

Effective

HEALTH CARE

Stroke

Rehabilitation

Does formal rehabilitation reduce disability and handicap and improve quality of life for people who have suffered a stroke?

▶ Stroke results in a major burden of suffering for patients and their families and is a significant claim on the resources of health and social care sectors.

▶ Rehabilitation after stroke aims to minimise disability and handicap and to maximise life satisfaction for both patient and carers.

▶ There are very few well designed studies that assess the effectiveness of rehabilitation after stroke.

▶ There is some evidence that formal rehabilitation after stroke is effective and that it is best provided by well organised multi-disciplinary teams.

▶ There is sufficient evidence to suggest that remedial therapy services (speech, occupational and physiotherapy) should be provided in hospital and in the community.

▶ Purchasers should review provider contracts to assess both the organisation of and access to rehabilitation services.

▶ Much more research is required to establish which aspects of rehabilitation are most effective.

▶ Purchasers should commission good quality research evaluating the rehabilitation of stroke survivors, which should also form one of the national and regional priorities of the NHS Research and Development Programme.

A. STROKE

Stroke and its associated disability result in a major burden of suffering for patients and their families and are a significant claim on the resources of the health and social care sectors.

A.1 Stroke, a broad diagnostic term, is due to a disturbance of the blood supply to a section of the brain. The consequence is the loss of function of that part of the brain resulting in death or varying degrees of disability.

A.2 Approximately 100 000 first-ever strokes occur in Britain each year (2 per 1000 population per year¹). One in four occur in people under 65 years old. A district with a population of 250 000 can expect to see 500 (0.2%) first-ever and 100 (0.04%) recurrent stroke cases per year.

A.3 Since the rate increases with age (Figure 1), demographic changes over the next 20 years could result in stroke becoming an increasing cause of mortality and morbidity, placing more strain on hospital and community resources².

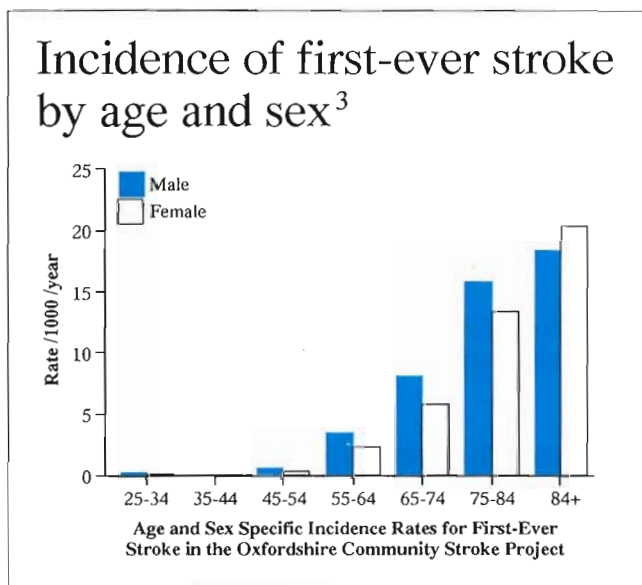


Figure 1

A.4 Around 20% of all stroke victims die in the first four weeks, usually as a direct result of the stroke, with a further 10% dying within a year³. In 1990, stroke accounted for almost 12% of deaths from all causes in England and Wales⁴.

A.5 Around 4% of the NHS budget is spent annually on cerebrovascular disease (the majority of which is directed towards the aftermath of stroke)⁵. Up to 75% of patients who suffer a stroke are admitted to hospital^{6,7}.

Stroke patients occupy approximately 12% of beds on general medical wards^{2,5}. Based on data from Oxfordshire, a district with a population of 250 000 is likely to devote around 30 beds to the medical care of stroke patients who have recently had a stroke⁶. Approximately 12% of stroke patients who survive are in institutional care one year following their stroke⁸.

A.6 A typical district of 250 000 will have around 1500 (0.6%) survivors of strokes living in the community⁹. Around 750 (0.3%) will have a significant level of disability, remaining dependent in at least one basic daily living activity six months after their stroke.

A.7 The consequences of a stroke for an individual can be devastating. Of those that survive 50% have some significant disability due to the loss or impairment of use of a limb (paresis), difficulties with speech (aphasia/dysphasia), or a decline in intellectual function.

A.8 Most survivors of stroke recover rapidly during the first three months, regardless of whether or not they receive formal rehabilitation. This spontaneous recovery can be impressive, although the rate of improvement diminishes, and it is most unusual for improvement to continue beyond one year after stroke⁹.

A.9 Strategies to combat the problem of stroke must consider a number of different approaches, such as the prevention and acute treatment of stroke, rehabilitation after stroke, and the need to provide supportive services for stroke survivors and their families.

B. REHABILITATION AFTER STROKE

Rehabilitation after stroke aims to minimise disability and handicap and to maximise life satisfaction for both patient and carers. Rehabilitation services in the UK are varied in organisation, content and availability.

B.1 The aims of rehabilitation after stroke are¹⁰:

- to aid physical recovery from stroke;
- to promote physical, psychological and social adaptation to stroke-related disability and handicap;
- to encourage a return to independence and activities of daily living;
- to prevent secondary complications of stroke¹¹ and related conditions, such as pneumonia and depressive illness¹².

B.2 Although this bulletin deals specifically with rehabilitation after stroke, rehabilitation services are used by patients with disability caused by many different diseases and injuries, some with needs very similar to

those of stroke patients, for example certain victims of head injury and multiple sclerosis.

B.3 Whilst formal rehabilitation services for patients usually commence around one week after a stroke, the general and nursing care that patients receive immediately after their stroke (ie within the first week) may also have a rehabilitative effect.

