Rehabilitation of cerebrovascular disorder (stroke): early discharge and support

A critical appraisal of the literature

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1999 New Zealand Health Technology Assessment Clearing House (NZHTA)

ISBN 1-877235-02-4
ISSN 1174-5142
ACKNOWLEDGEMENTS

This report was developed by the staff of NZHTA. It was prepared by Dr Robert Weir (Researcher) and supported by Dr Ray Kirk (Director), Mrs Susan Bidwell (Information Specialist), Dr Phil Hider (Researcher), Dr Barbara Nicholas (Researcher) and Ms Cecilia Tolan (Administrator). Additional administrative assistance was provided by Mrs Joan Downey and Miss Becky Mogridge.

We are grateful for the editorial review by Associate Professor Ruth Bonita (Associate Professor, University of Auckland) and Mrs Sue Allison (Journalist, Christchurch).

The Canterbury Medical Library provided invaluable assistance with the retrieval of articles used in this report.

NZHTA is a Research Unit of the University of Otago and funded under contract by the Health Funding Authority and the Ministry of Health.

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EXECUTIVE SUMMARY

Objectives

The primary objectives of this review were:

1. To critically evaluate the effectiveness of early discharge and community support in the management of patients following a stroke.
2. Through evaluation of objective one, evaluate methods of coordinating services that encompass primary and secondary care management of patients following a stroke.

Data sources

The studies selected for appraisal were restricted to those using a controlled design and were published from 1985 onwards. There was no restriction by language.

Study selection

Studies were selected and articles were appraised if they contained data on the effectiveness or cost effectiveness of early discharge or community support for patients following a stroke. The impact of these interventions was also assessed in the carers of patients following a stroke.

Criteria for exclusion from appraisal were:
- sample size less than 50
- participation rate less than 50%
- follow-up rate less than 50%
- less than 50% or a non-defined proportion of the study population had a stroke
- published as a letter or abstract only
- a second publication of the same study presenting the same results.

A single reviewer applied these criteria.

Twenty-five of 287 identified articles were eligible for selection after applying these criteria.

Data extraction

Critical appraisal forms standardised by study design were used to extract and appraise the literature. These forms were designed for use at Puget Sound, Seattle, USA (Group Health Cooperative of Puget Sound, 1996) and adopted by the New Zealand Guidelines Group.

A single reviewer conducted the appraisal of the eligible studies.

The level of evidence was evaluated using the U.S. Preventive Services Task Force protocol (U.S. Preventive Services Task Force, 1989) (See p. 5).

Data synthesis

Five studies evaluated the effect of early discharge from inpatient care in patients following a stroke. Three of these studies were randomised-controlled trials and a statistically significant difference in outcome between early discharge and discharge following conventional care was not observed. There was no significant difference in cost between the two groups in the one study that evaluated this outcome.
Eight studies examined the effectiveness of home-based management compared with hospital-based management. The outcome in these studies was inconsistent and varied between different patient populations.

Eight studies evaluated specific community-based interventions. Two randomised-controlled trials evaluating occupational therapy services in the domiciliary setting found support for this intervention. Other programmes produced inconsistent results.

A meta-analysis of day hospital rehabilitation also identified inconsistencies in the results between studies. Different control groups were used in the six studies included in this meta-analysis, further complicating the evaluation.

Four studies assessed the impact specific interventions for stroke patients had on their carers’ health. Two studies did not identify significant differences in outcome. One study lacked generalisability since the intervention involved a single health care worker. The other study identified a lower rate of severe depression in caregivers of patients living in areas with community-based support programmes.

Conclusions

The studies identified for critical appraisal had limitations that should be considered when interpreting the following conclusions:

- There is currently insufficient evidence to suggest that early discharge from hospital after a stroke confers any advantage in terms of effectiveness or cost effectiveness compared with conventional care. A well designed study based in a New Zealand setting using appropriate methodology is required in order to provide further evidence for a change in current management practices of stroke patients in New Zealand.

