patients (Table 15.6). These tables demonstrate that for most community services, the level of use was not related to outcome expressed as independence or dependence in performing the activities of daily living at the end of the acute phase of rehabilitation. There were only two statistically significant differences in the proportion of independent - versus - dependent patients who received services, and none when the mean number of contacts for different services between outcome categories were considered. The use of community nursing was the only major service where both the coverage and frequency of contacts were higher in dependent patients. Surprisingly, this did not apply to the home help service. In several services, the picture was mixed; and in the use of two services, general practitioner and health visitor, a higher proportion of independent rather than dependent patients received any contact.

Use of Community Services over Time

The log book which was kept by all patients living at home

TABLE 15.5

USE OF COMMUNITY SERVICES AMONGST STROKE UNIT PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION ACCORDING TO THEIR OUTCOME AT THE END OF THE ACUTE PHASE OF REHABILITATION

	Independent (n = 77)			Dependent (n = 35)			Significance of Differences
	N	%	Number of Contacts Mean ± S.E.	N	%	Number of Contacts Mean ± S.E.	
General Practitioner	71	92	9.1 ± 0.7	28	80	10.3 ± 1.5	N.S.
Health Visitor	61	79	4.0 ± 0.5	24	69	3.9 ± 0.6	N.S.
Community Nurse	38	49	17.8 ± 3.2	23	66	25.4 ± 4.3	N.S.
Social Worker	3	4	3.3 ± 1.2	8	23	1.9 ± 0.5	$p < 0.01$
Home Help	27	35	113.0 ± 11.4	14	40	107.5 ± 19.5	N.S.
Chiropodist	35	46	3.7 ± 0.4	11	31	4.1 ± 0.4	N.S.
Meals on Wheels	2	3	59.0 ± 9.0	0	0	N.A.	N.S.
Voluntary Agencies	7	9	30.4 ± 11.3	2	6	45.0 ± 43.0	N.S.

Note: The number of contacts refer only to those patients who received any contact with the relevant Community Service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

S.E. Standard error

TABLE 15.6

USE OF COMMUNITY SERVICES AMONGST MEDICAL UNIT PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION ACCORDING TO THEIR OUTCOME AT THE END OF THE ACUTE PHASE OF REHABILITATION

	Independent (n = 48)			Dependent (n = 45)			Significance of Differences
			Number of Contacts			Number of Contacts	
	N	%	Mean $\pm$ S.E.	N	%	Mean $\pm$ S.E.	
General Practitioner	44	92	8.8 $\pm$ 0.8	37	82	9.6 $\pm$ 1.2	N.S.
Health Visitor	17	35	3.9 $\pm$ 1.2	15	33	2.2 $\pm$ 0.5	N.S.
Community Nurse	12	25	22.9 $\pm$ 6.4	25	56	23.3 $\pm$ 4.7	$p < 0.01$
Social Worker	5	10	1.0 $\pm$ 0.0	8	18	3.4 $\pm$ 1.2	N.S.
Home Help	17	35	91.3 $\pm$ 14.6	12	27	108.3 $\pm$ 23.4	N.S.
Chiropodist	14	29	2.9 $\pm$ 0.4	16	36	2.7 $\pm$ 0.4	N.S.
Meals on Wheels	2	4	51.5 $\pm$ 49.5	4	9	66.0 $\pm$ 2.2	N.S.
Voluntary Agencies	7	15	36.0 $\pm$ 22.9	7	16	5.0 $\pm$ 2.5	N.S.

Note: The number of contacts refer only to those patients who received any contact with the relevant Community Service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

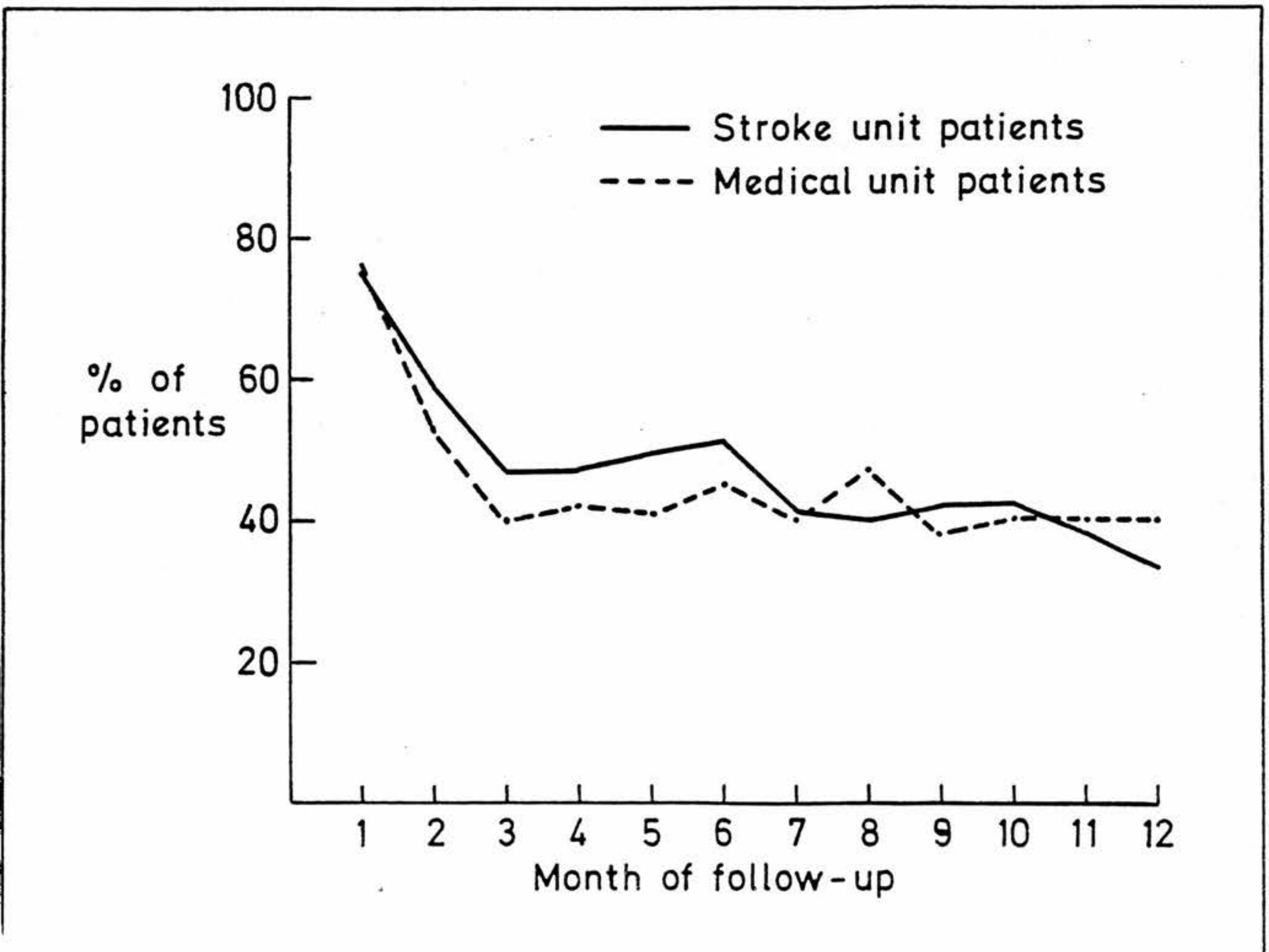
S.E. Standard error.

for any part of the continuing phase of rehabilitation listed all contacts with health and social service agencies which occurred between each monthly follow-up visit. Information from the log books was collated and used to compare the use of community services in each allocation over time.

(i) General Practitioner. The contacts which patients living at home (or in nursing homes and Part IV accommodation) had with their general practitioner during the continuing phase of rehabilitation is shown in Figure 15.1. High levels of contact

FIGURE 15.1

PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE GENERAL PRACTITIONER DURING THE CONTINUING PHASE OF REHABILITATION

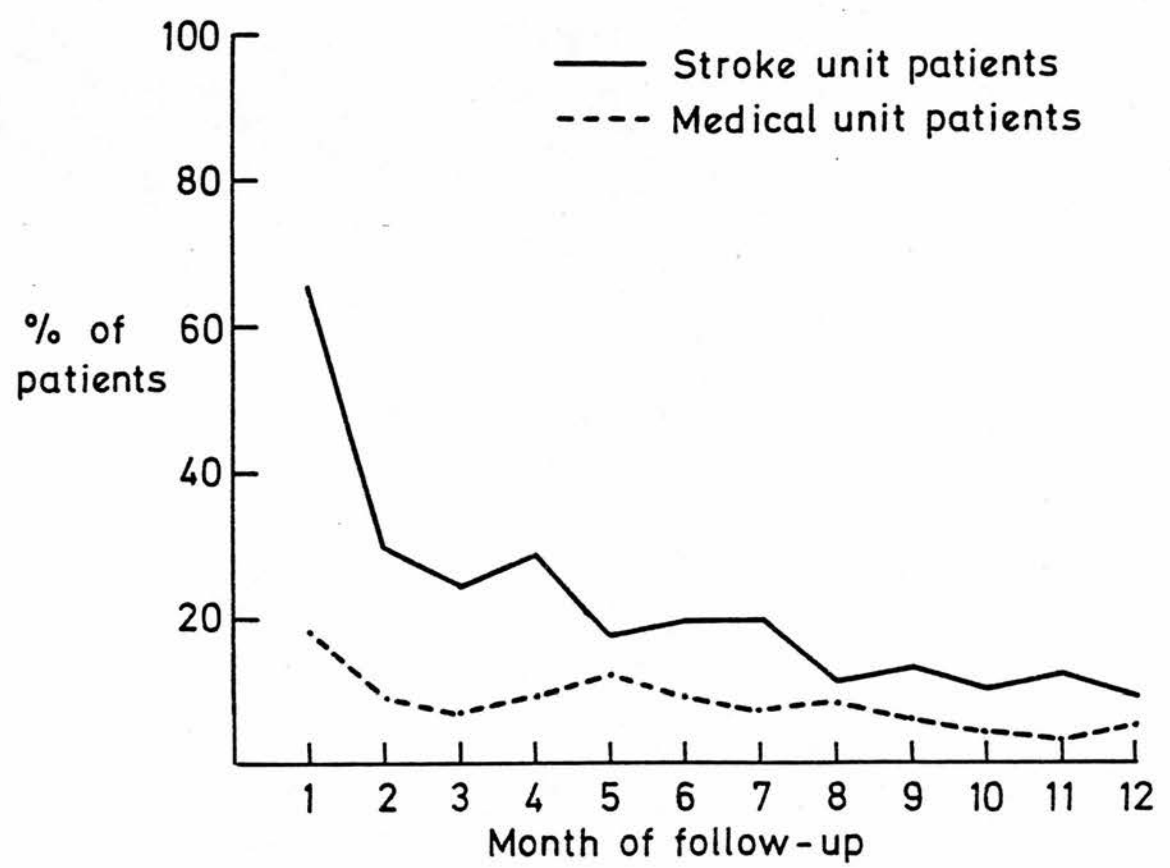


occurred in both allocations during the first month following hospital discharge with 75 per cent of patients having contact with their general practitioners. Thereafter, a fall-off in contacts occurred until the third month of follow-up was reached. The level of contact was constant from this point to the end of the continuing phase of rehabilitation, between 40 and 50 per cent of patients receiving general practitioner services during each month of the follow-up. There were no significant differences ($p > 0.05$) in practitioner contacts between allocations at any point in the follow-up. The pattern of independent patients having a somewhat higher contact rate than dependent patients held true for each month in both allocations. But the mean number of contacts was higher for dependent patients.

(ii) Health Visitor. A highly significant difference ($p < 0.001$) occurred between allocations in contacts with health visiting staff during the first month of follow-up. As can be seen in Figure 15.2 the difference began to diminish immediately, the statistical significance being reduced to the one per cent level in months two, three and four of the follow-up. The significance of the difference disappeared for the remaining months of the follow-up, although the proportion of stroke unit patients having contacts with health visitors was higher than the proportion of medical unit patients for every month of the follow-up. There was no difference in the use of health visiting in each month according to the outcome category of patients at the end of the acute phase of rehabilitation.