B.4 The range of services that constitute a package of formal rehabilitation care include those provided by nurses, remedial therapists (physiotherapists, occupational therapists and speech therapists [Tables B1, B2 and B3]¹³), doctors, social workers, counsellors, orthoptists, and chiropodists amongst many others. A variety of aids and adaptations are used by stroke patients.

B.5 There are at least 23 consultants in rehabilitation medicine in post in Great Britain¹⁴⁻¹⁷, and there is pressure for the development and coordination of an integrated stroke service which includes acute and long term care^{2,18}.

B.6 There is diversity in the organisation of rehabilitation at a local level¹⁸. Services can be based on general wards, on specialised stroke 'units', in dedicated general rehabilitation departments, and in the community. There are a number of different schools of training and practice within different remedial therapy disciplines.

TABLE B1

The role of the occupational therapist in stroke rehabilitation

1. Assessment
To determine the degree of disability and handicap and the potential to overcome problems of daily living
 - a) Physical – perceptual problems, ranges of movement
 - b) Activities of Daily Living status – eg eating, dressing, washing, transfers
2. Training therapy
To help the patient achieve maximum functional ability
3. Home care
To ensure that the patient is safe and independent in the community
 - a) Pre-discharge home visit
 - b) Provision of aids
 - c) Liaison with community services eg structural alterations
4. Psychological support and counselling for patient, family and carers
5. Educating patient, family, carers and professionals

Adapted¹³

TABLE B2

The role of the physiotherapist in stroke rehabilitation

1. Assessment as a basis for treatment after stroke onset to determine:
 - levels of motor and sensory impairment
 - deviations from normal movements and posture
 - level of functional disability
2. Early correction of positioning and functional movement
3. Therapeutic programme based on a variety of concepts of treatment including Prospective Neuromuscular Facilitation and Bobath which is the most commonly used in Britain
4. Use of physical agents such as ice and heat to relieve secondary symptoms such as pain or muscle spasm
5. Provision of aids when appropriate
6. Educating patients, family, carers and professionals
7. Psychological counselling and support for patients, family and carers

Adapted¹³

C. DIFFICULTIES IN INTERPRETING REHABILITATION RESEARCH

There are very few well designed and reliable randomized controlled trials that assess the effectiveness of rehabilitation after stroke.

C.1 Studies typically compare different 'packages' of rehabilitation. However, the elements of these packages are often poorly described and thus difficult to compare.

C.2 Difficulties in research are compounded by the fact that most patients make some 'spontaneous'

TABLE B3

The role of the speech therapist in stroke rehabilitation

1. Providing detailed assessment of speech, language and swallowing difficulties
2. Advising staff on how to handle specific receptive and expressive difficulties in stroke patients
3. Advising and counselling patients, carers and relatives
4. Stimulating recovery by special language techniques
5. Monitoring and reviewing progress
6. Educating patient, family, carers and professionals
7. Provision and maintenance of a means of communication for the patient.

Adapted¹³

improvement after stroke in the absence of formal rehabilitation.

C.3 Given these difficulties, the randomized controlled trial (RCT) is the best design available for assessing the effectiveness of rehabilitation after stroke¹⁹. Therefore this bulletin concentrates on evidence available from RCTs.

C.4 In RCTs, patients are randomly allocated to two or more groups, one of which acts as a control group receiving conventional or no treatment. The aim of randomization is to make the groups equal in all other respects.

C.5 In order to maintain objectivity patients and particularly observers (ie the people who are measuring any improvement) should be kept unaware of whether they are in the treatment or control group (blinding). This is rarely achieved satisfactorily.

C.6 A variety of outcome measures are used, including several different Activities of Daily Living (ADL) scales. Many of these have not been adequately validated, some are not sensitive to change and it is often not clear what aspects of disability are being measured. It is difficult to compare or combine the results of different trials where different outcome measures have been used.

C.7 It is also difficult to compare the results of studies if age and patient characteristics that influence recovery and survival are not similar.

C.8 In the field of rehabilitation after stroke, there are very few well designed and reliable RCTs. Despite the paucity and often poor quality of such trials in rehabilitation research (although improving in recent years) there are some general conclusions that can be made.

D. IS REHABILITATION AFTER STROKE EFFECTIVE?

There is some evidence that occupational and physiotherapy after stroke is effective. The evidence that speech therapy for aphasia after stroke is an effective treatment is conflicting. More good quality research is required.

Occupational and Physiotherapy

D.1 Table D1 gives a summary of the main published controlled trials in rehabilitation effectiveness.

D.2 An improvement in activities of daily living has been demonstrated for patients receiving intensive and conventional occupational and physiotherapy up to six months after discharge compared with a control group who received no formal rehabilitation²⁰. The intensive group attended out-patients for four full days a week. Conventional rehabilitation consisted of three half days attendance at out-patients each week.

D.3 The extra improvement achieved by the treated groups could have amounted to the difference between an individual being able to dress and wash without help.

D.4 The study excluded nearly 90% of patients, by examining only those with a moderate disability²⁰. This reduced its ability to demonstrate the effectiveness of rehabilitation in other stroke patients.

D.5 In another study, elderly stroke patients with difficulties in mobility showed a 4 second (9%) decrease in the time taken to walk 10 metres after physiotherapy²¹. After cessation of treatment patients experienced a gradual decline in mobility.

D.6 There are no reliable RCTs which study the effectiveness of occupational therapy as a treatment.