- A range of services should be maintained for the management of patients following a stroke. Home-based services do have a role to play in the rehabilitation of stroke patients.

- Current evidence supported the use of domiciliary occupational therapy in patients following a stroke. However, further research assessing domiciliary occupational therapy in a randomised-controlled trial with the observer blinded to the patient’s group would provide more robust data.

- There was some evidence suggesting community support programmes reduced caregiver anxiety but further research is required to examine this issue in depth.

Mesh headings

Cerebrovascular disorders, community health services, rehabilitation, ambulatory care, home care services, community health nursing, community networks, caregivers, cerebral haemorrhage, cerebral infarction, cerebral embolism and thrombosis, outpatients

Additional key words

Day hospital, early discharge
## LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>95%CI</td>
<td>95% confidence interval</td>
</tr>
<tr>
<td>ARR</td>
<td>absolute risk reduction</td>
</tr>
<tr>
<td>DOMINO</td>
<td>domiciliary rehabilitation in Nottingham</td>
</tr>
<tr>
<td>HFA</td>
<td>Health Funding Authority</td>
</tr>
<tr>
<td>NNT</td>
<td>number needed to treat</td>
</tr>
<tr>
<td>OR</td>
<td>odds ratio</td>
</tr>
<tr>
<td>RCT</td>
<td>randomised-controlled trial</td>
</tr>
<tr>
<td>RR</td>
<td>relative risk</td>
</tr>
</tbody>
</table>
GLOSSARY

Absolute risk reduction ~ The difference between adverse outcomes in the treated and placebo groups in a clinical trial.

Age standardisation ~ A procedure for adjusting rates designed to minimise the effects of differences in age composition when comparing rates for different populations.

Aphasia ~ Defect or loss of the power of expression by speech, writing, or signs, or of comprehending spoken or written language due to injury or disease of the brain.

Before and after study ~ A situation in which the investigator compares outcomes before and after the introduction of a new intervention.

Bias ~ Deviation of results or inferences from the truth, or processes leading to such deviation.

Blinded study ~ A study in which observers and/or subjects are kept ignorant of the group to which they are assigned. When both observers and subjects are kept ignorant, the study is referred to as double blind.

Case control study ~ The observational epidemiologic study of persons with the disease (or other outcome variable) of interest and a suitable control group of persons without the disease. The relationship of an attribute to the disease is examined by the diseased and the non-diseased with regard to how frequently the attribute is present.

Case fatality rate ~ The proportion of cases of a specified condition which are fatal within a specified time.

Case management ~ All health professionals’ activities to ensure coordination of services for the patient.

Cerebrovascular disorder ~ An abnormality resulting from a pathological process to the blood vessels supplying the brain.

Cohort study ~ The analytic method of epidemiologic study in which subsets of a defined population can be identified who are, have been, or in the future may be exposed or not exposed, or exposed in different degrees, to a factor or factors hypothesised to influence the probability of occurrence of a given disease or outcome.

Confidence interval ~ The computed interval with a given probability, eg. 95%, that the true value of a variable such as a mean, proportion, or rate is contained within the interval.

Confounding ~ A situation in which the measure of the effect of an exposure on risk is distorted because of the association of exposure with other factor(s) that influence the outcome under study.

Cost benefit analysis ~ An economic analysis in which the costs of medical care and the benefits of reduced loss of net earnings due to preventing premature death or disability are considered.
Cost effective analysis ∼ This form of analysis seeks to measure the costs and effectiveness of an activity or to compare similar alternative activities to determine the relative degree to which they will obtain the desired objectives or outcomes.

Cost minimisation analysis ∼ A particular type of cost effectiveness analysis in which it is assumed the outcome is the same in all comparison groups. The focus is, therefore, on the comparative costs of different interventions.


Cross sectional study ∼ A study that examines the relationship between diseases (or other health related characteristics) and other variables of interest as they exist in a defined population at one particular time.