FIGURE 15.2

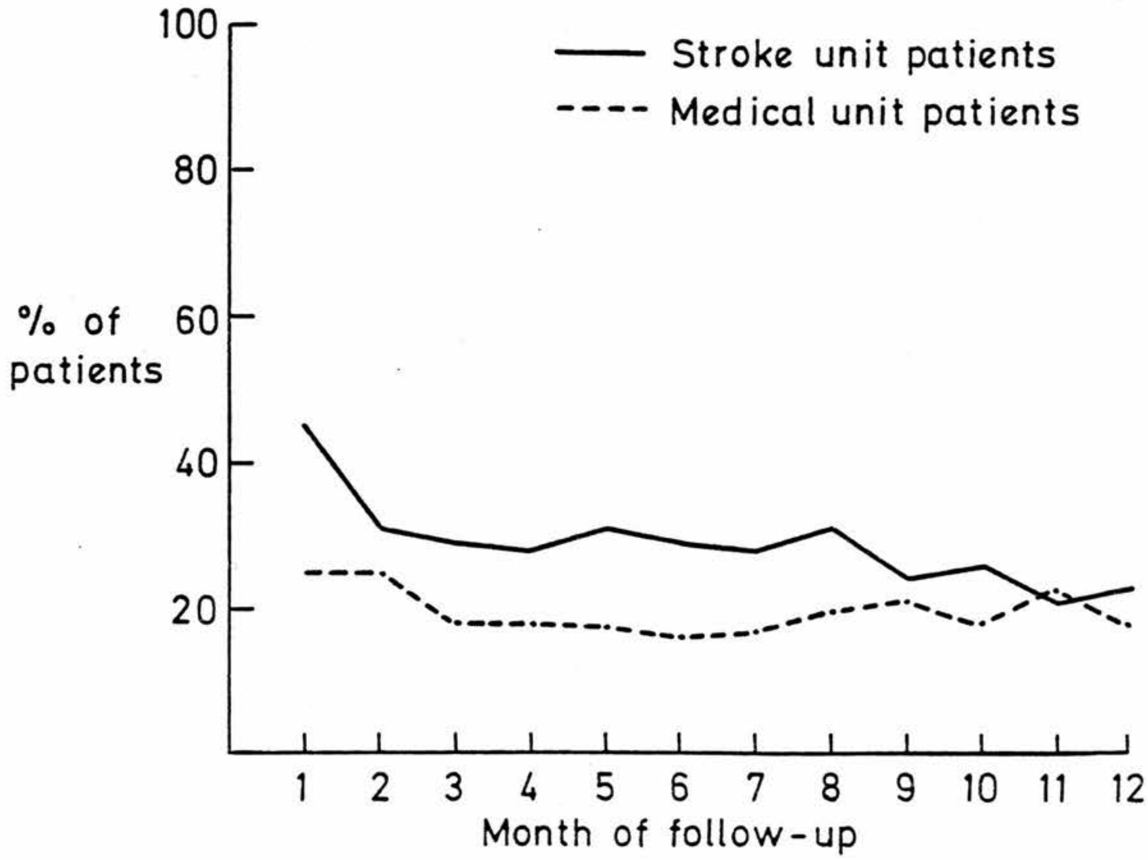
PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE HEALTH VISITOR DURING THE CONTINUING PHASE OF REHABILITATION



(iii) Community Nursing. There was also a difference between allocations in the use of community nursing during the first month of the continuing phase of rehabilitation, but the difference was not as large as that seen for health visiting ($p < 0.05$). The trend in the use of community nursing over time is summarised in Figure 15.3. After the first month, the difference between allocations was reduced to a level which was not statistically significant although a higher proportion of the stroke unit patients continued to receive community nursing. The sharp decline in health visitor utilisation experienced by stroke unit patients did not occur with community nursing, the proportion of patients receiving contacts remaining constant throughout. Community nursing was the only service in which both the proportion of patients using the service and the frequency with which they obtained it was higher for every month of the follow-up amongst patients who were dependent at the end of the acute phase of rehabilitation.

FIGURE 15.3

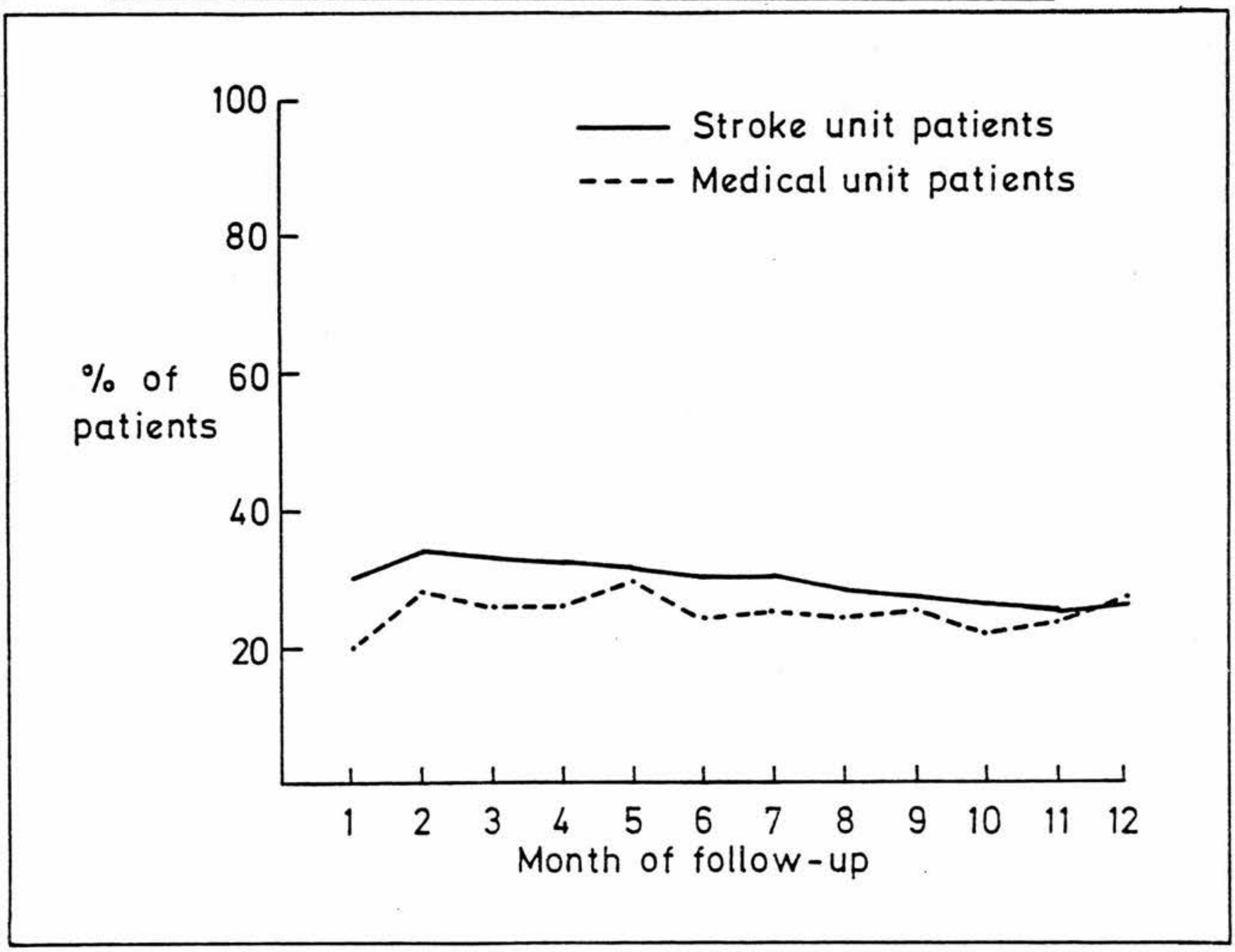
PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE COMMUNITY NURSE DURING THE CONTINUING PHASE OF REHABILITATION



(iv) Home Help. The use of the home help service during the continuing phase of rehabilitation is summarised in Figure 15.4. The proportion of patients who received this service was stable throughout, with the stroke unit allocation containing a higher proportion of patients who received the service up to the final month of the follow-up. The difference between allocations was not significant. Analysing the frequency of home help contacts each month revealed that at no point in the continuing phase of rehabilitation was there a significant difference ($p > 0.05$) in the use of home helps according to whether they were classified as independent or dependent at the end of the acute phase of rehabilitation.

FIGURE 15.4

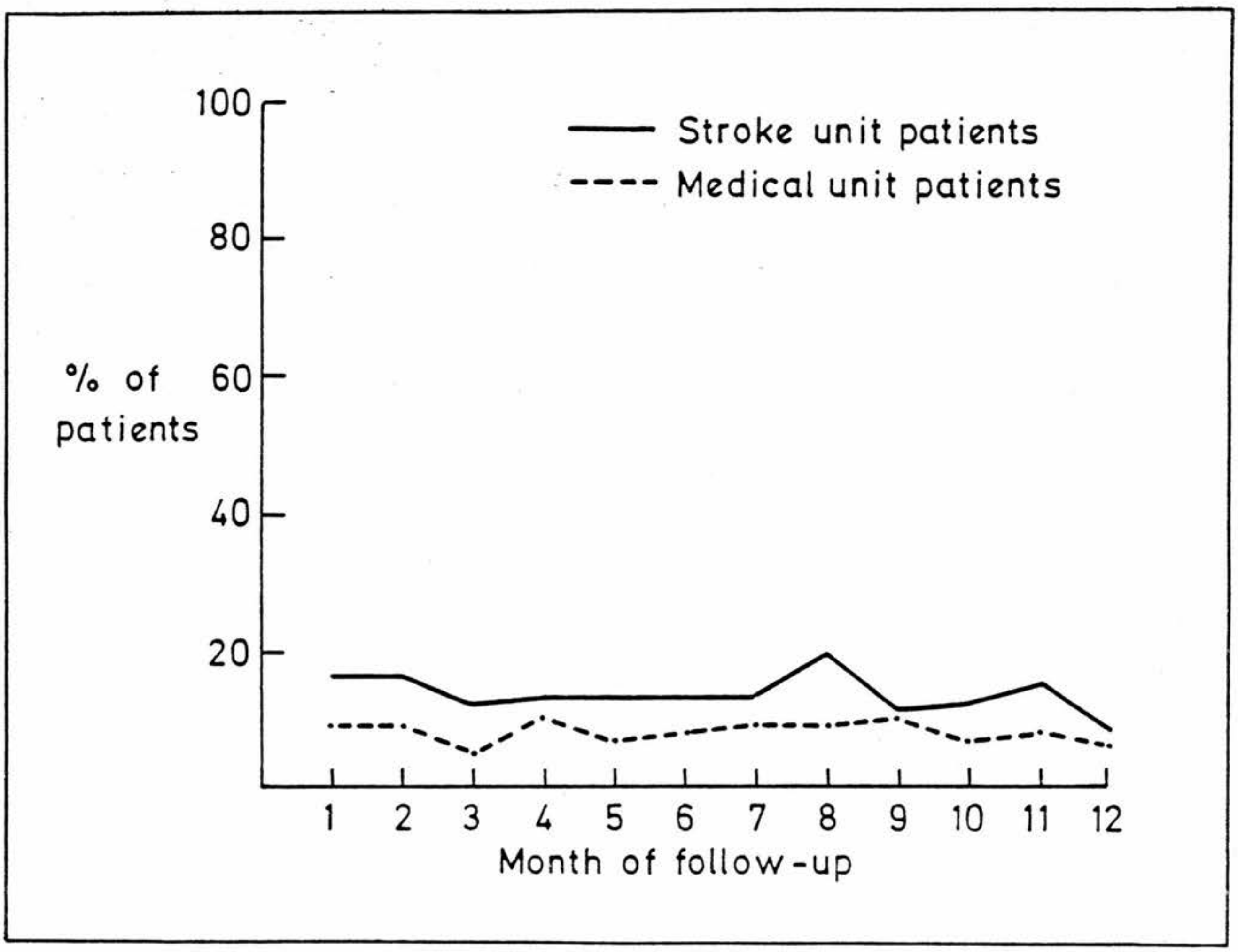
PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE HOME HELP DURING THE CONTINUING PHASE OF REHABILITATION



(v) Chiropody. The proportion of patients receiving chiropody was stable throughout the follow-up. As Figure 15.5 demonstrates, there was no major difference in use between allocations. A higher proportion of the stroke unit allocation received chiropody throughout the follow-up although the mean number of contacts was similar in each month for both allocations. There was no difference in the use of chiropody according to the outcome category of patients at the end of the acute phase of rehabilitation.

FIGURE 15.5

PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE CHIROPODIST DURING THE CONTINUING PHASE OF REHABILITATION



Use of Hospital Services

(a) Hospital Readmissions

Thirty-seven readmissions involving 29 patients from the stroke unit occurred during the continuing phase of rehabilitation compared with 29 readmissions involving 22 patients in the medical unit allocation. Table 15.7 summarises the number of episodes of hospital readmission, and the number of hospital readmissions which occurred each month for stroke unit and medical unit patients. A difference in the timing of readmissions occurred between the allocations, with 40 per cent of stroke unit readmissions occurring within the first three months of follow-up. Medical unit readmissions were spread more evenly throughout the follow-up period. The mean duration of stay for readmissions was 35.8 days and 47.7 days for stroke unit and medical unit patients respectively. The total number of bed days used by hospital readmissions was very similar, being 1,323 and 1,383 bed days used by stroke unit and medical unit patients respectively. All but eight readmissions were to medical units or the stroke unit, but only 22 of the 66 readmissions were to the initial admitting hospital. Twelve readmissions in each allocation were due either to the stroke which placed the patient in the study or to a subsequent stroke which occurred during the continuing phase of rehabilitation. The other main causes of readmission were myocardial infarction, congestive cardiac failure and fractured neck of femur.

(b) Use of Long Stay Beds

Table 15.8 summarises the use of long stay hospital accommodation during the continuing phase of rehabilitation. There were 21 and 19 transfers to long stay accommodation from the stroke and

TABLE 15.7

THE NUMBER OF EPISODES OF HOSPITAL READMISSION WHICH OCCURRED DURING THE CONTINUING PHASE OF REHABILITATION

Month of Follow-up	Stroke Unit		Medical Units	
	N*	Number of bed days used during readmissions	N*	Number of bed days used during readmissions
1	10(10)	127	0 (0)	0
2	11 (3)	194	1 (1)	13
3	8 (2)	143	2 (2)	27
4	5 (0)	112	4 (3)	69
5	8 (5)	114	7 (5)	110
6	5 (2)	121	7 (2)	193
7	3 (1)	47	7 (2)	179
8	3 (2)	70	9 (3)	186
9	5 (3)	69	8 (4)	177
10	5 (3)	80	8 (2)	194
11	8 (6)	150	6 (2)	140
12	6 (0)	96	5 (3)	95
Total number of re-admissions and bed days	(37)	1,323	(29)	1,383

Figures in parentheses represent the number of individual hospital readmissions.

* Number of patients receiving hospital care as a result of readmission for each month of the continuing phase of rehabilitation.