Speech therapy

D.7 An American study with a high drop out rate (23%) showed an improved outcome for patients treated by speech therapists compared with those receiving no treatment²². Most of the overall improvement was due to spontaneous recovery. The measurement of outcome did not extend beyond 24 weeks, so the longer term effects of treatment were not demonstrated. This study provides evidence that speech therapy is an effective treatment for aphasia as a result of stroke.

D.8 A British study found no difference between the improvement of a group receiving speech therapy and a group receiving no speech therapy²³. However the amount of speech therapy received by the treatment group was small (two hours per week). Only 45% of the speech therapy group completed the trial. This study

suggests that some packages of speech therapy used in clinical practice are ineffective.

D.9 While the evidence from published trials does seem to suggest that rehabilitation after stroke is effective, the evidence is clearly not as good as we would like. Further good quality research (Section G below) is required to assess the effectiveness of rehabilitation after stroke.

1. When is rehabilitation most effective?

There is currently no convincing evidence that the timing of therapy improves long term outcome.

1.1 Examination of the effectiveness of early or delayed rehabilitation after stroke is complicated by spontaneous recovery⁹.

Physiotherapy

1.2 There is some recent evidence that physiotherapy produces a slight improvement in mobility when given to a group of elderly patients one year after stroke²¹. The patients involved demonstrated an improvement late after stroke from community physiotherapy compared with a control group who did not receive physiotherapy.

Speech therapy

1.3 A study of the effectiveness of speech therapy demonstrated a measurable improvement in the language abilities of stroke patients after 12 weeks of therapy which was given soon after their stroke, compared with no therapy²². However, when the no-therapy group was given the same package of speech therapy 12 weeks later they demonstrated a similar level of improvement, suggesting that the exact timing of therapy is not crucial.

2. Where should rehabilitation be provided?

Well organised multi-disciplinary rehabilitation increases the rate of improvement in stroke patients, although the long term effectiveness is unclear.

The 'unit' approach

2.1 There is little agreement in the definition of a stroke 'unit'. It ranges from a specialised multi-disciplinary

team who provide services wherever a patient is situated to a defined ward of variable size on which care is provided by a stroke team. Common features of stroke 'units' include a multi-disciplinary approach and a well-organised mode of delivery of services.

2.2 Two British studies have examined the effectiveness of stroke 'units' in promoting independence among elderly rehabilitation patients²⁴⁻²⁷. There are also several controlled studies (some randomized) from other countries which provide evidence about the effectiveness of rehabilitation in stroke 'units'²⁸⁻³⁴. All these studies compare rehabilitation conducted in a stroke 'unit' with conventional care on general medical wards.

2.3 A significant advantage was described in elderly patients who received a non-intensive rehabilitation regime in a stroke 'unit' compared to those receiving a similar mix of therapies on general medical wards when measured around 60 days after stroke²⁴⁻²⁶. When those who had died during this period were excluded from the results, 62% of the stroke 'unit' group and 45% of the control group were found to be independent. However, the difference between the groups was not present after a year. These findings have been replicated elsewhere²⁷.

2.4 A maintained improvement after one year has been demonstrated, with 63% of stroke 'unit' patients and 45% of general medical ward patients living at home at the end of one year³⁰. The stroke 'unit' group also had a significantly improved ADL score. However it is not clear to what extent the improvement was attributable to enhanced medical care during acute stroke or to subsequent rehabilitation. These findings replicate those found less reliably elsewhere^{28,29}.

2.5 Other studies using similar outcome measures do not show convincing evidence that stroke 'unit' care is preferable to conventional care on general medical wards^{33,34}. These trials, however, had only small numbers of patients.

2.6 What is clear from these studies is that there is a more rapid rate of recovery in stroke 'units'. However, there is conflicting evidence of the long term effects.

2.7 The costs of rehabilitation in a stroke 'unit' may not differ significantly to those incurred through conventional treatment on general medical wards³¹. In one study the degree of rehabilitation was in fact less for the stroke 'unit' group than for the general medical ward group²⁶.

Community based

2.8 There is some evidence that rehabilitation can be provided in an effective way in the community²¹, though one study failed to show any reduction in hospital use from the introduction of domiciliary based home care service³⁵.

2.9 A recent trial³⁶ of day hospital care compared with home based physiotherapy demonstrated a significant, though modest, improvement in outcome for patients receiving physiotherapy at home when measured at six months³⁷. In both groups around a quarter of carers were emotionally distressed.