Descriptive study ∼ A study concerned with and designed only to describe the existing distribution of variables, without regard to causal or other hypotheses.

Effectiveness ∼ A measure of the extent to which a specific intervention, procedure, regimen, or service, when deployed in the field in routine circumstances, does what it is intended to do for a specified population.

Efficiency ∼ The effects or end results achieved in relation to the effort expended in terms of money, resources and time. The extent to which the resources used to provide a specific intervention, procedure, regimen, or service of known efficacy and effectiveness are minimised.

Fibrinogen ∼ A coagulation factor that is essential to the clotting process.

Generalisability ∼ Applicability of the results to other populations.

Homocysteine ∼ A sulphur containing amino acid.

Incidence ∼ The number of instances of illness commencing during a given period in a specified population.

Intangible costs ∼ The costs of suffering to the patients and their carers.

Intention to treat analysis ∼ A method for data analysis in a randomised-controlled trial in which individual outcomes are analysed according to the group to which they were randomised even if they never received the treatment to which they were assigned.

Intracerebral haemorrhage ∼ Haemorrhage within the cerebrum (main portion of the brain).

Ischaemic stroke ∼ Stroke syndrome caused by ischaemia (caused by a deficiency in blood supply) of an area of the brain.

Mean ∼ Calculated by adding all the individual values in the group and dividing by the number of values in the group.
Median  ~  Any value that divides the probability distribution of a random variable in half. For a finite population or sample the median is the middle value of an odd number of values (arranged in ascending order) or any value between the two middle values of an even number of values.

Meta-analysis  ~  Any systematic method that uses statistical analysis to integrate the data from a number of independent studies.

Multiple regression  ~  Any analysis of data that takes into account a number of variables simultaneously. Logistic regression is a commonly used method.

Natural history  ~  The course of a disease from onset to resolution.

Number needed to treat  ~  The number of patients, similar to the study patients, who need to be treated to obtain one fewer bad outcome or one better outcome.

Power  ~  The ability of a study to demonstrate an association if one exists.

Prevalence  ~  The number of events in a given population at a designated time.

Primary care  ~  First contact, continuous, comprehensive and coordinated care provided to individuals and populations undifferentiated by age, gender, disease or organ system.

Randomised-controlled trial  ~  An epidemiologic experiment in which subjects in a population are randomly allocated into groups to receive or not receive an experimental preventive or therapeutic procedure, manoeuvre, or intervention. Randomised-controlled trials are generally regarded as the most scientifically rigorous method of hypothesis testing available in epidemiology.

Random sample  ~  A sample that is arrived at by selecting sample units such that each possible unit has a fixed and determinate probability of selection.

Relative risk  ~  The ratio of the risk of disease or death among the exposed to the risk among the unexposed. It is a measure of the strength or degree of association applicable to cohort and randomised-controlled trials.

Secondary care  ~  Surgical and medical services that are generally provided in a hospital setting. In many cases access to these services is by referral from a primary care health professional such as a general practitioner.

Segi’s world population  ~  A standard population which is merely an arbitrary set of figures against which other populations can be standardised to produce comparable rates.

Selection bias  ~  Error due to systematic differences in characteristics between those who are selected for study and those who are not.

Sensitivity analysis  ~  A method to determine the robustness of an assessment by examining the extent to which results are affected by changes in methods, values of variables, or assumptions.
**Stroke** ∼ Rapidly developing signs of focal (or global) disturbance of cerebral function, leading to death or lasting longer than 24 hours, with no apparent cause other than vascular (See also cerebrovascular disorder).

**Subarachnoid haemorrhage** ∼ Intracranial haemorrhage into the subarachnoid space.

**Variance** ∼ A measure of the variation shown by a set of observations, defined by the sum of the squares of deviation from the mean, divided by the number of degrees of freedom in the set of observations.
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Introduction

OBJECTIVE

This review was developed as a result of a request from the Health Funding Authority (HFA) to produce an evidence-based report on the effectiveness of various tools in the implementation of services that cross the primary and secondary care interface. The tools of interest included case management, critical care pathways, practice guidelines and referral guidelines.