TABLE 15.8

THE NUMBER OF PATIENTS RECEIVING LONG STAY HOSPITAL CARE DURING THE CONTINUING PHASE OF REHABILITATION

	STROKE UNIT		MEDICAL UNITS	
MONTH OF FOLLOW UP	N*	NUMBER OF BED DAYS USED	N*	NUMBER OF BED DAYS USED
1	12(12)	328	4 (4)	83
2	15 (3)	432	6 (2)	163
3	15 (0)	433	6 (0)	159
4	13 (0)	390	6 (1)	160
5	15 (2)	401	6 (1)	154
6	15 (0)	434	10 (3)	238
7	15 (1)	436	9 (0)	270
8	15 (0)	394	11 (2)	309
9	14 (1)	395	12 (1)	332
10	13 (0)	390	14 (2)	390
11	13 (0)	390	12 (0)	355
12	13 (2)	388	14 (3)	408
TOTAL ADMISSIONS AND BED DAYS	(21)	4811	(19)	3021

Figures in parentheses represent the number of individual long stay hospital admissions.

*Number of patients requiring long stay hospital care during each month of the continuing phase of rehabilitation.

medical units respectively. But as with hospital readmissions, the timing was different. Twelve transfers from the stroke unit had taken place by the first month of the follow-up compared with only four transfers from medical units. Accordingly, the number of long stay bed days used during the continuing phase of rehabilitation was much higher for stroke unit patients, being 4,811 bed days; 60 per cent more than the 3,021 bed days used by medical unit patients. All patients transferred to long stay hospitals were dependent at the end of the acute phase of rehabilitation and if they survived, remained dependent up to the end of the continuing phase of rehabilitation. Fourteen of the 30 deaths which occurred during the continuing phase of rehabilitation took place amongst the 40 patients transferred to long stay care.

(c) Use of Hospital Outpatient Facilities

There were two statistically significant differences in the use of hospital staff and facilities by stroke unit and medical unit patients. These differences were for day hospital attendances and the use of outpatient physiotherapy (Table 15.9). Further differences in the proportion of patients who attended hospital outpatient clinics, and received outpatient occupational therapy occurred, but the differences did not reach levels of statistical significance. Speech therapy followed the pattern of the acute phase of rehabilitation. The proportion of patients receiving these therapies was greater in the stroke unit allocation. The difference with medical unit patients was more pronounced for physiotherapy than occupational therapy. The imbalance in the mean amount of therapy used which was created by the extended hospital stay and transfer groups of patients in the acute phase

TABLE 15.9

USE OF HOSPITAL SERVICES AMONGST PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION.

	Stroke Unit (n = 112)			Medical Units (n= 93)			Significance of Differences
	N	%	Number of contacts Mean $\pm$ S.E.	N	%	Number of contacts Mean $\pm$ S.E.	
Hospital outpatient clinic attendance	75	67	9.0 ± 2.6	49	53	13.6 ± 4.1	N.S.
Day hospital attendance	27	24	38.2 ± 6.4	9	10	36.9 ± 13.9	$p < 0.05$
Physiotherapist	85	76	34.4 ± 3.1	45	48	34.2 ± 6.7	$p < 0.001$
Occupational therapist	59	53	20.7 ± 3.8	40	43	14.6 ± 3.2	N.S.
Speech therapist	14	13	32.1 ± 5.9	13	14	20.3 ± 6.5	N.S.

Note: The number of contacts refer only to those patients who received any contact with the relevant hospital service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

S.E. Standard error.

of rehabilitation was not repeated in the continuing phase of rehabilitation. There was evidence which applied to both the stroke unit and medical unit allocations that the use of hospital outpatient services was related to patients' outcome at the end of the acute phase of rehabilitation. With one exception (attendance at medical outpatient clinics), a higher proportion of dependent patients received services (physiotherapy, occupational therapy and attendance at day hospital) than independent patients. This trend also applied to the mean number of contacts which stroke unit patients received, dependent patients having more contacts than independent patients for all hospital outpatient services. This is illustrated in Table 15.10. As Table 15.11 shows, this did not apply to medical unit patients who had a more variable pattern of contacts.

Use of Hospital Outpatient Services Over Time

(i) Medical Outpatient Clinics

Although 67 per cent of stroke unit patients and 53 per cent of medical unit patients attended at least one medical, surgical or other specialty outpatient clinic during the follow-up, the proportion attending clinics in any one month was much lower (Figure 15.6). In every month except the first, a higher proportion of stroke unit patients attended clinics compared with medical unit patients although none of these differences were statistically significant. There was some evidence of a two-monthly pattern of attendances amongst stroke unit patients which was not seen in the medical unit allocation. A higher proportion of independent, rather than dependent patients attended clinics throughout the follow-up period.

TABLE 15.10

USE OF HOSPITAL SERVICES AMONGST STROKE UNIT PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION ACCORDING TO THEIR OUTCOME AT THE END OF THE ACUTE PHASE OF REHABILITATION

	Independent (n = 77)			Dependent (n = 35)			Significance of Differences
	N	%	Number of contacts Mean $\pm$ S.E.	N	%	Number of contacts Mean $\pm$ S.E.	
Medical outpatient clinic attendance	56	74	7.8 $\pm$ 2.8	19	54	12.7 $\pm$ 6.6	N.S.
Day hospital attendance	14	18	32.1 $\pm$ 8.5	13	37	44.8 $\pm$ 9.5	N.S.
Physiotherapist	57	74	27.9 $\pm$ 3.7	28	80	47.6 $\pm$ 4.7	N.S.
Occupational therapist	36	47	19.0 $\pm$ 4.8	23	66	23.4 $\pm$ 6.2	N.S.
Speech therapist	6	8	17.8 $\pm$ 7.2	8	23	42.9 $\pm$ 6.9	$p < 0.05$

Note: The number of contacts refer only to those patients who receive any contact with the relevant hospital service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

S.E. Standard error

TABLE 15.11

USE OF HOSPITAL SERVICES AMONGST MEDICAL UNIT PATIENTS LOCATED AT HOME DURING ANY PART OF THE CONTINUING PHASE OF REHABILITATION ACCORDING TO THEIR OUTCOME AT THE END OF THE ACUTE PHASE OF REHABILITATION

	Independent (n = 48)			Dependent (n = 45)			Significance of Differences
	N	%	Number of contacts Mean $\pm$ S.E.	N	%	Number of contacts Mean $\pm$ S.E.	
Medical outpatient clinic attendance	28	58	6.6 $\pm$ 3.5	21	42	23.0 $\pm$ 8.1	N.S.
Day hospital attendance	3	6	68.0 $\pm$ 38.2	6	13	21.3 $\pm$ 5.1	N.S.
Physiotherapist	21	44	33.1 $\pm$ 6.0	24	53	35.1 $\pm$ 7.2	N.S.
Occupational therapist	17	35	16.9 $\pm$ 5.7	23	51	12.9 $\pm$ 3.7	N.S.
Speech therapist	9	19	25.0 $\pm$ 9.1	4	9	9.8 $\pm$ 3.1	N.S.

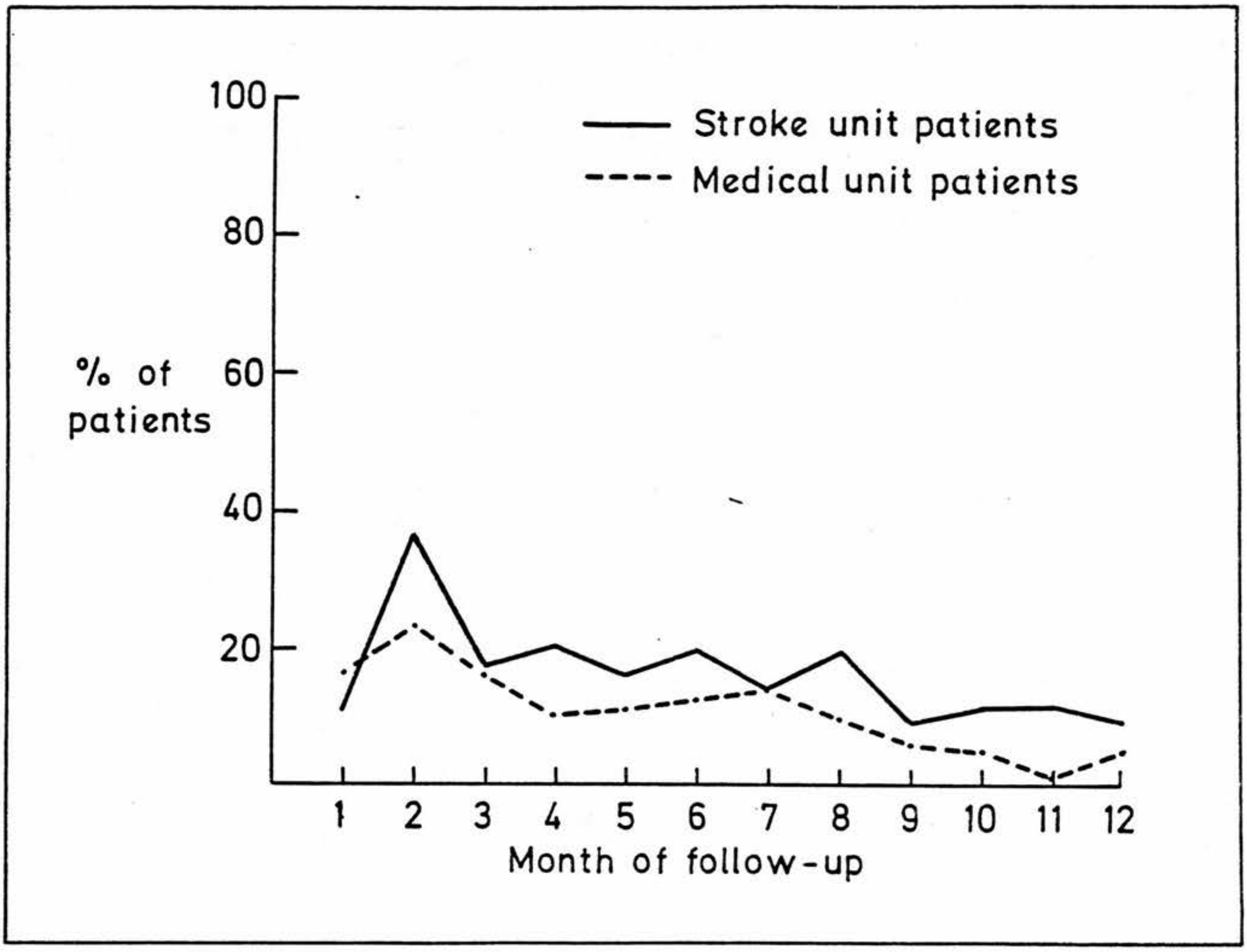
Note: The number of contacts refer only to those patients who received any contact with the relevant hospital service during any part of the continuing phase of rehabilitation.

N.S. Not significant ($p > 0.05$)

S.E. Standard error.

FIGURE 15.6

PROPORTION OF PATIENTS LIVING AT HOME WHO ATTENDED THE HOSPITAL OUTPATIENT CLINIC DURING THE CONTINUING PHASE OF REHABILITATION

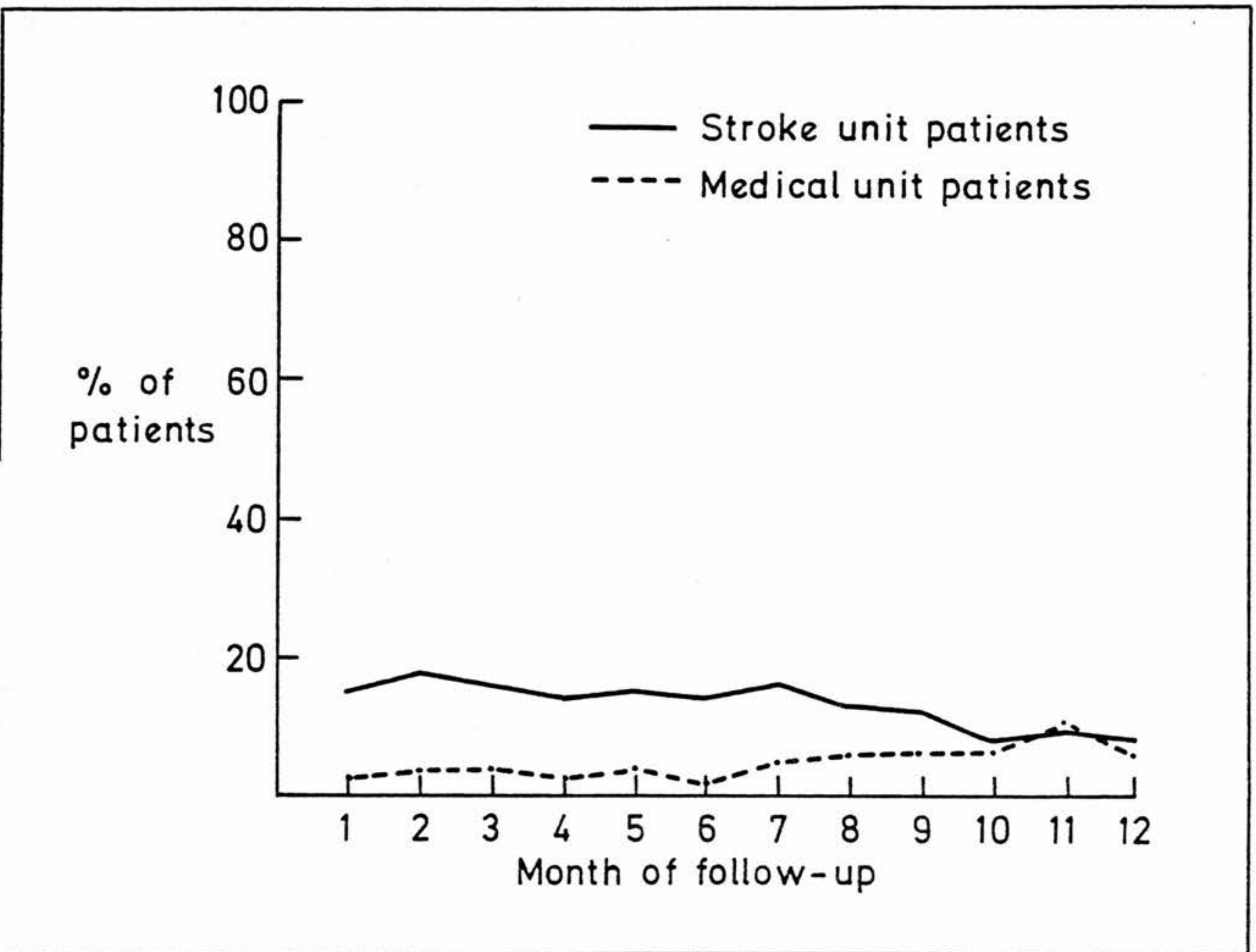


(ii) Day Hospital Attendance

Only 12 per cent of all patients in the follow-up attended day hospitals. The distribution of patients who attended day hospitals during each month of the follow-up is summarised in Figure 15.7. Up to the tenth month, a higher proportion of stroke unit patients attended day hospitals. The number of patients attending were insufficient to determine whether a higher proportion of patients seen in each month were independent or dependent. Wide fluctuations in the mean attendance for each month occurred because of the small numbers of patients involved.