TABLE D1

Reference / Year / Country	Sample	Trial Method	Main Outcome Measures / Timing	Conclusion
Feldman <i>et al</i> ³² 1947–1956 US	Hospital admissions n^T (size of trial group) = 42 n^C (size of control group) = 40	Patients randomly allocated to 'functionally orientated medical care' or formal rehabilitation.	a) Neuromuscular deficit b) Activities of daily living (ADL) scores c) Place of discharge Assessed up to 1 year	The great majority of hemiparetic stroke victims can be rehabilitated adequately on medical and neurological wards without formal rehabilitation services if proper attention is given to ambulation and self care activities.
Garraway <i>et al</i> ^{24,25} Smith <i>et al</i> ²⁶ 1975–1978 Scotland	Hospital admissions n^T = 155 n^C = 152	Patients randomly admitted to either a stroke unit or conventional care on a general medical ward.	a) Barthel ADL scores assessed as dependent or independent b) Mortality c) Onset of therapy Assessed up to 1 year	There was an improvement in functional outcome of stroke unit patients at discharge. At one year of follow up this difference was not apparent.
Stevens <i>et al</i> ²⁷ 1978–1979 Kent	Hospital admissions n^T = 112 n^C = 116	Patients randomly admitted to a stroke unit or conventional care on a general medical ward.	a) Rankin disability scale b) Mortality c) Complications d) Duration of stay e) Follow-up appointment given f) Place of care after discharge Assessed up to 1 year	At one year patients in the stroke unit had a better outcome in terms of survival and proportion returning to the community.
Strand <i>et al</i> ^{28,29} 1979–1981 Sweden	Hospital admissions n^T = 110 n^C = 183	Patients non-randomly allocated to a non-intensive stroke unit or conventional care on a general medical ward.	a) Place of stay b) Mortality c) ADL scores d) Duration of stay Assessed up to 1 year	Patients in the stroke unit had significantly improved in some aspects of function at one year. Fewer stroke unit patients were in an institution at one year.
Indredavik <i>et al</i> ³⁰ 1986–1987 Norway	Hospital admissions n^T = 110 n^C = 110	Patients randomly admitted to an acute stroke unit or conventional care on a general medical ward.	a) Proportion at home/institution b) Barthel ADL scores c) Neurological deficit score d) Mean institutional stay during first year Assessed up to 1 year.	Functional state was significantly better for patients in the stroke unit. Stroke unit patients were also more likely to be at home one year after their stroke.
Wood-Dauphinee <i>et al</i> ³³ 1979–1981 Canada	Hospital admissions n^T = 64 n^C = 62	Patients randomly allocated to hospital rehabilitation in team care or 'traditional' care.	a) Motor function b) Barthel ADL scores Assessed up to 5 weeks	Team and traditional care patients fared similarly in motor and functional outcomes.
Wade <i>et al</i> ³⁵ 1984 Bristol	Community stroke register n^T = 440 n^C = 417	Non-randomised provision of additional home care support or conventional community support.	a) Barthel ADL scores b) Frenchay Activities Index of social functioning c) Wakefield depression inventory d) General Health Questionnaire for carers e) Use of hospital services during trial Assessed up to 6 months	There was no difference in functional recovery or stress on carers. Home care support patients used more hospital bed days.
Young <i>et al</i> ^{36,37} 1991 Bradford	Hospital admissions n^T = 61 n^C = 63	Patients randomly allocated to day hospital rehabilitation or domiciliary rehabilitation after discharge.	a) Functional Ambulation Categories b) Barthel ADL scores c) Motor Club Assessment d) Frenchay Activities Index e) Nottingham Health Profile f) General Health Questionnaire – carers Assessed up to 6 months after discharge	Home physiotherapy is slightly more effective than day hospital attendance and should be the preferred rehabilitation method for stroke aftercare.

3. How much rehabilitation should be provided?

Intensive physiotherapy has produced improved outcomes but is only applicable to a minority of stroke patients. Speech therapy in greater intensity for aphasia has produced improved outcomes.

Occupational and physiotherapy

3.1 There is evidence that intensive rehabilitation, defined as attendance at out-patients four full days per week, may benefit a 'middle band' (around 10%) of stroke patients healthy enough to undergo the rigours of an intensive occupational and physiotherapy regime²⁰.

However, the advantage beyond what would be expected from less intensive therapy (ie three half days per week) is limited^{20,38} and may not be sustained.

3.2 Any improvements that may occur for the individual patient^{20,38,39} must be considered along with the personal costs associated with intensive rehabilitation regimes, in terms of time and physical discomfort⁴⁰.

Speech therapy

3.3 An American study demonstrated an improved outcome from an average nine hours per week of speech therapy for aphasic patients²², while a British study found no significant improvement in outcome for patients receiving only two hours of speech therapy per week (a level representative of speech therapy for stroke patients in the NHS)²³.