For the purposes of this review primary care was defined as “first contact, continuous, comprehensive and coordinated care provided to individuals and populations undifferentiated by age, gender, disease or organ system.” It includes general practice, nursing, midwifery, health visiting, pharmacy, dentistry, optometry and the professions allied to medicine (physiotherapy, speech therapy, chiropody, dietetics and occupational therapy) (National Working Group on R&D in Primary Care, 1997).

Secondary care was defined as surgical and medical services that are generally provided in a hospital setting. In many cases access to these services is by referral from a primary care health professional such as a general practitioner (Ministry of Health Performance Management Unit, 1998).

The review subject of early discharge and the use of community support in the rehabilitation of stroke patients was chosen as an example of a chronic disease with an adequate research base. It was also of interest to the HFA since early discharge was a potential method of maintaining or improving quality of care and cost effectiveness.

At the time of writing this report the HFA was funding a series of pilot programmes involving the use of integrated care. One of these pilots included the management of stroke in elderly patients. Therefore, it was thought this review would also be of interest to that group of providers.

Therefore, the primary objectives of this review were:

1. To critically evaluate the effectiveness of early discharge and community support in the management of patients following a stroke.
2. Through evaluation of objective one, evaluate methods of coordinating services that encompass primary and secondary care management of patients following a stroke.

HOW SHOULD HOME-BASED REHABILITATION SERVICES BE EVALUATED?

Four attributes around which services could be evaluated include (Lafferty, 1996):

1. **Service effectiveness.** Indicators providing evidence that the service achieves its stated objectives. Potential measures include destination on discharge, use of community services and readmission rate (although the last is dependent on a range of factors).
2. **Service efficiency.** Indicators providing evidence that the service achieves its objectives with the minimal use of resources. Length of stay is a useful indicator.
3. **Patient risk.** Readmission rate or admission to nursing homes are useful indicators for community-based services.
4. **Patient acceptability.** Carer acceptability should also be included as an indicator in this context.

Ideally a randomised-controlled trial (RCT) should be used and single outcome measures for specific dimensions are useful to avoid spurious associations due to the use of multiple tests. The use of investigator blinding is also important.

The pilot programme (known as the Elder Care Canterbury Project) on the management of stroke in elderly patients is not an RCT. It is important that the pilot should have an adequate sample size. Other factors to consider include comparability of comparison groups and generalisability to the population.

WHAT ADVANTAGES DO COMMUNITY-BASED REHABILITATION SERVICES HOLD?

Advocates for home-based rehabilitation suggest the following advantages (Lafferty, 1996):

- Satisfying patient choice
- Reducing the risks associated with inpatient care by reducing the time spent in hospital
- The home setting is more conducive to meeting the specific needs of individual patients and their families
- Saving money.

However, there must be continuity of care between the hospital and community (King’s Fund, 1988). It is

1 Further information about the Elder Care Canterbury Project is available from their website http://www.cec.net.nz/
important to ensure that domiciliary-based services are effective for both the patient and carer.

Variation in services used by patients emphasises the complexity of primary care of stroke patients. As a result of this complexity “coordination, review and effective links with hospital” have been identified as areas of need (Bisset et al., 1997).

WHAT IS A STROKE?

The WHO definition of a stroke is “rapidly developing signs of focal (or global) disturbance of cerebral function, leading to death or lasting longer than 24 hours, with no apparent cause other than vascular” (Hatano, 1973). There are three principal pathological types of stroke: ischaemic stroke, primary intracerebral haemorrhage and subarachnoid haemorrhage (Warlow, 1998). Approximately 80% of strokes are ischaemic.

WHAT IS KNOWN ABOUT THE INCIDENCE AND EVENT RATE OF STROKE?