FIGURE 15.7

PROPORTION OF PATIENTS LIVING AT HOME WHO ATTENDED THE DAY HOSPITAL DURING THE CONTINUING PHASE OF REHABILITATION



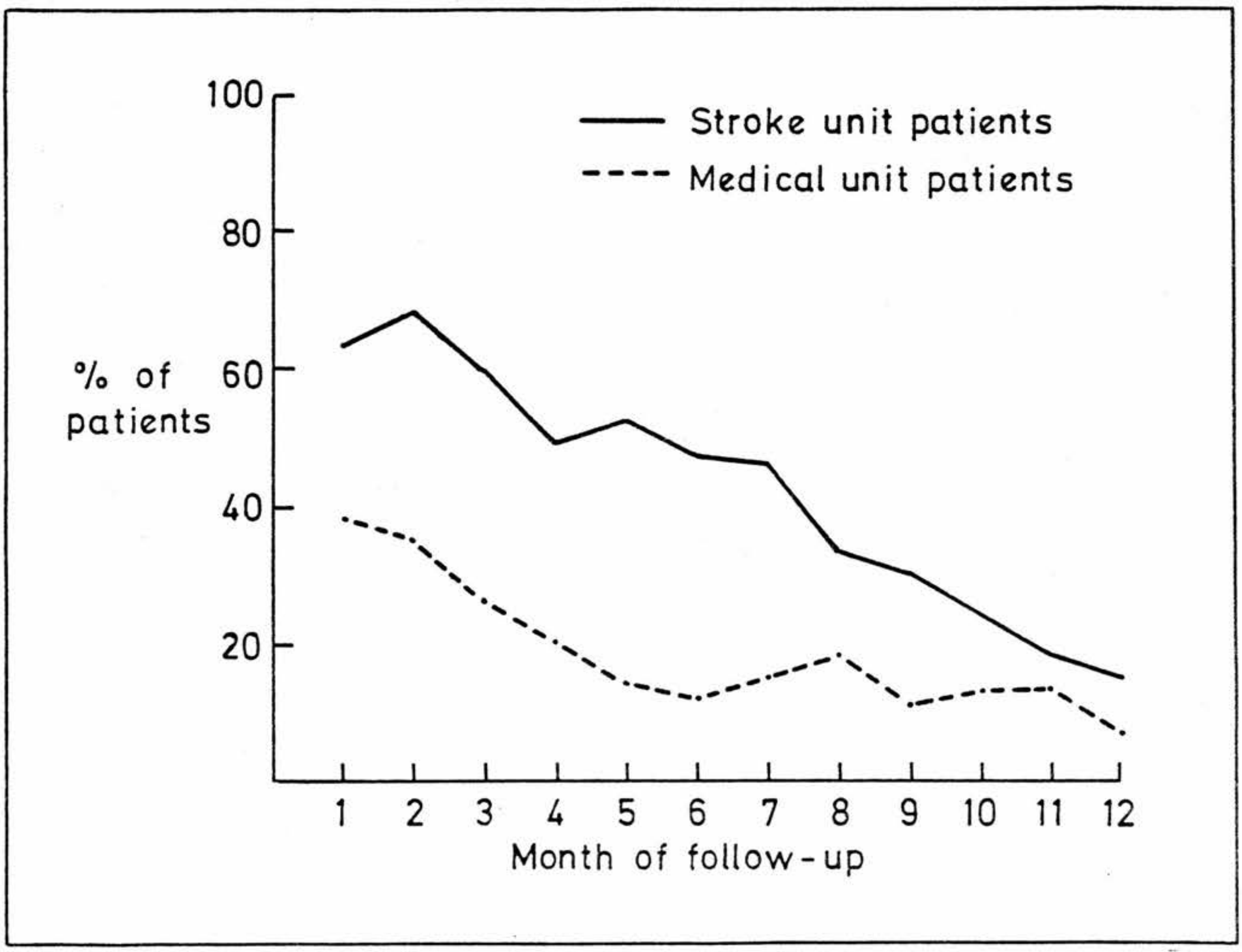
(iii) Physiotherapy

A striking difference in the proportion of patients receiving physiotherapy as hospital outpatient or during day hospital attendances occurred between the stroke unit and medical unit allocations

(Figure 15.8). This commenced with a statistical significance of $p < 0.01$ in month one, increased to $p < 0.001$ to month six and decreased to $p < 0.05$ in month eight, differences in remaining months not being statistically significant. The mean number of contacts per month remained constant throughout the follow-up period amongst patients who received any physiotherapy. Although a higher proportion of dependent patients in both allocations received physiotherapy during each month of the follow-up, there was no difference in the mean number of contacts experienced by independent - versus - dependent patients in either allocation.

FIGURE 15.8

PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE PHYSIOTHERAPIST DURING THE CONTINUING PHASE OF REHABILITATION

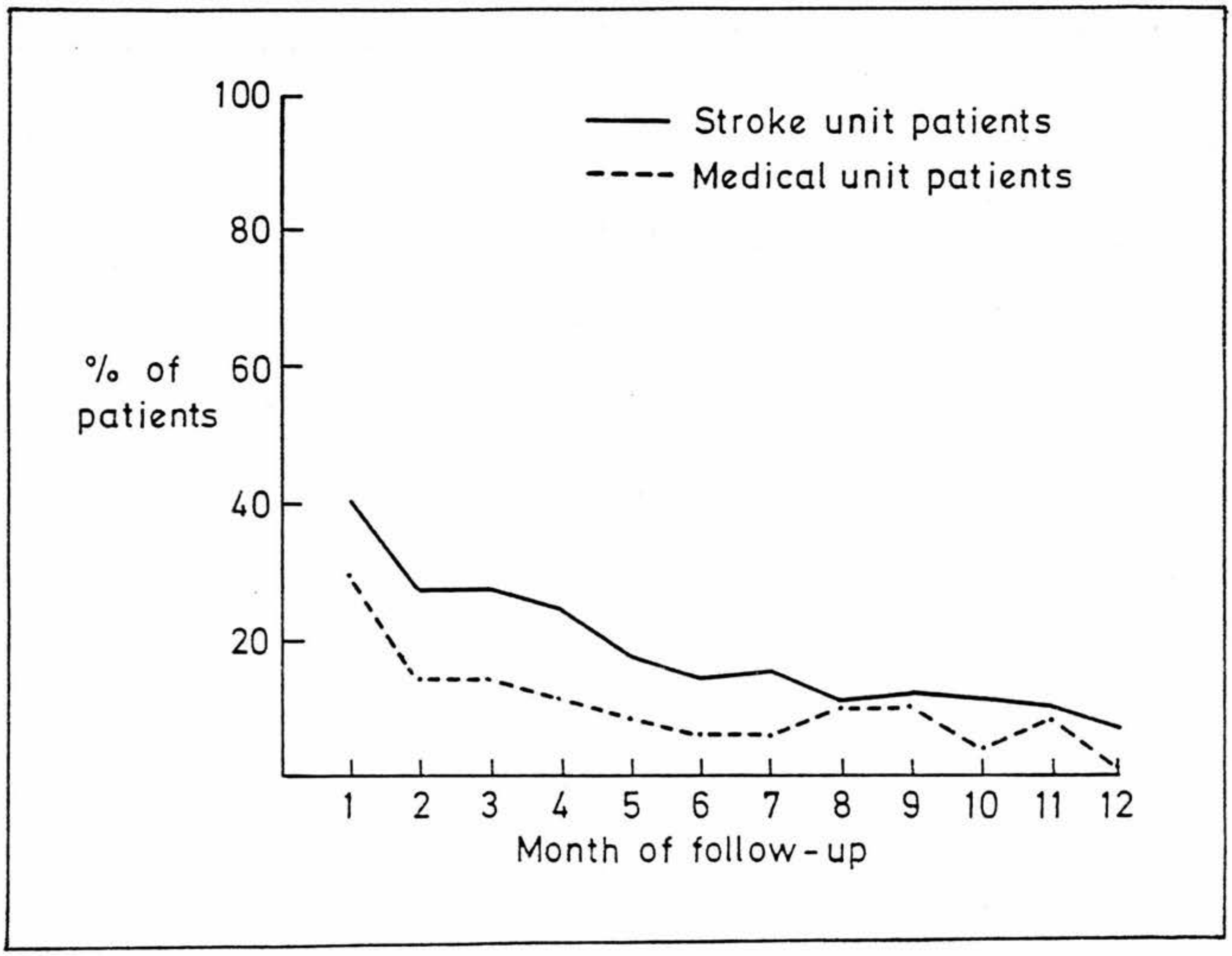


(iv) Occupational Therapy

The differences between allocations in the use of occupational therapy during the continuing phase of rehabilitation were not so marked as those for physiotherapy, as Figure 15.9 demonstrates. No statistically significant differences occurred after the first month ($p > 0.05$), although a higher proportion of patients from the stroke unit used occupational therapy during each month of the follow-up. No major differences in the mean number of contacts occurred between independent and dependent patients, and although the overall mean number of contacts was higher in the stroke unit allocation, there was no obvious trend visible when these were examined for each allocation at each month of the follow-up.

FIGURE 15.9

PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE OCCUPATIONAL THERAPIST DURING THE CONTINUING PHASE OF REHABILITATION

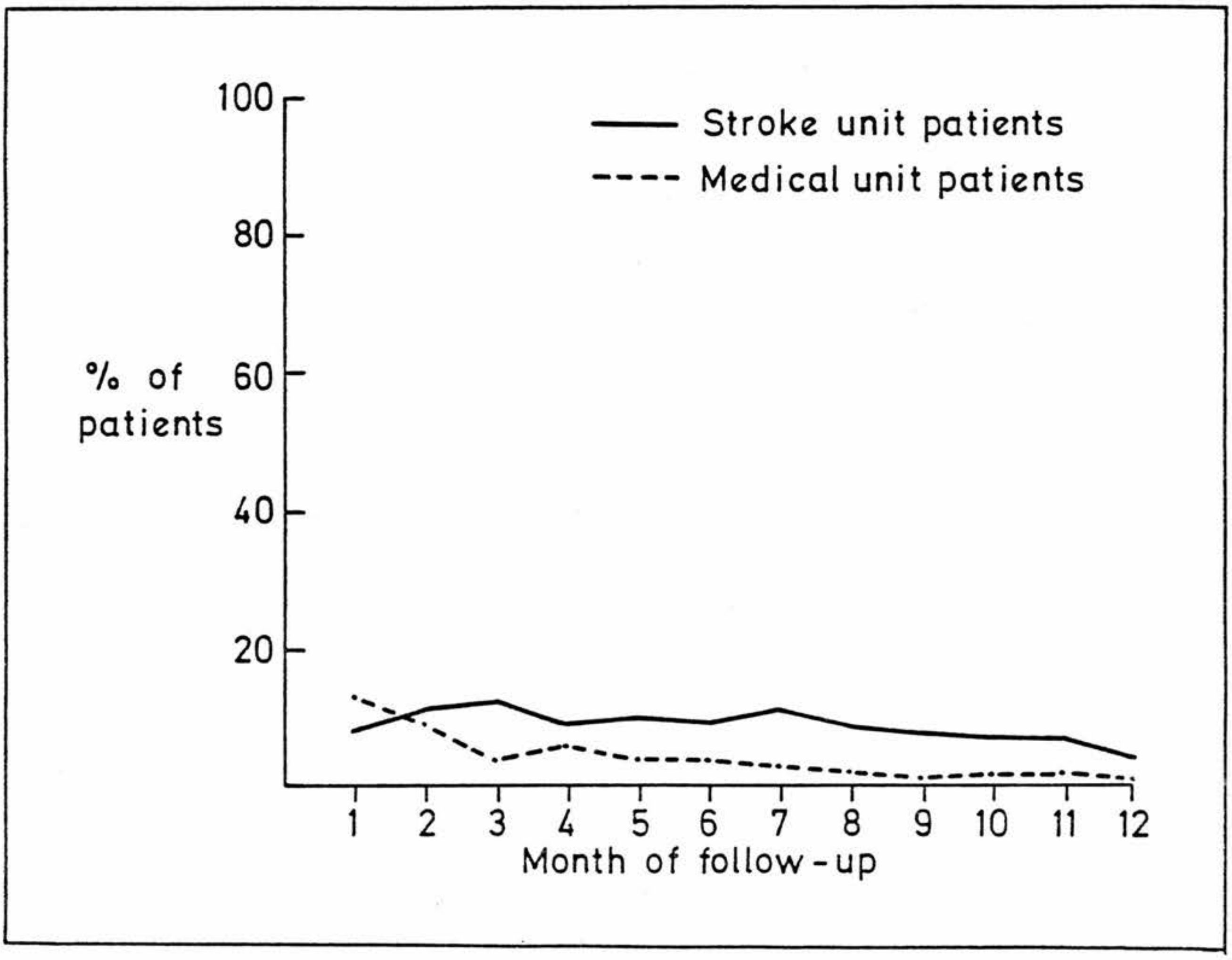


(v) Speech Therapy

The proportion of patients who received any speech therapy during the follow-up was 13 per cent for the stroke unit and 14 per cent for medical unit patients. Figure 15.10 summarises the position for each month of the follow-up. In later months, the higher proportion of patients who received speech therapy came from the stroke unit allocation. It was not possible to divide patients receiving speech therapy into independent or dependent categories because of the low numbers of patients involved.