Hamrin ³⁴ 1977–1978 Sweden	Hospital admissions $n^T = 60$ $n^C = 52$	Patients non-randomly allocated to either an 'early systematic activation' programme or conventional care on a general medical ward.	a) Activity Index (mental and motor function and ADL) b) Mortality c) Place of discharge Assessed up to 1 year	Although at four weeks there were improvements in activity in both groups, there was no significant difference between groups.
Smith <i>et al</i> ²⁰ 1972–1978 London	Hospital admissions n^{T1} (intensive) = 46 n^{T2} (conventional) = 43 n^C (no therapy) = 44	Patients randomly allocated to either an intensive, conventional or no formal out-patient physiotherapy group.	a) ADL scores Assessed up to 1 year	There was a significant difference between intensive and no formal out-patient physiotherapy at one year.
Sivenius <i>et al</i> ³⁹ 1978–1980 Finland	Community stroke register $n^T = 50$ $n^C = 45$	Patients randomly assigned to intensive or conventional rehabilitation.	a) ADL scores b) Neuromuscular deficit in limbs on affected side c) Mortality d) Place of care at 12 months Assessed up to 1 year	There was a difference in ADL and motor function up to one year after stroke.
Sunderland <i>et al</i> ³⁸ before 1992 Bristol	In and out-patient referrals $n^T = 65$ $n^C = 67$	Patients randomly allocated to an intensive physiotherapy group or a conventional physiotherapy group.	a) Strength and range of movement (extended Motricity Index) b) Functional Motor Skills and Manual Dexterity (Frenchay Arm, Nine Hole Peg Test (NHPT)) c) Background measures (sensory loss, Barthel ADL scores, depression, dysphasia) Assessed up to 6 months	Improved arm function in the treatment group.
Wade <i>et al</i> ²¹ before 1992 Oxford	Community recruitment n^T (received physiotherapy first) = 49 n^C (received physiotherapy second) = 45	Patients with a mobility problem one year after stroke randomly assigned to a physiotherapy treatment group or a no treatment group (cross-over trial).	a) Motricity Index b) Functional Ambulation Categories c) Rivermead Motor Assessment d) Barthel ADL scores e) Frenchay Activities Index f) Gait Speed g) Rivermead Mobility Index h) Nottingham Extended ADL i) Background measures (Hospital Anxiety and Depression Scale and NHPT) Assessed up to 9 months	Speed of mobility improved in the treatment phases of both groups. There was a general decline in gait speed when not being treated.
David <i>et al</i> ⁴¹ before 1982 Bristol	Speech therapy referrals (multi-centre) n^T (speech therapists) = 155 n^C (volunteers) = 84	Patients randomly allocated to a standard speech therapy group or a volunteer treatment group.	a) Functional Communication Profile (FCP) Assessed up to 12 weeks	No difference between groups, both improved. Timing of treatment does not appear to make a significant difference
Wertz <i>et al</i> ²² before 1986 US	In and out-patients in 5 hospitals n^1 (speech therapists for 12 weeks) = 38 n^2 (volunteers for 12 weeks) = 43 n^3 (no treatment until 12 weeks) = 40	Patients randomly allocated to standard clinic treatment by speech therapists, home treatment by a trained volunteer or no treatment (cross-over trial).	a) Porch Index of Communicative Ability (PICA) Assessed up to 24 weeks	Clinic treated patients had significantly improved at 12 weeks compared to the no treatment group. There was no difference between clinic and volunteer groups at 12 weeks.
Lincoln <i>et al</i> ²³ before 1984 Nottingham	Hospital admissions $n^T = 104$ $n^C = 87$	Patients randomly allocated to a conventional speech therapy group and a no-treatment group.	a) PICA b) Functional Communication Profile (FCP) c) Boston Diagnostic Aphasia Examination (BDEA) Assessed up to 34 weeks	There was no significant difference between groups.
Meikle M <i>et al</i> ⁴² 1976–1978 London	Referrals from hospital consultants and GPs $n^T = 16$ $n^C = 15$	Patients randomly allocated to a conventional speech therapy group or a volunteer treatment group.	a) Porch Index of Communicative Ability (PICA) Assessed up to 2 years	There were no significant differences found between the two groups.

4. Who should provide rehabilitation: professionals or volunteers?

There is some evidence that professionally supported volunteers may be as effective as speech therapists.

4.1 Many stroke patients who have a disability are never admitted to hospital. The potential role of carers or volunteers in rehabilitating stroke patients is therefore important. The only area where the use of volunteers in rehabilitation has been evaluated is in speech therapy.

4.2 Around a third of stroke survivors experience speech difficulties as a result of stroke (aphasia/dysphasia)²³. Volunteers are used in a variety of guises to assist in the

treatment of speech difficulties related to stroke^{22,41,42}.

4.3 In one trial speech therapists and professionally supported volunteers were compared⁴¹. Both groups improved and there was no significant difference in their progress. The trial had a high drop out rate (38%) and a low (but representative) treatment level (an average 1.5 hours a week by qualified speech therapists). This trial indicates that professionally supported volunteers are as effective as professional speech therapists at these low (but representative) levels of therapy.

4.4 A British study which found no significant difference between treatment from professional speech therapists and trained volunteers was too small to be able to detect differences⁴².

4.5 An American study with a high drop out rate (23%) compared a group of home volunteer treated patients with speech difficulties with a no treatment group²².

Although the home therapy group improved more than the no therapy group the difference was not statistically significant.

4.6 There are clear cost implications, particularly in the light of the changes in community care arrangements, related to the use of volunteers or unqualified health care workers for speech therapy duties.

E. VALUE FOR MONEY IN REHABILITATION

Information on the cost-effectiveness of rehabilitation is essential but lacking.

E.1 There are no recent studies assessing the cost-effectiveness of stroke rehabilitation despite the considerable resources allocated to it.

E.2 Differences in the effectiveness of various strategies of care may be limited to variations in the rate of improvement. If two programmes are equally effective, then adopting the less costly will result in savings that can be used elsewhere. If the two programmes are not equally effective then the question becomes what extra benefits are obtained and at what cost.

E.3 More active approaches to rehabilitation, leading to shorter stays, may not reduce costs per case if more staff are ultimately required. Whether released beds represent a saving depends upon how they are used. The long term effect may be increased total expenditure due to a greater turnover of patients.

E.4 It is important that the cost-effectiveness of different aspects of rehabilitation after stroke (both organisational and its component parts) is examined so that resources can be used to the best benefit of the stroke patient⁴³. It is essential to measure the resource implications of different strategies.

F. IMPLICATIONS FOR PURCHASERS

Commissioning issues in stroke rehabilitation

F.1 Much more research is required to establish which aspects of rehabilitation are most effective and what organisational forms it should take. Purchasing authorities should not interpret the lack of reliable evidence as

an implication that rehabilitation after stroke is not effective.

F.2 There is some good evidence that rehabilitation after stroke is effective and which suggests that rehabilitation after stroke is most effective when provided by a well organised multi-disciplinary team.

F.3 There is no information to evaluate the effect of appointing consultants in rehabilitation medicine.

F.4 There is sufficient evidence to suggest that access to remedial therapy services (speech, occupational and physiotherapy) should be provided both in hospital and the community, over and above nursing care, for survivors of the acute phase of stroke.

F.5 Purchasers should review provider contracts with the aim of assessing both the organisation of and access to rehabilitation services. Where these are poor, measures should be taken to redress this situation.

F.6 The level of research is too low given the resources allocated to rehabilitation after stroke. Because purchasers are in the position to define questions appropriate to the local situation, they should be commissioning research among providers.