Figure 1 shows the age specific event rate for hospital discharge from cerebrovascular disorders in 1996. There were 8863 hospital discharges coded for cerebrovascular disorder in that year.

A second study was conducted in Auckland for the year ending February 1992 (Bonita et al., 1997) to measure changes in incidence and case fatality since an earlier study conducted in 1981/1982 (Bonita et al., 1984). This study used similar methods to the earlier one (Bonita et al., 1984) with all admissions and deaths being assessed and a 25% random sample of general practitioners used to ascertain stroke patients cared for in the community. The age adjusted event rates (first or recurrent stroke) were significantly higher for the Maori (OR 1.34, 95%CI 1.05 to 1.67) and Pacific Island (OR 1.63, 95%CI 1.33 to 1.98) populations compared with Europeans. The mean age of stroke patients also varied by ethnicity with Maori being 55.0 years, Pacific Island people 59.7 years and Europeans 73.3 years.

There was no significant change in the age standardised incidence rate of stroke in New Zealand between 1981 and 1991 (Bonita, 1993). However, the incidence increased by 23% in women under 75 years while in men 75 years and over it decreased by one third.

WHAT IS THE LONG TERM OUTCOME AFTER STROKE?


The case fatality rate within 28 days of onset of stroke declined from 32.2% in 1981 to 24.1% in 1991 in Auckland. Specifically, the case fatality rate was significantly lower in males aged less than 75 years (rate ratio 0.92, 95%CI 0.85-0.98) and in females of all ages (rate ratio 0.84, 95%CI 0.78-0.91). After adjustment for age and sex, the case fatality rate within 28 days of stroke was significantly higher in Pacific Island people than Europeans (OR 1.61, 95%CI 1.15 to 2.27) but not for Maori compared with Europeans (OR 1.37, 95%CI 0.90 to 2.09).

In an English study, 24% of patients having their first stroke are dead in a month. Of those alive at six months about a third are dependent on others for activities of daily living (Warlow, 1998).

A review of the epidemiology of stroke included studies that met pre-determined criteria (Bonita, 1992). About 88% of the deaths attributed to stroke occurred among people aged over 65 years, making stroke very much a condition affecting older people. First ever strokes account for about 75% of all acute events. The one-month case fatality rate averages about 24% and one year about 42%.
Extrapolation from the Auckland stroke study suggests that in a population of one million people, 1250 will experience their first stroke every year and an additional 350 will have a recurrent stroke. Of these 1600, 880 will survive six months and 640 will be living in a private residence.

Hospital care in the acute phase after stroke is the most costly component of the care of stroke patients. Given the pattern of illness with higher incidence in older age groups and the aging population, the burden of this condition is likely to increase in the future unless the incidence decreases or the patterns of management change.

WHAT IS KNOWN ABOUT THE COST OF MANAGING PATIENTS WHO HAVE HAD STROKES?

Conservative estimates have put the health service costs for dealing with acute stroke at about 4% of the total UK health budget. The additional cost of long term care and support in the community may be over four times this figure (Langton-Hewer, 1990).

The cost of ischaemic stroke to New Zealand society was estimated for the year 1992 to lie between $99m and $154m dollars (Scott and Scott, 1994). Hospital and continuing care costs made up 90% of this cost. Vote: Health in 1992 was $3.8b (Ministry of Health Performance Management Unit, 1998).

The direct cost of hospital care for stroke has been estimated in Denmark (Jorgensen et al., 1997). These results were based on 1197 consecutive patients and cost per patient was estimated at $US12,150. These results should be interpreted cautiously since:

- Waiting time for nursing home placement was excluded.
- All patients were admitted to a stroke unit.
- Generalisability to New Zealand may be limited due to different admission and discharge policies, different costs of overheads and different organisation in stroke treatment.

Cost is a complex issue. Increasing use of technology will add to cost, for example. The major cost is in the acute care stage but those who are admitted and survive also produce significant costs.