FIGURE 15.10

PROPORTION OF PATIENTS LIVING AT HOME WHO HAD CONTACT WITH THE SPEECH THERAPIST DURING THE CONTINUING PHASE OF REHABILITATION



The Equation of Stroke Rehabilitation

One of the aims of the study was to establish the balance of resources used by patients in the stroke unit and medical unit allocations during the acute and continuing phases of rehabilitation. Many of the resources used during the acute phase of rehabilitation could not be compared directly with the use of resources which occurred during the continuing phase of rehabilitation. For example, the performance of hospital medical staff during the acute phase of rehabilitation cannot be equated with the contacts which patients had with their general practitioners during the continuing phase of rehabilitation. But it was possible to make two direct comparisons between stroke unit and medical unit allocations in the use of resources during the acute and continuing phases of rehabilitation. These were the use of hospital beds and therapy.

Use of Hospital Bed Days

Table 15.12 provides a summary of the use of hospital beds during the acute and continuing phases of rehabilitation. Bed days used by medical unit patients during initial hospital admissions were 35 per cent higher than bed days consumed in the stroke unit. Bed days consumed by episodes of hospital readmission during the continuing phase of rehabilitation were almost identical in the two allocations, 1,323 bed days being used by patients from the stroke unit and 1,383 bed days by patients whose initial allocation had been to a medical unit. But the use of long stay bed days was much higher amongst stroke unit patients, being 60 per cent greater in long stay hospitals than

TABLE 15.12

THE USE OF HOSPITAL BED DAYS DURING THE ACUTE AND CONTINUING PHASES OF REHABILITATION

	Stroke Unit			Medical Units		
	N	Number of bed days used	%	N	Number of bed days used	%
Initial hospital admission	155	8,463	58	152	11,415	72
Episodes of hospital readmission	37(29)	1,323	9	29(22)	1,383	9
Long stay hospital care	21	4,811	33	19	3,021	19
TOTAL		14,597	100		15,819	100

Figures in parentheses are the number of patients involved in episodes of hospital readmission for patients from medical units. When all bed days used by each allocation of patients were considered together, there was virtually no difference, the total of 15,819 bed days for medical unit patients being only eight per cent higher than the total of 14,597 bed days used by stroke unit patients.

Use of Therapy

The use of physiotherapy, occupational therapy and speech therapy in the acute and continuing phases of rehabilitation was compared (Table 15.13). The comparison was based on the assumption that each therapy contact during the continuing phase of rehabilitation was equal to one hour of therapy time during the acute phase of rehabilitation. Although a higher proportion of stroke unit patients received physiotherapy and occupational therapy during the acute and continuing phases of rehabilitation, the total use of these therapies differed between allocations during the two phases of rehabilitation. More physiotherapy hours were used by medical unit patients during the acute phase of rehabilitation, but the position was reversed during the continuing phase, when a much higher number of contact hours of physiotherapy were used by stroke unit patients. There was virtually no difference in the total consumption of physiotherapy when both phases of rehabilitation were considered. Stroke unit patients had a higher use of occupational therapy throughout the study. The use of speech therapy was much less than for either of the other two therapies, with the higher number of contact hours being in the stroke unit allocation during both phases of rehabilitation.

TABLE 15.13

THE USE OF THERAPY DURING THE ACUTE AND CONTINUING PHASES OF REHABILITATION

		Physiotherapy		Occupational Therapy		Speech Therapy	
		Stroke Unit	Medical Units	Stroke Unit	Medical Units	Stroke Unit	Medical Unit
The Acute Phase	Patients receiving any therapy	149 (96%)	134 (88%)	136 (88%)	71 (47%)	20 (13%)	27 (18%)
	Mean number of therapy hours for each referred patient	21.0	36.4	33.3	48.2	16.8	11.2
	Total number of therapy hours for all referred patients	3,129	4,878	4,529	3,422	336	302
The Continuing Phase	Patients receiving any therapy	85 (76%)	45 (48%)	39 (53%)	40 (43%)	14 (12%)	13 (14%)
	Mean number of therapy contacts for each referred patient	34.4	34.2	20.7	14.6	32.1	20.3
	Total number of therapy contacts for all referred patients	2,924	1,539	1,221	584	449	264
	Total number of therapy hours* for all referred patients: Acute and continuing phases of rehabilitation	6,053	6,417	5,750	4,006	785	566

* Based on the assumption that each contact during the continuing phase of rehabilitation was equal to one hour of therapy.

Figures in parentheses are the percentage of patients who received any therapy.

P A R T IV

DISCUSSION

CHAPTER 16

DISCUSSION

The Outcome of Stroke Rehabilitation

The purpose of this thesis has been to test the hypothesis that a stroke unit can discharge a higher proportion of patients following onset of acute stroke who are independent in daily living activities compared with the proportion of such patients who are discharged from medical units. The hypothesis can be accepted on the basis of the statistically significant difference in outcome between stroke unit and medical unit patients which was present at the end of the acute phase of rehabilitation.

The difference in outcome at the end of the acute phase of rehabilitation occurred because higher proportions of medical unit patients were assessed as dependent or did not survive. It can be argued that the hypothesis should have been based only on the survivors of the acute phase of rehabilitation, excluding those patients whose outcome was death. If only survivors had been considered, the proportions of independent patients would have risen to 62 per cent for the stroke unit and 45 per cent for medical units. This is still a statistical difference, but at a lower level of significance ($p < 0.05$. χ^2 6.46 on 1df). But one of the principles of stroke rehabilitation is early intervention following onset in order to prevent the occurrence of complications of stroke such as contractures, bedsores or chest infections (Rehabilitation Study Group of the Joint Committee for Stroke Facilities, 1972). The development of such complications might be contributory factors to early death in stroke patients and in this context, the hypothesis which was formulated was the more relevant one to test in this thesis. However, the difference in mortality which occurred between the stroke unit (19 per cent) and medical units (28 per cent) cannot be explained satisfactorily. The difference was not statistically significant ($p > 0.05$) and could therefore have occurred by chance alone. But the difference between allocations in the distribution of deaths over time which occurred is compatible with previous reports that stroke units can reduce the number of secondary complications during the "subacute" period of seven to 10 days after onset of stroke (Drake, Hamilton, Carlsson et al, 1973; Carpenter & Reed, 1972). Surprisingly, the difference in mortality between the allocations was similar to that found in the study of Adams (1971), upon which the hypothesis which was tested in this thesis was based (Figure 8.1).

The subsequent changes which occurred between stroke unit and medical unit patients resulted in the difference in outcome disappearing by the end of the continuing phase of rehabilitation. Thus, although establishing a stroke unit improved the natural history of this disease in the short term by increasing the proportion of patients who were returned to functional independence, the improvement was not sustained in the longer term. There were two findings which could explain why the initial difference in outcome disappeared. A larger number of stroke unit patients lost their functional independence during the continuing phase of rehabilitation. This might have occurred because a higher proportion of stroke unit patients living at home who were independent at the beginning of the continuing phase of rehabilitation received human assistance throughout the follow-up period, compared with independent medical unit patients. A larger group of stroke unit patients regressed to functional dependence which might have occurred as a result of the higher level of 'protection' given by their caring relatives and friends. The data cannot explain why 'protection' in the form of a higher level of human assistance should be given to stroke unit patients by their relatives and friends after hospital discharge. Certainly, the relatives and friends of stroke unit patients must have had a heightened awareness of their patients' disabilities as a result of the higher level of communication which they had with members of the hospital staff of the stroke unit. Thus the opportunity to give adequate orientation and instruction to the family and friends of stroke unit patients about the need to maintain gains made during the acute phase of rehabilitation was available. But the extent to which this opportunity was taken cannot be ascertained from the data and the reasons why families and friends adopted a more protective role to the detriment of the long term functional outcome of stroke unit patients are not known.

The other factor which contributed to the disappearance of the difference in functional outcome between stroke unit and medical unit patients was the larger number of dependent patients from medical units who gained their independence during the continuing phase of rehabilitation. This group of patients had a much lower mean duration of hospital stay than other medical unit patients. Consequently, although a similar proportion of these patients had referrals to physiotherapy and occupational therapy, they had lower amounts and durations of treatment compared with other medical unit patients. Therefore, it can be postulated that the full rehabilitation potential of these patients had not been realised when they were discharged from hospital and they continued to improve during the continuing phase of rehabilitation. This was substantiated by observing the pattern of human assistance being received by this group of patients which decreased progressively throughout the follow-up. It can be postulated that pressure on medical unit beds could have been responsible for the early discharge of this group of patients, but there is no evidence available to support this possible explanation.

These findings emphasise the importance of undertaking a follow-up over a sufficiently long period of time in order to be certain that improvements in outcome produced by interventions in the working of health services do not disappear when the intervention is withdrawn. The findings also confirm that stroke rehabilitation is a continuing process which extends well beyond the acute phase in hospital and highlight the importance of appropriate family involvement if functional gains made through rehabilitation of the stroke patient are to be maintained. If the input of only one factor in the complex picture of stroke rehabilitation is inappropriate, incomplete or missing, the contribution of all the other factors may not lead to the successful long term maintenance of the stroke patient in the community. This was demonstrated in the study.

<u>The Use of Resources in the Acute Phase of Rehabilitation</u>

Each medical unit had access to rehabilitation staff and facilities either within its parent institution or in an affiliated hospital. So the study which forms the basis of this thesis was not about the provision of staff and facilities for stroke rehabilitation, it was about the way they were used. Differences in the use of the main components which are advocated for stroke rehabilitation have been found which could account for the improved outcome of patients admitted to the stroke unit during the acute phase of rehabilitation. It is not possible to say whether the optimum level or mix of resources have been used to achieve the improvement in functional prognosis. This information can only come from a series of trials which examine the impact of different levels of each component of stroke rehabilitation in turn, whilst maintaining the input of all other components constant. Some of the differences found in this study should form a useful baseline for planning these investigations.

It is difficult to account for the difference in outcome on the basis of differences in the traditional medical input of investigations performed, diagnoses made or drug therapy prescribed. What emerged was the very low proportion of patients in either allocation who received special diagnostic procedures as part of their medical work up. The extent to which efforts should be made to establish more specific diagnoses in elderly strokes is debatable, given the present lack of evidence that medical technology can actually improve stroke prognosis. In any event, the problems of rehabilitation are precisely the same if the patient survives, whatever the nature of the underlying vascular lesion. The difference in nursing dependency is not surprising considering the homogeneous nature of admissions to the stroke unit compared with the heterogeneous case mix of medical units. But conclusions drawn must be tentative because of the short period of observation and a larger, more definitive nursing study is required to establish the importance of both the narrower range of nursing dependency and the suggestion that an increase in nursing activity times might have occurred in the stroke unit. It is difficult to know how to interpret the differences in medical social work involvement, particularly as its content and contacts appeared to be similar in both allocations.

The most striking differences seen between allocations were in relation to the use of physiotherapy and occupational therapy. Admission to the stroke unit did not result in the intensive use of therapy that might have been implied by the creation of such a unit. What was achieved in the stroke unit was almost universal coverage of therapy and shorter delays before commencing treatment. The mean use of 21 hours of physiotherapy and 33 hours of occupational therapy for each referred patient in the stroke unit is quite modest, and significantly less than the mean consumption of occupational therapy and particularly physiotherapy amongst referred patients in medical units during the acute phase of rehabilitation. The low level of speech therapy involvement is not surprising, being similar to the level reported to be used in stroke rehabilitation by other workers (Brocklehurst, Andrews and Richards, 1978). The policy of transferring a selected group of patients from medical units after a number of weeks, and then subjecting them to intensive therapy must be seriously questioned. The failure to improve the functional outcome of this group of transfer patients compared with those who remained in the admitting medical units throughout, is further evidence that wider coverage of stroke patients with rehabilitation potential accompanied by early intervention might be a more effective answer to the problem than a late, concentrated effort.

It is difficult to determine precisely why the residue of patients with extended hospital stays was larger in medical units but it must have been due, at least in part, to the easier access to long stay hospital beds enjoyed by dependent patients from the stroke unit which was an integral part of a geriatric assessment unit. The pattern of hospital bed use in the continuing phase of rehabilitation confirmed that this is probably what occurred. The number of stroke unit patients in long stay hospital locations was stable throughout the follow-up; but in the medical unit allocation, the number of patients with extended stays in their initial hospitals was only reduced as they were transferred to long stay beds. This emphasises the importance of having adequate long term facilities available to accommodate those stroke patients who remain heavily dependent at the end of the acute phase of rehabilitation.

The Use of Resources in the Continuing Phase of Rehabilitation

A higher proportion of patients living at home who had been in the stroke unit used health and social services during the continuing phase of rehabilitation. This applied to virtually every individual hospital and community service, the difference in use between stroke unit and medical unit patients being particularly striking for physiotherapy and health visiting. There is no information available to explain why the consistent pattern of higher use of services by stroke unit patients occurred, although the better levels of communication with general practitioner and community services, combined with the higher level of hospital follow-up arranged prior to hospital discharge must have been contributory factors. The higher level of use amongst stroke unit patients occurred from the beginning of the follow-up period and was sustained throughout the continuing phase of rehabilitation. Yet it was patients from medical units whose functional outcome improved. This may have happened because less hospital and community services were being received, but the study cannot identify the nature of the relationship between changes in functional outcome and the use of services.