F.7 Research and development is an essential activity, indeed a prerequisite, for achieving a cost-effective health service responsive to changes in needs as well as innovation⁴⁴. Research evaluating the rehabilitation of stroke victims should form one of the national and regional priorities of the NHS Research and Development Programme.

Community care issues in stroke rehabilitation

F.8 Changes in the funding of community care, which come into effect in April 1993, are likely to have important consequences for the provision of health and social care to stroke survivors. Major resources currently spent on funding private residential and nursing home care are to be transferred to local authorities, although they will not be ring-fenced.

F.9 People with significant disability requiring long term care, most of whom will have had a stroke, will be subject to a process of individual assessment organised by social services departments, although the process may be carried out by NHS staff on their behalf or through multi-disciplinary teams.

F.10 The establishment of a more systematic process of assessment and case management together with the involvement of family and carers in that process offers the possibility of improvements to the quality of care for stroke survivors.

F.11 Strategies that lead to shorter stays in hospital, the development of community-based rehabilitation, and the use of carers and volunteers are all important enough to need thorough evaluation if effective personalised care packages for stroke survivors are to be created.

F.12 Much work is needed at the local level to establish the organisation of the interface between health and social sectors⁴⁵.

G. ADVICE TO PURCHASERS ON COMMISSIONING RESEARCH

G.1 The lack of good evidence on which to base clear purchasing decisions reflects the small number and poor quality of studies on the effectiveness of rehabilitation after stroke⁴⁶⁻⁴⁹. Purchasers should therefore commission good quality research. If purchasers are to use resources effectively in commissioning research, the following guidelines on the characteristics of good research design may be helpful.

Adequate numbers

G.2 The numbers of patients included in a trial (size) must be sufficient in order to have a reasonable chance of detecting a clinically important difference as statistically significant. This will decrease the chance of getting false negative conclusions (type II errors). The size of study should also be large enough to allow subgroup analysis (for example by severity of stroke) so that classes of stroke patients likely to benefit from formal rehabilitation may be identified.

Need for controls

G.3 The impact of spontaneous recovery after stroke must be considered at all stages of study design and analysis. Therefore all studies must involve a comparison between at least two groups of patients, either therapy versus no therapy or comparing two or more different therapies. Studies which measure outcomes in only a single group of patients before and after rehabilitation will not be able to distinguish between a change due to spontaneous recovery and that attributable to the therapy.

The therapy

G.4 Investigators should clearly define the aspect of rehabilitation that is being evaluated. Awareness of the timing, amount, duration and types of therapy employed in a trial is important for standardisation and cross-study comparisons.

Outcome measures

G.5 Rehabilitation trials should consider a profile of outcome measures which addresses the various dimensions of impairment, disability and handicap that can follow a stroke. The development and use of patient and carer-centred outcomes should be encouraged, such as measures of well-being, quality of life and satisfaction.

All outcome measures should have been formally

validated, tested for reliability and known to be sensitive to change. Standardisation of these measures is needed so that studies can be compared.

More emphasis is required on the follow-up of patients beyond a year after their stroke and therapy.

Blinding

G.6 In order that subjective preferences by researchers for one therapy or another does not unduly influence their assessment of patients, those measuring outcomes in the trial should be unaware of which form of rehabilitation a patient received (blinding). This may be done by using an external independent assessor.

Costs in rehabilitation

G.7 Measurement of costs as well as outcomes is essential⁵⁰. Researchers should record significant resource use, such as:

- length of stay (eg in NHS facilities, other institutions),
- time with remedial therapists,
- diagnostic tests performed, drugs, aids and adaptations,
- costs in the community (eg GP and community nurse visits),
- day hospital and out-patient attendance,
- local authority social services (eg home help, meals-on-wheels, respite care),
- personal costs to patients and carers.

Selection

G.8 Patients selected for a trial should be representative of the type of patients to whom the trial's findings may be applied. Therefore if one wishes to examine the effect of therapy on stroke patients in general, exclusive use of those admitted to hospital would be too restrictive, and ideally the sampling frame should be based on community stroke registers compiled from multiple sources.

Whilst restricting selection to a narrower band of patients (eg by severity) can be important in improving the comparability in the study groups (internal validity), this has meant that the results have been applicable to only a minority of patients.

Acknowledgements

Effective Health Care would like to acknowledge the helpful assistance of the following who acted as consultants to the project and of the many others who helped in the preparation of this bulletin: Professor A Chamberlain, Dr M Dennis, Professor GP Mulley, Professor R Tallis, Dr DT Wade, Mr G Wistow. The views expressed are those of the *Effective Health Care* Research Team and not necessarily those of the Department of Health.