The pattern of management of patients after stroke was investigated in Auckland for the year starting February 1, 1981 (Bonita et al., 1987). Two thirds of all patients were admitted to a public hospital at some time in the year following their stroke. The location of management for those surviving at selected times is shown in Table 1.

Among stroke survivors, in the year following their stroke, 68% of their time was spent in a private residence.

Services for stroke patients one year after stroke were documented in an English setting (Legh-Smith et al., 1986). The analysis was based on all surviving patients from a series of 976 acute strokes registered (both hospitalised and community patients). There were 492 patients alive at one year and 436 were available for interview.

There were 383 living at home (88%) and 82 of these participants lived alone (21%). One hundred and forty seven (38%) living at home received one or more community service.

Table 1. Place of management at selected time intervals following a stroke

<table>
<thead>
<tr>
<th>Place of management</th>
<th>One month</th>
<th>Six months</th>
<th>One year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public hospital</td>
<td>37%</td>
<td>8%</td>
<td>4%</td>
</tr>
<tr>
<td>Private residence</td>
<td>53%</td>
<td>73%</td>
<td>74%</td>
</tr>
<tr>
<td>Private hospital or rest home</td>
<td>10%</td>
<td>19%</td>
<td>21%</td>
</tr>
</tbody>
</table>
Methodology

LITERATURE SEARCH

The following databases were searched using the search strategies outlined in Appendix One:

- Medline
- Embase
- Current Contents
- Cinahl
- DARE (Database of Abstracts of Reviews of Effectiveness)
- Cochrane Library
- NHS Economic Evaluation Database
- Healthstar
- Clinpsych (carer burden strategy only)
- TRIP (Turning Research into Practice) database - Gwent Health Authority
- Publications and current projects of the International Network of Agencies for Health Technology Assessment (INAHTA)
- Reference lists of documents obtained during the course of the project

All searches were from 1984 onwards and were carried out between October and December 1998.

APPRaisal MethoDoloGY

Studies were considered for inclusion in the assessment of outcome resulting from the use of early discharge or community support for patients with a stroke if they used one of the following designs:

- meta-analysis
- randomised-controlled trial (RCT)
- non-randomised controlled trial
- cohort study
- case-control study
- before and after study

Economic analyses were considered. Details of these study designs are found in Appendix Two.

Exclusion criteria

The following criteria were used to exclude articles from appraisal:

- sample size less than 50
- participation rate less than 50%
- follow-up rate less than 50%
- less than 50% or a non-defined proportion of the study population had a stroke
- published as a letter or abstract only

- a second publication of the same study presenting the same results.

The studies that were retrieved after assessing the abstract but excluded due to the above criteria are identified in Appendix Three.

Articles were formally appraised using the schedule developed by the Group Health Cooperative of Puget Sound (Group Health Cooperative of Puget Sound, 1996) and adapted by the New Zealand Guidelines Group of the National Health Committee (New Zealand Guidelines Group, 1997).

Summaries of appraisal results have usually been shown in tabular form and conclusions have been drawn that were dependent on the study design and the specific problems associated with the individual studies.

Absolute risk reduction (ARR) due to the intervention studied was the favoured method of presenting results. When ARR was determined and there was a significant difference resulting from the intervention, the number needed to treat (NNT) to prevent one case of the outcome under study was calculated. If ARR could not be calculated from the available data, relative risk was used as the second summary statistic of choice. Odds ratios were presented when the study design was case control or a multiple regression method was used. Formulae for these measures are presented in Appendix Four.

A description of the outcome instruments used in the appraised studies is presented in Appendix Five.