There were no major differences between stroke unit and medical unit patients in the levels of contact which occurred with individual hospital and community services amongst patients who received any such services. As Table 16.1 illustrates, the overall levels of contact are low when expressed as a mean number of contacts per month and confirm the findings of previous reports that the involvement of health and social services in the long term management of stroke patients is not very extensive (Harris, 1971;

Isaacs, Neville and Rushford, 1976; Carstairs, 1966; Anderson, 1978; Brocklehurst, Andrews, Morris et al, 1978). By far the most frequent contribution to the long term management of stroke patients was made by the home help service, and particular attention should be paid in future to assessing the role of the home help in the management of stroke.

TABLE 16.1

AVERAGE NUMBER OF MONTHLY CONTACTS WITH DIFFERENT SERVICES AMONGST PATIENTS WHO RECEIVED ANY HOSPITAL OR COMMUNITY SERVICES DURING THE CONTINUING PHASE OF REHABILITATION

	STROKE UNIT	MEDICAL UNITS
Hospital Outpatient Clinic	0.8	1
Day Hospital Attendance	3	3
Physiotherapy	3	3
Occupational Therapy	2	1
Speech Therapy	3	2
General Practitioner	0.8	0.8
Health Visiting	0.3	0.3
Community Nursing	2	2
Social Work	0.2	0.2
Home Help Service	9	8
Chiropody	0.3	0.2
Meals on Wheels	5	5
Voluntary Agencies	3	2

One problem which has previously been highlighted is the lack of guidelines for the provision of community services in the long term management of stroke patients (Moskowitz, Lightbody and Freitag, 1972). The study does not provide any insight into this problem because the aim of the follow-up was not to intervene but to observe the use of hospital and community services. The criteria used to allocate hospital and community resources to patients during the continuing phase of rehabilitation were not known but a measure of the need for these services, expressed as the functional outcome at the end of the acute phase of rehabilitation was used to establish the relationship between need and the use of services. The relationship was similar in both allocations. Higher levels of contact occurred for hospital services amongst dependent patients. But with the exception of community nursing, the use of community services by stroke patients living at home was not related to need (when expressed as functional dependence) during the continuing phase of rehabilitation. Whilst this criterion of need is superficial and does not reflect other aspects of need which patients might have exhibited, it was a surprising finding and emphasises the importance of establishing precise guidelines for the use of community services in the long term management of stroke.

The timing of hospital readmissions differed between stroke unit and medical unit allocations, with a higher proportion of readmissions from the former group occurring early in the follow-up. The reasons for this difference are not clear. It could be postulated that the higher number of early hospital readmissions represent stroke unit patients who had been discharged prematurely, to relatives and friends who had not been properly educated, or that patients had been rehabilitated too intensively and had regressed to a dependent state on hospital discharge. The study did not provide any evidence to substantiate these statements.

Balancing the Equation of Stroke Rehabilitation

One of the secondary aims of the study was to assess the balance of resources used during the acute and continuing phases of rehabilitation. It can be postulated that because a higher proportion of patients were functionally independent when they were discharged from the stroke unit, this would result in a reduction in the use of resources required for the long term management of stroke patients compared with the resources required for the management of the higher proportion of functionally dependent medical unit patients. What is required is to establish how any additional resources used in the stroke unit compared with medical units during the acute phase of rehabilitation are compensated for by a reduction in resources used during the continuing phase of rehabilitation. Completing this equation is extremely difficult because of the large number of different health and social service staff involved. Comparability between staff involvement in the acute and continuing phases of rehabilitation cannot be considered and financial constraints in the design and conduct of the study ruled out any attempt to calculate the economic costs of the acute and continuing phases of rehabilitation.

Only two aspects of the equation of stroke rehabilitation were considered; bed day occupancy and the use of therapy. The number of bed days used during the initial hospital admission in the stroke unit was considerably less than in medical units. This was almost entirely due to the easier disposal of dependent patients to long stay beds from the stroke unit which was an integral part of a geriatric unit. The medical units had to cope with a larger residue of patients with an extended hospital stay, this group including most of the patients subsequently transferred to long stay beds. Accordingly, fewer long stay bed days were used by medical unit patients up to the end of the continuing phase of rehabilitation. Although the timing of hospital readmissions differed, the number of bed days used was similar in both allocations. Overall, there was no saving in hospital bed days by the stroke unit and the suggestion from the 'before and after' study (Adams, 1971) that such a saving would result from the establishment of a stroke unit has not been confirmed.

The greater quantity of occupational therapy and speech therapy (but not physiotherapy) used by stroke unit patients during the acute phase of rehabilitation did not result in less use of therapy during the continuing phase. Stroke unit patients used 90 per cent more physiotherapy, 109 per cent more occupational therapy and 70 per cent more speech therapy during the continuing phase of rehabilitation compared with medical unit patients. Overall, the effect of establishing a stroke unit was to use six per cent less physiotherapy, 44 per cent more occupational therapy and 39 per cent more speech therapy with no overall improvement in functional outcome at the end of the continuing phase of rehabilitation.

The Burden of Dependency

The large reservoir of dependency present amongst stroke patients living in the community had important implications for the involvement of relatives and friends of stroke patients and for the provision and use of community health and social services. The results of the study provide insight into two important aspects of this problem. The study cannot differentiate between the burden of dependency that was necessary from that which was created by relatives and friends carrying out activities of daily living for stroke patients who were capable of doing them for themselves. There was evidence in the study that the regression to functional dependence of a larger number of stroke unit patients may have been due to the 'over-protection' by relatives and friends of those patients who were previously independent. This emphasises the importance of the proper orientation and instruction which patients' families require in order to maintain patients' maximum function following hospital discharge. There is general agreement that community health and social services have an important role to play in supporting the family as they cope with the sudden burden of dependency created when the stroke patient is discharged from hospital. But the evidence from the study suggested that only a fraction of the burden of dependency created by stroke patients living with family or friends was supported by all combined sources of community assistance. Even this disappeared almost completely at weekends. Patients living alone at home received a greater contribution from all community sources in supporting their dependency, but this applied only to weekdays. Given the size of the burden of stroke in the community, and the fact that it is likely to grow rather than diminish in the future, there is no easy solution to relieving the family and friends of stroke patients of some of the burden of dependency without a major expansion in the provision of community services to provide the required support. An alternative solution would be to concentrate on developing objective criteria of need for community services in supporting dependent stroke patients, so that a more effective distribution of existing services can be made.

The Triage of Stroke Rehabilitation

It has previously been suggested that the spirit of medical practice is to support the maximum effort for all patients, even when a proportion of patients will respond poorly to such effort (Wylie, 1964). But when resources for health services are scarce, it may be more beneficial to provide the most resources to those patients who are likely to derive the greatest benefit from available services rather than distribute a uniform level of services to all patients. Epidemiology has been used in this study to define a "high risk" or susceptible group of patients who, from knowledge of the natural history of the disease, were identified as those patients likely to derive the most benefit from intervention in the provision of rehabilitation services. The development of a simple system of triage for stroke rehabilitation which defined a middle band of stroke who were likely to derive the most benefit from admission to the stroke unit was probably an important factor in being able to accept the hypothesis which has been tested in this thesis. Validation of the selection criteria used to separate patients into upper, middle and lower bands of stroke was possible because the outcome assessment used in the study was developed in a way which was compatible with a clinically based disability scale which had previously been used to estimate functional outcome from patients' medical records. The results of the validation exercise indicated that the simple criteria used to separate patients into upper, middle and lower bands were broadly correct. The application of the triage would probably have been even more successful if it had been delayed for two or three days until more strokes had stabilised and certain patients had proved their ability to survive. This would be a better time to select patients for admission to a stroke unit as it is unlikely that a domiciliary service similar to that used to admit patients to the study could be contemplated in routine clinical practice.

Completing the Triage of Stroke Rehabilitation

Including epidemiology in the study of the working of health services enables the results to be applied to whole populations once it has been demonstrated that changes in the organisation or use of health services can alter the natural history of disease for the better. Epidemiology was used in this study as a means of estimating the number of beds which would be required for the defined population of the study. Completing the triage of stroke rehabilitation by obtaining details of a random sample of all stroke patients over the age of 60 years from the defined population who were admitted to hospital during a specified period of the study enabled the incidence rates of hospital admission for upper, middle and lower bands to be calculated. The average annual incidence rate for middle band strokes of 1.76 per 1,000 persons aged 60 years and over per annum is much lower than had originally been anticipated, but surprisingly similar to the revised estimated incidence of middle band strokes of 1.52 per 1,000 persons per annum which was made after a major shortfall in the number of patients eligible for the study had been encountered. The average annual age and sex adjusted incidence rate of 7.24 per 1,000 persons per annum was similar to the findings of previous studies for the age group being considered (Eisenberg, Morrison, Sullivan et al, 1966; Matsumoto, Whisnant, Kurland et al, 1973; Stensgaard Hansen and Marquardsen, 1977). Confirmation of the incidence rate of middle band strokes being admitted to hospital in other centres as well as the frequency and distribution of the three bands of stroke occurring in persons aged less than 60 years would be useful additions to the concept of triage which was developed for this study. However, completing the triage of stroke rehabilitation in this way does not provide any estimate of the number of middle band strokes which occurred in the defined population during the period of the study and were not referred to hospital, being retained and treated at home by general practitioners.

Two further interesting observations which can be made as a result of completing the triage of stroke rehabilitation concern the type of hospital admission which occurred and the impact of the selection criteria on the characteristics of strokes which were referred to the study. Although the Emergency Bed Bureau only received 55 per cent of all strokes for hospital placement, they were notified about 80 per cent of middle band strokes. Much lower proportions of upper band and lower band strokes obtained hospital placement through the Emergency Bed Bureau. Thus, in retrospect, the concentration of requests for hospital admission of middle band strokes through the Emergency Bed Bureau, and their onward transmission to the study provided an efficient way of identifying patients who were most likely to be eligible for the study. No less than 88 per cent of middle band strokes who went through the Emergency Bed Bureau were referred on to the study. The impact of the selection criteria for eligibility to participate in the study which were widely circulated amongst general practitioners is of interest. One in every two referred patients were eligible to participate. Major differences in the reasons why patients were ineligible to participate (or would have been if they had been referred) were discovered. For example, only six per cent of all strokes ineligible on grounds of poor conscious level were referred as were only nine per cent of patients who presented with transient ischaemic attacks. These differences could have been due to the widespread recognition amongst general practitioners and staff of the Emergency Bed Bureau that only conscious patients were eligible for the study and that likely transient ischaemic attacks would also be rejected.

Conduct of the Study

The planning of controlled trials in health care must be carried out in the context of the organisation of health services and this creates problems for the conduct of these studies which often involve many different health and social service agencies. The limitations inherent in undertaking this type of study in health care must also be taken into account. There are many facets of this study where planning worked out well in practice. But other aspects proved more difficult to implement in practice.

Adopting a multidisciplinary approach for the study in which an epidemiologist, clinician, medical statistician and a nurse combined their range of skills and expertise was an important contribution to achieving a balanced design for the study. The subsequent conduct of the study was greatly aided by the excellent collaboration and wide support which was obtained from the many health and social service agencies who were involved in the care of stroke patients.

A major contribution to the success which the study enjoyed in obtaining a sufficient number of patients to satisfy the minimum sample size required to test the hypothesis was the method of case notification and speed of response by the clinicians on call for the study. The key to entering patients into the study was the presence of the Emergency Bed Bureau of the Lothian Health Board which arranged emergency hospital admissions for all types of disease on behalf of general practitioners. The fact that the study succeeded in entering 70 per cent of all middle band strokes which occurred in persons aged 60 years and over during 1976-77 was almost entirely due to the very high notification rate to the study by staff of the Emergency Bed Bureau. No less than 88 per cent of all middle band strokes referred to the Emergency Bed Bureau in 1976-77 were notified to the study. A mean delay of only 40 minutes between notification of a potential case and the commencement of the home visit to assess clinical eligibility, carried out on a 24-hour rota basis over a period of 31 months and ultimately applied to a population of 470,000 persons, was also a major contributory factor in overcoming the problem of an insufficient number of available patients which other controlled trials in health care have experienced.

The reliability of the randomisation procedure was examined and subsequently confirmed when the comparability of the two groups was examined and found to be well balanced. Despite the high proportion of patients whose mental or sensory function could not be tested, neurological impairments at the time of entry to the study appeared to be equally distributed between the two allocations. The operation of the Activities of Daily Living (A.D.L.) Unit provided an accurate replication of a patient's home in which to assess the outcome of stroke rehabilitation under circumstances in which factors such as the emotional and psychological effects of returning home, and the presence of anxious or overprotective relatives could be excluded. The procedures undertaken to validate the selection criteria for entry to the study, the A.D.L. Unit and administration of the Nursing Dependency Index can also be judged to have been successful.

But other aspects of the study ran into problems which had not been expected or anticipated. The major practical problem which arose was a major shortfall in the number of suitable patients for the study. This occurred because of a miscalculation in the expected incidence rate of middle band strokes in the original defined population of 226,775 persons. This miscalculation was made as a result of basing estimates of middle band strokes on a non-random sample of medical records. Increasing the size of the defined population to 470,435 persons compensated for this mistake when a revised estimate of the incidence of middle band strokes, based on examination of a random sample of medical records, showed that a much lower number of suitable strokes were likely to be available in the earlier defined population.

A shortfall in the throughput of patients occurred because a higher than expected case fatality ratio was encountered. This arose because the estimate of the case fatality ratio for middle band strokes, based on a previous study of the natural history of stroke, had been set far too low. The discrepancy was not caused by using different criteria for middle band strokes, but in the timing of assessments of conscious level amongst patients in this study, and the previous study on which the estimated case fatality ratio had been based. The early notification of cases by general practitioners in this study combined with the quick response of the clinicians on call for home visits created a good working relationship between general practitioners and the study, but meant that strokes were sometimes being assessed too early, before their level of consciousness had stabilised. Thus, the study became a victim of its own success in developing an efficient way of establishing clinical eligibility for entry to the study.