References

1. Bamford J, Sandercock P, Dennis M *et al*. A prospective study of acute cerebrovascular disease in the community: the Oxfordshire Community Stroke Project. 1. Methodology, demography and incident cases of first-ever stroke. *J Neurol Neurosurg Psychiatry* 1988;51:1373-80.
2. King's Fund Consensus Statement. Treatment of stroke. *BMJ* 1988;297:126-8.
3. Bamford J, Sandercock P, Dennis M, Burn J, Warlow C. A prospective study of acute cerebrovascular disease in the community: The Oxfordshire Community Stroke Project - 1981- 86. 2. Incidence, case fatality rates and overall outcome at one year of cerebral infarction, primary intracerebral and subarachnoid haemorrhage. *J Neurol Neurosurg Psychiatry* 1990;53:16-22.
4. Department of Health. The health of the nation. London: HMSO, 1991. (Cm 1523).
5. Office of Health Economics. Stroke. (Series of papers on current health problems, 89). London: Office of Health Economics, 1988.
6. Wade DT, Langton-Hewer R. Hospital admission for acute stroke: who, for how long, and to what effect? *J Epidemiol Commun Health* 1985;39:347-52.
7. Bamford J, Sandercock P, Warlow C, Gray M. Why are patients with acute stroke admitted to hospital? *BMJ* 1986;292:1369-72.
8. Legh-Smith J, Wade DT, Langton-Hewer R. Services for stroke patients one year after stroke. *J Epidemiol Commun Health* 1986;40:161-5.
9. Langton-Hewer R. Rehabilitation after stroke. *Q J Med* 1990;76:659-74.
10. Stroke-1989: recommendations on stroke prevention, diagnosis, and therapy. Report of the WHO Task Force on Stroke and Other Cerebrovascular Disorders. *Stroke* 1989;20:1407-31.
11. Goldberg G, Berger GG. Secondary prevention in stroke: a primary rehabilitation concern. *Arch Phys Med Rehabil* 1988;69:32-40.
12. House A. Depression after stroke. *BMJ* 1987;294:76- 8.
13. Mulley GP. Practical management of stroke. London: Croom Helm, 1985.
14. *Hansard* 1991, 18 October, col 266.
15. *Hansard* 1991, 18 October, col 271.
16. *Hansard* 1991, 18 October, col 284.
17. *Hansard* 1991, 22 October, col 557.
18. Dennis M, Warlow C. Strategy for stroke. *BMJ* 1991;303:636-8.
19. US Preventive Services Task Force. Guide to clinical preventive services: an assessment of the effectiveness of 169 interventions. Baltimore: Williams and Wilkins, 1989.
20. Smith DS, Goldenberg E, Ashburn A, Kinsella G, Sheikh K, Brennan PJ, *et al*. Remedial therapy after stroke: a randomised controlled trial. *BMJ* 1981;282:517-20.
21. Wade DT, Collen FM, Robb GF, Warlow CP. Physiotherapy intervention late after stroke and mobility. *BMJ* 1992;304:609-13.
22. Wertz RT, Weiss DG, Aten J, Brookshire RH, García-Buñuel L, Holland AL, *et al*. Comparison of clinic, home, and deferred language treatment for aphasia: a Veterans Administration Cooperative Study. *Arch Neurol* 1986;43:653-8.
23. Lincoln NB, McGuirk E, Mulley GP, Lendrem W, Jones AC, Mitchell JRA. Effectiveness of speech therapy for aphasic stroke patients. *Lancet* 1984;1:1197-200.
24. Garraway WM, Akhtar AJ, Prescott RJ, Hockey L. Management of acute stroke in the elderly: preliminary results of a controlled trial. *BMJ* 1980;280:1040-3.
25. Garraway WM, Akhtar AJ, Hockey L, Prescott RJ. Management of acute stroke in the elderly: follow-up of a controlled trial. *BMJ* 1980;281:827-9.
26. Smith ME, Garraway WM, Smith DL, Akhtar AJ. Therapy impact on functional outcome in a controlled trial of stroke rehabilitation. *Arch Phys Med Rehabil* 1982;63:21-4.
27. Stevens RS, Ambler NR, Warren MD. A randomized controlled trial of a stroke rehabilitation ward. *Age Ageing* 1984;13:65-75.
28. Strand T, Asplund K, Eriksson S, Hagg E, Lithner F, Wester PO. A non-intensive stroke unit reduces functional disability and the need for long-term hospitalization. *Stroke* 1985;16:29-34.
29. Strand T, Asplund K, Eriksson S, Hagg E, Lithner F, Wester PO. Stroke unit care - who benefits? Comparisons with general medical care in relation to prognostic indicators on admission. *Stroke* 1986;17:377-81.
30. Indredavik B, Bakke F, Solberg R, Rokseth R, Haaheim L, Holme I. Benefit of a stroke unit: a randomized controlled trial. *Stroke* 1991;22:1026-31.
31. Feigenson JS, Gitlow HS, Greenberg SD. The disability orientated rehabilitation unit. A major factor influencing stroke outcome. *Stroke* 1979;10:5-8.
32. Feldman DJ, Lee PR, Unterecker J, Lloyd K, Rusk HA, Toole A. A comparison of functionally orientated medical care and formal rehabilitation in the management of patients with hemiplegia due to cerebrovascular disease. *J Chron Dis* 1962;15:297-310.
33. Wood-Dauphinee S, Shapiro S, Bass E, Fletcher C, Georges P, Hensby V *et al*. A randomized trial of team care following stroke. *Stroke* 1984;5:864-72.
34. Hamrin E. Early activation in stroke: does it make a difference? *Scand J Rehab Med* 1982;14:101-9.
35. Wade DT, Langton-Hewer R, Skilbeck CE, Bainton D, Burns-Cox C. Controlled trial of a home care service for acute stroke patients. *Lancet* 1985;1:323-6.
36. Young JB, Forster A. The Bradford community stroke trial: eight week results. *Clin Rehab* 1991;5:283-92.
37. Young JB, Forster A. The Bradford community stroke trial: six month results. *BMJ* In press.
38. Sunderland A, Tinson DJ, Bradley EL, Fletcher D, Langton Hewer R, Wade DT. Enhanced physical therapy improves recovery of arm function after stroke. A randomised controlled trial. *J Neurol Neurosurg Psychiatry* In press.
39. Sivenius J, Pyorala K, Heinonen OP, Salonen JT, Riekkinen P. The significance of intensity of rehabilitation after stroke - a controlled trial. *Stroke* 1985;16:928-31.
40. Tallis R. Measurement and the future of rehabilitation. *Geriatr Med* 1989;19:31-40.
41. David R, Enderby P, Bainton D. Treatment of acquired aphasia: speech therapists and volunteers compared. *J Neurol Neurosurg Psychiatry* 1982;45:957-61.
42. Meikle M, Wechsler E, Tupper A, Benenson M, Butler J, Mulhall D *et al*. Comparative trial of volunteer and professional treatments of dysphasia after stroke. *BMJ* 1979;2:87- 9.
43. Drummond M, Ward H. Assessing the 'value for money' from rehabilitation programmes. *Physiother Pract* 1988;4:30- 40.
44. Peckham M. Research and development for the National Health Service. *Lancet* 1991;338:367-71.
45. Wistow G. Community Care Futures. In KPMG: The Clivenden debate. London: KPMG, 1992.
46. Andrews K. The limitations of randomized controlled trials in rehabilitation research. *Clin Rehab* 1991;5:5-8.
47. Sheikh K, Smith DS, Meade TW, Brennan PJ. Methods and problems of a stroke rehabilitation trial. *Occup Ther* 1978;262-5.
48. Ebrahim S. Clinical epidemiology of stroke. Oxford: OUP, 1990.
49. Dombovy ML, Sandok BA, Basford JR. Rehabilitation for stroke: a review. *Stroke* 1986;17:363-9.
50. Drummond MF, Stoddart GL. Economic analysis and clinical trials. *Controlled Clin Trials* 1984;5:115-28.