A further problem was created by the lack of notice of intent to discharge amongst some of the participating medical units at the end of the acute phase of rehabilitation. This resulted in a much higher proportion of medical unit patients having their outcome assessed at the end of the acute phase of rehabilitation in their own homes, rather than in the Activities of Daily Living (A.D.L.) Unit. This discrepancy could have created doubts about the comparability of the results of functional assessments carried out in these two settings, if validation of the outcome measurement in the A.D.L. Unit during the pilot study had not confirmed that only minor discrepancies due to subject variation occurred when results of assessments carried out on the same patients in the two settings were compared.

Another difficulty which arose in practice concerned the degree of observer variation present in using the clinical examination which recorded levels of neurological function. The importance of measuring observer variation in this clinical examination was recognised from the outset of the study and considerable efforts were made to record and subsequently reduce the extent of observer variation which was present. Whilst this problem was recognised, it was not solved and there still existed considerable room for improving the group performance of the panel of consultants who participated in the study of observer variation when the decision to commence the input of patients into the study had to be taken. The apparent difference in interpretation which occurred during the assessment of observer variation between the three clinicians based in Edinburgh and the external clinical assessor, combined with the difficulty of arranging for patients in various locations to be examined twice in rapid succession meant the role of the external assessor as a monitor of bias introduced into the neurological examinations had to be abandoned. The introduction of another physician in geriatric medicine to record separate findings to those of the clinical research fellow on consecutive examinations was a poor substitute for the more extensive monitoring of clinical bias which was planned for the study. In any event, the possibility of using the results of the standard neurological examination in the comparison of functional outcome of patients could not be pursued. This was because of the high proportion of patients who could not co-operate in the clinical assessments as a result of being tired, confused or not orientated. The final difficulty which was encountered occurred in monitoring the more objective outcome assessment, when planned arrangements for the independent occupational therapist to be monitored by a member of the therapy staff from the patient's hospital broke down, either because no attending therapist was present or the preselected patient died.

Limitations of the Study

Some of the limitations which apply to the use of controlled trials in evaluating the working of health services either did not have much impact on this study or were successfully circumvented. For example, no changes in the natural history of stroke as a result of medical or surgical intervention were reported during the period of the study which in themselves, invalidated criteria adopted for the study or reduced the relevance of its findings. The baseline information required to establish the sample size before the study commenced was acquired by using the results of the 'before' and 'after' study of Adams (1971). The difficulty in defining an appropriate outcome measurement was overcome by selecting activities of daily living as the measurement of outcome and developing an objective method of assessment. The importance of observer variation was recognised, reduced, but not eliminated in the neurological examination employed in the study. There was no evidence that the presence of observer variation in the clinical aspects of the study produced any systematic bias. Observer variation was not a problem in the measurement of outcome.

But the planning, conduct and interpretation of the results of this study are subject to some of the limitations which apply to controlled trials in health care. Even though the study was undertaken in a defined population whose characteristics were broadly representative of Scotland as a whole, it cannot be assumed that the findings of the study would be useful in other areas. Different geographical areas may have different local priorities which could render the clinical importance of being able to accept the hypothesis which was tested in this thesis less relevant to a local situation. For example, the fact that the short term improvement in functional outcome amongst stroke unit patients was achieved by using more occupational therapy may rule out the possibility of establishing a stroke unit if there were no occupational therapists available in the area concerned.

The inferences which can be drawn from the study and applied to patients in other locations are also restricted because many other factors relating to the management of acute stroke in the elderly which were involved in this study must be taken into consideration. The pattern of hospital care for stroke in the defined population was similar to Scotland as a whole, except that a higher proportion of admissions were placed in medical units. But this does not exclude the possibility that hospital admission and discharge policies for stroke patients which could influence outcome might be different in other centres. Longer delays between onset and hospital admission might occur or patients could be discharged early before their full rehabilitation potential had been realised. The policy of who, where, when and how to provide treatment for acute stroke in hospital might also differ in other locations. Additional factors other than hospital admission, treatment and discharge policies might affect the outcome of stroke rehabilitation. For example, knowledge, opinions, and attitudes towards stroke amongst different members of hospital staff and patients' families may not be similar in other centres. Thus, just because the study has demonstrated that a stroke unit can return a higher proportion of patients to functional independence at the end of the acute phase of rehabilitation, does not mean that this would occur wherever stroke units are set up. This study can only point the way to the need for further evaluation at other centres, and if similar findings are made elsewhere, wider inferences may be justified.

Double blind procedures when neither patient nor doctor know which treatment is being given are widely used in therapeutic trials in order to avoid the possibility of bias. Because this study involved the use of different facilities as the alternative forms of health care being compared, blindness could not be introduced into the design of the study. One major source of bias which might have arisen in the study as a result of being unable to implement blindness could have been a change in the performance of medical units as a result of a heightened awareness of participating in the study over time. A careful search of the data was made for supporting evidence that this might have occurred, but none was found. The fact that several medical units were involved, and that each contained other stroke patients who were not participating in the study might have helped to avoid the potentially serious bias which could have arisen as the study progressed. Lack of blindness also limited the methods of data collection which could be employed; in particular, direct observation of events which occurred during the acute phase of rehabilitation could not be considered as this would have been accompanied by the risk of influencing treatment through a heightened awareness of the study. A consequence of being unable to make direct observations because of the lack of blindness was the absence of information on four important aspects of the acute phase of stroke rehabilitation.

(i) Difference in Mortality between the Stroke Unit and Medical Units

The difference in mortality between the stroke unit (19 per cent) and medical units (28 per cent) cannot be explained satisfactorily. Confirmation of previous reports (Drake, Hamilton, Carlsson et al, 1973; Carpenter and Reed, 1972) that this difference might have occurred as a result of the stroke unit reducing the number of secondary complications due to stroke would have required the kind of direct observation likely to encourage treatment bias in the absence of blindness.

(ii) Methods of Rehabilitation employed in the Stroke Unit and Medical Units

Whilst the study has provided information on the timing, duration and amount of therapy which was used by patients in the stroke unit and medical units, it was not possible to obtain any information about the actual methods of rehabilitation which were used. In particular, no data is available to indicate whether active or remedial therapy was employed, to what extent an individual or group approach to therapy was used, or which of the techniques of Brunnstrom (1964), Bobath (1970) or Knott (1956) form the basis for physiotherapy treatment in either allocation.

(iii) The Stroke Unit as a Therapeutic Community

An important contribution to the difference in outcome between the stroke unit and medical units might have been the psychological and therapeutic effect which the stroke unit had on patients. The stroke unit can be envisaged as a community where the close relationship between the hospital staff and patients played an important part in achieving a higher level of functional independence amongst its patients than occurred in medical units which offered a more conventional institutional approach. The study has provided no insight into this important aspect of stroke rehabilitation.

(iv) The Input of Different Members of the Rehabilitation Team

A major advantage which has been put forward for setting up stroke units is the opportunity to develop a collaborative policy for stroke rehabilitation (Isaacs, 1977). This should form the basis for constant and active team-work between the different members of the rehabilitation team (Feigenson and McCarthy, 1977). Whilst the study was able to obtain information on the use of several of the components which 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 could be obtained on the relationship between the contribution of these various components. For example, to what extent were the longer nursing activity times in the stroke unit due to nursing staff providing additional physiotherapy, or occupational therapy to patients when the trained therapy staff had gone off duty? Answering questions of this nature would have required the kind of direct observations which could not be considered in this study.

CONCLUSION

The hypothesis that a stroke unit could discharge a higher proportion of patients following acute stroke who were independent in daily living activities compared with the proportion of such patients who were discharged from medical units can be accepted. Differences in the use of some of the components of rehabilitation, including almost universal coverage of physiotherapy and occupational therapy and shorter delays before commencing treatment, could have contributed to the improved outcome of patients admitted to the stroke unit. But the improvement in outcome amongst stroke unit patients at the time of hospital discharge had disappeared by the end of one year. Factors which might have contributed to this final result were overprotection by the families of patients who were not permitted to carry out activities of daily living in which they were independent, and the early discharge from medical units of patients whose full rehabilitation potential had not been realised. Thus, whilst intervention in the management of stroke at an early stage after onset through the establishment of a stroke unit created a temporary improvement in the natural history of the disease, it did not provide a sustained or long term advantage over more conventional management. Stroke rehabilitation is a continuing process and prolonging the benefits of short term gains made in functional outcome through the intervention of a stroke unit requires that all the links in the chain of rehabilitation are maintained, including the proper orientation of patients' families before home discharge is arranged. Appropriate levels of support from community health and social services, based on criteria of need, are required to support families who are carrying the burden of stroke dependency in the community. Completing the triage of stroke rehabilitation has enabled the size of a stroke unit per unit of population to be calculated, and this should form a useful baseline for establishing stroke units once all the links in the chain of stroke rehabilitation have been completed. But because of the limitations inherent in carrying out controlled trials in health care, the inferences which have been drawn from this study must be widened by attempting to replicate the findings of this study in other centres before any policy to establish stroke units for the management of acute stroke in the elderly is adopted.

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APPENDIX (i) : THE CLINICAL ASSESSMENT

Definitions, instructions and the interpretation of results

Mental Function

(a) Memory Recall

Definition: The Isaac Walkey mental impairment measurement is used to test orientation and memory.

Instructions: Ask the patient the following questions in the order given (1-8) after the following introduction. "I am going to ask you a few questions to test your memory. You may find some of them rather simple, but I hope you do not mind answering them."

1. What is the name of this place / street?
2. What day is it today?
3. What month is it?
4. What year is it?
5. What age are you? (allow 1 year error)
6. In what year were you born?
7. In what month is your birthday?
8. What time is it? (allow 1 hour error)

Interpretation: (Note: ANY combination of correct answers will do)

If patient scores correct answers to

2	questions or less,	mental	function	grading	is	severe loss
3-4	"	"	"	"	"	moderate "
5-6	"	"	"	"	"	mild "
7-8	"	no apparent loss of mental function is present				

(b) Problem Solving Ability

Definition: The building beaker test is used to assess the ability of the patient to solve a simple problem.

Severe difficulty: The patient does not even begin to tackle the problem.

Moderate difficulty: The patient tackles the problem, but is unable to solve it within 90 seconds.

Mild difficulty: The patient is able to solve the problem within 90 seconds but takes longer than 60 seconds

No difficulty: The patient is able to solve the problem within 60 seconds.

Instructions: Three consecutive building beakers are used for the test. These are placed before the patient with the largest beaker in the middle and the other two on either side of it. The patient is then asked to perform the test in the following way, "Would you please build these into a column which is as high as possible".

Sensory Function

Proprioception and spatial orientation involving the left half of space are the two types of sensation to be examined.

(a) Proprioception

Definition: Proprioception is the ability to appreciate the position of the affected arm without visual assistance.

Severe difficulty:	The patient is unable to find his thumb and does not climb up the affected arm in order to locate the thumb.
Moderate difficulty:	The patient finds the affected arm, and then this leads him to the affected thumb.
Slight difficulty:	The patient aims in the right general direction but misses the affected thumb by no more than 3 inches, and is able to locate it within five seconds.
No difficulty:	The patient is able to accurately locate the affected thumb.

Instructions: The patient is asked to touch his/her nose with the forefinger of the unaffected hand. This is then repeated with the eyes closed, and if the patient is able to touch any part of the nose or touches the face no more than ½" from the nose and then finds the nose, proprioception is considered normal in the unaffected arm. The examiner will then lift the affected arm so that the hand is on a level with the patient's eyes. He will then ask the patient to grasp the thumb of the affected hand with the good hand. He will then ask the patient to release the thumb and to repeat this manoeuvre on one further occasion. The examiner will then place his left hand over the patient's eyes and will raise the patient's affected hand to well above the patient's head. The patient will then be asked to grasp the thumb as before.

(b) Spatial orientation involving the left half of space

Definition: Neglect of the left half of space is a clinically demonstrable defect of left-sided spatial orientation.

Instructions: Only patients with left-sided hemiplegia are to be examined for the presence of neglect of the left half of external space. The examiner confronts the patient and holds before his/her eyes two pencils of different colours, held one foot apart. The patient is then asked "What do you see?" If the patient is able to see both pencils, their positions should be interchanged before the patient's eyes. If once again the patient is able to indicate his/her awareness of both pencils then significant neglect has been excluded. If when the pencils are held one foot apart and the patient fails to appreciate the pencil on his left, the positions of the pencils should be interchanged and the above question repeated. The patient should then be asked if he/she is aware of the whereabouts of the pencil in his/her left visual field.

If the patient tilts his head and indicates that he/she is able to see the pencil in the left visual field then significant neglect has been excluded.

If he/she is unaware of the pencil in the left visual field, the patient has significant neglect.

Motor Function

(a) Upper Limb

Definitions:

Complete paralysis: When the patient is unable to move the affected limb and no flicker of muscular contraction is visible.

Severe weakness: When the patient is able to move the affected arm, but is unable to lift it to shoulder height and is unable to push against the examiner's hand.

Moderate weakness: When the patient is able to lift the affected arm to shoulder level but is unable to push against the examiner's hand.

Slight weakness: When the patient is able to lift the arm to shoulder height and is able to push the examiner's hand, but the affected limb is weaker than the unaffected.

No Weakness:	There is no difference in the ability of the affected and unaffected limbs to push against the examiner's hand.

Instructions: Ask the patient to lift the affected arm in front of him to shoulder height and beginning with the shoulder fully abducted and the elbow fully fixed, to push away against the examiner's hand by extending the elbow.

(b) Lower Limb

Definitions:

Complete paralysis:	When the patient is unable to move the affected limb and no flicker of muscular contraction is visible.
Severe weakness:	When the patient is able to move the limb.
Moderate weakness:	When the patient is able to lift the heel from the bed but is unable to push against the examiner's hand.
Slight weakness:	When the patient is able to lift the heel from the bed and to push the examiner's hand but the affected limb is weaker than the unaffected one.
No weakness:	Contraction against powerful resistance with normal power: no loss of function when both lower extremities are equally powerful.

Instructions: Ask the patient to lift the affected leg from the bed to push against the examiner's hand.

Postural Capability

Definitions: The assessment of the patient's ability to sit up, stand and walk with or without support.

Lying:	When the patient is unable to sit up without help, and once sat up is unable to MAINTAIN the sitting position with their legs together and flexed over the side of the bed unsupported.
Sitting:	When the patient is able to MAINTAIN the sitting position with their legs together and flexed over

the side of the bed without support but is unable to stand.

Standing: When the patient is able to MAINTAIN the standing position without support but cannot walk without human assistance.

Walking: When the patient can walk without human assistance for a distance of about ten feet.

Instructions: The patient is tested while lying supine on a bed with his head on one pillow. He must not be wearing a dressing-gown and should have no bed-clothes covering him. The examiner should then ask the patient to sit up. If he is unable to do this, the examiner should gently push the patient up from behind and after a few seconds have elapsed the patient should be asked to remain sitting and the examiner should withdraw his support. The examiner, should however, remain behind the patient and be prepared to support him if he falls back. If the patient is able to maintain the sitting position without support, he should be asked to stand. If the patient is unable to stand without help, the examiner should help him stand by supporting the unaffected arm. After a few seconds the examiner should withdraw support and ask the patient to remain standing. If he is able to stand without support, he should be asked to walk.

Communication Function

(a) Comprehension of spoken speech

Definitions: The patient's ability to respond to a verbal command.

Communication not possible: The patient is unable to follow verbal command even when shown the manowuvre.

Communication possible, but difficult: The patient is unable to follow verbal command, but is able to imitate the manoeuvre.

Communication easy: The patient is able to respond accurately to a verbal command without being shown the manoeuvre.

Instructions: The patient is asked to touch the ear of the affected side with the unaffected forefinger. For example, "Would you, please, touch your right ear with your left forefinger". If the patient is unable to carry out this manoeuvre accurately he should be shown how to by the physician who will then touch his own appropriate ear with the appropriate forefinger.

(b) Expression

Definitions:	The patient's ability to express himself by means of spoken speech.	
	Absent:	The patient is unable to convey any meaning.
	Impaired:	The patient is able to convey meaning but word formation is poor.
	Normal:	The patient's expression is normal.
Instructions:	The patient should be asked questions about the onset of his illness, his past occupation, his present whereabouts, and his home situation.	

APPENDIX (ii) : THE NURSING DEPENDENCY INDEX

ACTIVITY	CODE	PERFORMANCE LEVEL OF A.D.L. ACTIVITY
BED*	0	Able to rise and return to bed without help of any kind, either from other person, or prescribed aids.
	1	Able to rise and return to bed using prescribed aids, but without human assistance. (Does not exclude acceptance of occasional help for reasons other than necessity.)
	2	Requires the assistance of 1 person, to rise and return to bed.
	3	Dependent on the assistance of 2 persons, to rise and return to bed.
	4	Bedfast. Unable to rise, even with assistance of 2 persons, for any purpose.
DRESSING*	0	Able to dress without help of any kind, either from other person or prescribed aids.
	1	Able to dress using prescribed aids, but without human assistance.
	2	Requires the assistance of 1 person to dress.
	3	Requires the assistance of 2 persons to dress. Cannot help in any stage of the procedure.
	4	Bedfast. Bedwear only. Changed by others as necessary.
MOBILITY*	0	Able to sit down and rise up from chair, walk on level throughout house, negotiate doors, without help of any kind.
	1	Able to sit down and rise up from chair, walk on level throughout house, and negotiate doors, using prescribed aids.
	2	Requires the assistance of 1 person at some stage in procedure, either to sit down and rise up from chair, or walking on level throughout house.
	3	Requires the assistance of 2 persons either to sit down and rise up from chair, or walking on level throughout house.
	4	Bedfast.

TOILETING*	0	Able to use toilet, with appropriate regard to hygiene, without help of any kind.
	1	Able to use toilet, with appropriate regard to hygiene, using prescribed aids.
	2	Requires the help of 1 person at some stage in procedure, either for adjusting clothing, sitting down, cleansing operation.
	3	Requires the assistance of 2 persons to perform function with regard to hygienic requirements.
	4	Bedfast.
FEEDING*	0	Able to feed him/herself without help of any kind.
	1	Able to feed him/herself using prescribed aids, or adaptations.
	2	Requires the assistance of 1 person to cut up food, and can then feed him/herself.
PREPARATION of HOT DRINK, SNACK*	0	Able to make hot drink, or simple snack, handling crockery, and other utensils, without help of any kind.
	1	Able to make hot drinks, or simple snack, using kitchen aids.
	2	Dependent on 1 other person for provision of hot drinks or snacks.
ENVIRONMENT*	0	Able to conduct him/herself safely indoors with regard to control of heating, lighting, use of telephone (where available), locking front door, without help of any kind.
	1	Able to conduct him/herself safely indoors with regard to control of heating, lighting, use of telephone, locking front door, making use of aids and adaptations.
	2	Requires the help of 1 person in some or all of these areas.
WASHING and GROOMING	0	Able to wash hands and face without assistance, also clean teeth, brush and comb hair. Shave (male).
	1	Able to wash hands and face using prescribed aids, but without human assistance. Grooming also at same level.
	2	Requires the assistance of 1 person to wash hands and face. This may be to take him/her to wash-basin or bring equipment. Able to perform ablutions. Help with grooming.

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	3	Washing and grooming requires 2 persons to assist.
	4	Bedfast. Washing requires to be carried out in bed, by one or more persons.
BATHING or SHOWER	0	Able to bath or shower safely without supervision.
	1	Bathing or showering accomplished safely using prescribed aids. Or may take sponge bath.
	2	Bathing or showering requires the help of 1 person, either for supervision or physical aid.
	3	Requires the help of 2 persons for bathing.
	4	Bedfast. Bathing requires to be carried out in bed.
CHAIR	0	Able to sit down in chair and rise up throughout day as necessary, without help of any kind, either from other person, or aids.
	1	Able to sit down in chair and rise up throughout day using prescribed aids, but without human assistance.
	2	Requires the assistance of 1 person to sit down and rise up as necessary. May also use aid.
	3	Dependent on the assistance of 2 persons to sit down and rise up from chair.
	4	Bedfast.
WHEELCHAIR	0	No wheelchair required.
	1	Able to manoeuvre wheelchair, apply and release brake, without help of any kind, either from other person or aids, indoors.
	2	Requires the assistance of 1 person to manoeuvre wheelchair and for wheeling, indoors or out.
	3	Requires the assistance of 2 persons to manoeuvre wheelchair, for wheeling, managing ramp, steps.
	4	Bedfast.
BLADDER FUNCTION	0	Has full control of bladder function.
	1	Good control of bladder function, but may have occasional lapse
	2	Weak control of bladder function. Day and/or night lapse. Able to use toilet between lapses.
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	3	Incontinent. Up during day. Protective measures used. Changing is necessary with help of other person.
	4	Bedfast. Incontinent. Requires frequent changing.
BOWEL FUNCTION	0	Has full control of bowel function.
	1	Good control of bowel function, but may have occasional lapses.
	2	Weak control of bowel function. Day or night lapses.
	3	Incontinent. Up during day. Protective measures used. Changing necessary.
	4	Bedfast. Incontinent. Changing required.
MEDICATION	0	No prescribed medication required. (Does not exclude use of laxative).
	1	Capable of taking prescribed medication without supervision by other person.
	2	Taking prescribed medication requires supervision by relative.
	3	Medication supervised by District Nurse.
	4	Bedfast. Medicine given at Bedside.
TREATMENT includes SKIN CARE DRESSINGS INJECTIONS ENEMATA SUPPOSITORIES PASSIVE EXERCISE PHYSIOTHERAPY OCCUPATIONAL THERAPY CHIROPODY	0	No treatment required
	1	Treatment such as may be carried out independently under Doctor's instructions, or regular supervision by District Nurse.
	2	Treatment carried out in Day Hospital, Out-Patient Department, or Doctor's surgery.
	3	Treatment carried out by District Nurse during a Home Visit.
	4	Bedfast. Treatment depending on needs, and situation.
COMMUNICATION SPEECH AND COMPREHENSION	0	Powers of speech and comprehension unaffected. No difficulty in communication.
	1	Power of speech impaired, but capable of making him/herself understood. Comprehends what is said. Communication only slight problem.
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	2	Power of speech impaired to extent that he/she is incomprehensible to those unfamiliar with defect. Comprehends what is said. Communication difficult.
	3	Power of speech absent. Communication possible on simple level through signs and writing. Understands simple commands.
	4	Unable to communicate through speech or any other channel.
MANAGEMENT of HOUSEHOLD	0	Able to carry out light household tasks without assistance of any kind, although may make arrangements for laundry and shopping.
	1	Able to carry out light household tasks, using adaptations or aids. Arrangements for laundry and shopping.
	2	Is dependent on 1 other person in household for management of household tasks.
	3	Is dependent on Community help for management of household tasks, shopping, laundry.
	4	Bedfast. Dependent on others, according to situation.
EMOTIONAL HEALTH IN RELATION TO STROKE	0	Residual disability, if any, slight. Minimal restriction in activities. Well adjusted.
	1	Able to cope with residual disability and overcome difficulties. Good adjustment being made.
	2	Mood changeable. Periods of despondency. Not satisfied with present progress/conditions.
	3	Anxious, and easily discouraged. Requires constant reassurance.
	4	Mood tends to depression. Tearful. Labile.
SLEEP	0	Sleeps well without sedation (own report).
	1	Sleeps well with sedation (own report).
	2	Wakes once or twice during night for toilet purposes. Able to attend to own requirements. Sleeps again.
	3	Requires attention during night for toilet purposes. Able to sleep again after disturbance.
	4	Poor sleep pattern. Difficulty in falling asleep or wakes early.

TIME UP DURING DAY	0	Able to be up all day. 10 hours or more.
	1	Able to be up most of day. Rests in afternoon or retires early. Up more than 6 hours. Less than 10 hours.
	2	Able to be up morning to early afternoon. More than 3 hours, less than 6 hours.
	3	Up for short time. Less than 3 hours.
	4	Bedfast.

* The seven activities which formed the basis of the Activities of Daily Living assessment carried out at the end of the acute and continuing phases of rehabilitation.

APPENDIX (iii) : COMPOSITION OF THE RESEARCH TEAM

The following were the main responsibilities of the various members of the research team who participated in the study, together with the dates of their appointments.

Clinical Research Fellow (1975-78)

The responsibilities of this member of the research team were to conduct the initial clinical assessment of patients to determine their suitability for entry to the study, to obtain patients' and/or relatives' permission to participate in the study and to perform the randomisation. Subsequently, a weekly neurological examination was conducted on all patients during the acute phase of rehabilitation. This member of the research team was also responsible for completing patients' hospital admission and discharge forms from the hospital medical records.

Relief Medical Officer (1976-77)

This member of the research team participated in the evening and weekend on call rota which enabled the study to carry out clinical assessments for eligibility to enter the study on a 24 hour basis. The participation of this member was limited to that part of the input period in which one of the co-investigators (A.J.A.) was absent on sick leave.

Occupational Therapist (1974-79)

This member of the research team was responsible for the conduct of the Activities of Daily Living (A.D.L.) assessment which was the measurement of outcome at the end of the acute and continuing phases of rehabilitation. These assessments were either carried out in the A.D.L. Unit or in the patients' homes or other locations in hospital or the community. Assessments carried out in the A.D.L. Unit required the occupational therapist to visit patients' homes and take measurements which would be used to create the replication of patients' home circumstances in the A.D.L. Unit. Additional responsibilities included screening in hospital wards to identify those patients who were too dependent to be assessed in the A.D.L. Unit and recording details of aids and/or adaptations which had been recommended or prescribed.

Relief Occupational Therapist (1975-78)

This member of the research team was available to assist in the setting up of the A.D.L.Unit and perform outcome assessments when more than one impending hospital discharge was notified to the study within a short time period, when the workload involved in carrying out the A.D.L. assessments would have delayed patients' hospital discharges.

Registered Nurse (1974-79)

This member of the research team was responsible for the administration of the nursing dependency index during each month of the continuing phase of rehabilitation, which ascertained what patients were being permitted to do and how much of the burden of dependency was being carried by patients' families and friends; and how much by health and social services. The registered nurse also administered the distribution, and subsequent collation, of the log books which were kept by patients and their families and friends and recorded contacts which occurred with health and social service agencies.

Relief Registered Nurse (1976-78)

The nursing dependency index was administered on a different day of the week each month, according to a pattern established by a randomisation procedure which determined the day on which the nursing dependency index was first administered. Accordingly, home visits had to be carried out on every day of the week, and this member of the research team provided relief by carrying out the duties of the registered nurse on two days of the week.

Social Worker (1974-79)

This member of the research team was seconded from the Social Work Department, Lothian Region to obtain data on the social consequences of stroke. This involved interviews with patients and their relatives which were carried out immediately prior to hospital discharge, shortly after hospital discharge and at the end of the continuing phase of rehabilitation.

Computer Programmer (1978-79)

This member of the research team was responsible for the preparation of computer programmes for data analysis, checking ongoing data and updating the master data file; as well as creating, editing and manipulating the computer programme files.

Secretary (1974-79)

This member of the research team was responsible for filing and indexing all relevant information about all patients in the various stages of the study, checking and assisting with the collation and coding of completed forms and questionnaires and running the office in which members of the research team were based.