Members of the Steering Group:

- Dr G Bickler, Senior Medical Officer, Health Care Directorate, Department of Health
- Mr R Brown, Chief Executive, North Yorkshire Health Care Commissioning Project
- Dr J Carpenter, Director of Health Development, North Yorkshire Health Commissioning Project
- Professor MF Drummond, Professor of Economics, Centre for Health Economics, University of York
- Mrs J Emminson, General Manager, Walsall FHSA
- Mr P Hewitson, District General Manager, Bradford Health Authority
- Dr A Hopkins, Director, Research Unit, Royal College of Physicians
- Dr E Kernohan, Director of Public Health, Bradford Health Authority

Members of the Project Team:

- Dr R Cartwright, Director, Leukaemia Research Fund Centre for Clinical Epidemiology, University of Leeds
- Professor H Cuckle, Professor of Reproductive Epidemiology, Department of Obstetrics and Gynaecology, St James's University Hospital, Leeds
- Dr A Dowell, Department of General Practice, St James's University Hospital, Leeds

- Professor MF Drummond, as above
- Professor D Hunter, Professor of Health Policy Management, Nuffield Institute for Health Services Studies, University of Leeds

Members of the Research Team:

- Mr Nick Freemantle, Research Assistant, School of Public Health, University of Leeds
- Dr Sue Ibbotson, Senior Registrar in Public Health Medicine, Yorkshire Regional Health Authority
- Mr Andrew Long, Project Manager, Nuffield Institute for Health Services Studies, University of Leeds
- Dr James Mason, Research Fellow, Centre for Health Economics, University of York
- Dr Colin Pollock, Senior Registrar in Public Health Medicine, Yorkshire Regional Health Authority
- Mr Trevor Sheldon, Project Manager, Academic Unit of Public Health Medicine, University of Leeds
- Dr Fujain Song, Research Assistant, School of Public Health, University of Leeds
- Ms Christine Wilson, Project Secretary, School of Public Health, University of Leeds

Bulletin 3 will discuss purchasing and providing issues related to the management of subfertility.

CUSTOMER FEEDBACK

This bulletin is one of a series designed to help decision makers in the health service make more informed decisions using the latest available information on the effectiveness of particular health service interventions.

In order to ensure that you get information that will be useful and accessible to a range of medical and non-medical decision makers, we would be grateful for some feedback. This is an opportunity for you to tell us what particular areas of health care interventions you would like to see us cover in the future, as an aid to your decision making.

Please answer the questions below, giving us your comments on this bulletin, and return this sheet to:
Effective Health Care, School of Public Health, 30 Hyde Terrace, University of Leeds, Leeds LS2 9LN, UK.

1. Did you receive a copy of this bulletin directly? YES / NO
2. Is the topic of rehabilitation after stroke particularly relevant in your district/region at present? YES / NO

If YES and you would like to discuss this subject with us in more detail, please tick this box and give your name and address overleaf.

3. Did you find the format helpful? YES / NO

Please indicate any improvements you would like to see.

4. Are there any areas of fact or interpretation where you think the bulletin can be improved? Please indicate below or send more detailed comments.

5. What particular areas of health care would you like to see covered in this new series of *Effective Health Care*. Please state specific questions you would like answering.

6. Have you any general comments to make on this bulletin? Please indicate below or send more detailed comments.

Name:

Position:

Organisation:

Address:

Work Phone:

The Department of Health funds a limited number of these bulletins for distribution to purchasers and providers. If you would like a personal copy of this or future bulletins, they are available priced individually at £3 or as a series of nine bulletins at £25 (within the UK; £35 outside the UK, including postage). Cheques must be payable to 'Effective Health Care'. Please send orders to Nick Freemantle (address below).

Effective Health Care is based upon a systemic literature review and is compiled and published by a consortium of the School of Public Health, University of Leeds, Centre for Health Economics, University of York, and the Research Unit of the Royal College of Physicians. It is funded by the NHS Management Executive of the Department of Health. Production is by OIS, University of Leeds. All enquiries concerning content should be addressed to Nick Freemantle, *Effective Health Care*, School of Public Health, University of Leeds, 30 Hyde Terrace, Leeds LS2 9LN, UK.