The level of evidence was graded using the U.S. Preventive Services Task Force protocol (U.S. Preventive Services Task Force, 1989). Thus, levels of evidence were:

I Evidence obtained from at least one properly designed randomised-controlled trial

II-1 Evidence obtained from well-designed controlled trials without randomisation

II-2 Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group

II-3 Evidence obtained from multiple time series with or without intervention

III Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.
LIMITATIONS OF THE REVIEW

Although, randomised-controlled trials are usually best able to reduce the effects of bias and confounding the most important determinant of the validity of the study is the rigour applied to its design and analysis and not necessarily the type of study design used. In addition, certain study designs are more appropriate for particular issues. For example, randomised-controlled trials are best for comparisons between different therapeutic options, cohort studies are best for assessing prognosis and cross-sectional studies are best for describing the prevalence of a condition at one point in time. For a detailed description of the methods, results and interventions used in the studies appraised the reader is referred to the particular studies cited.

Although this review has greatly benefited from advice provided by consultants, it has not been exposed to wide peer review. In addition, the review has been limited to the published academic literature and has not appraised unpublished work.

The review was conducted over a limited period of time (October, 1998 – January, 1999).
Over the past 20 years the length of hospital stay has been decreasing (Clarke, 1996). It is attractive to both managers (through postulated inpatient cost savings per patient) and to clinicians (due to reductions in iatrogenic illness).

The effectiveness of early discharge in the rehabilitation of patients with strokes is summarised in Table 2 (p. 9) and the studies identified are described below. There were three RCTs and one cost comparison identified.

One randomised-controlled trial (level I evidence) compared early discharge with conventional care for inpatients admitted to a London hospital following a stroke (Rudd et al., 1997). Patients were randomised when they were able to independently transfer if living alone or they were able to transfer with assistance if living with a carer. A community team managed the early discharge group.

There were no differences in demographic details at baseline (as assessed by an investigator blinded to the intervention group). A range of groups was eligible for the study including those receiving care in general medical wards, geriatric wards and stroke units, potentially increasing the generalisability of the results.

There were 331 participants who met the inclusion criteria. These represented 50% of the population admitted for a stroke with 167 in the community group and 164 in the conventional therapy group. The mean age was 71 years (70 in the early discharge group and 72 in the conventional therapy group) and 44% of the participants were female. Outcome was assessed at one year and the follow-up rate was 97%. The power to detect a difference of 3.5 points on the Barthel scale (possible of 20) was 80% at the 5% significance level.

There were no significant differences in the mortality rate (ARR 41 cases per 1000, p=0.22), readmission rate (ARR −7/1000, p=0.20) or stroke recurrence rate (ARR −30/1000, p=0.20) in the two groups. The Barthel index (Mahoney and Barthel, 1965) was used to evaluate daily living between the two groups and no significant difference was identified. The length of hospital stay after the participants were randomised was shorter in the early discharge group (12 days versus 18 days, p=0.0001).

Limitations of the study included:

- The refusal rate was only documented for one of the two hospitals involved in the study; therefore the participation rate could not be calculated.
- It was unclear whether the investigators assessing outcome at 12 months were blinded to the participant’s group.
- Randomisation was carried out in blocks of 10 rather than on an individual basis.
- The generalisability was uncertain since the study was set in England.

A study set in Stockholm compared early discharge to community care with conventional care (Widen Holmqvist et al., 1998). Patients were randomised if they were inpatients for at least five days, had impaired motor function and/or aphasia for seven days, were continent and independent of feeding. There were 83 participants. Three eligible patients refused to participate and two patients were not followed up. The length of follow-up was one year but this study presented follow-up results at three months. The assessors were blind to the group assignment.

The home rehabilitation group involved the use of a case manager to link inpatient and outpatient services. Those in the routine rehabilitation group received heterogeneous interventions including hospital, day and outpatient care.

There were no significant differences in rehabilitation-based outcomes between the two groups. These outcomes included the Frenchay independence in activities of daily living scale, the Barthel index, the Lindmark motor capacity and manual dexterity (measured by the nine-hole peg test). The mean hospitalisation period was 14 days in the home rehabilitation group and 29 days in the routine rehabilitation group (p=0.0008).

Limitations of the study:

- Despite a computer generated randomisation process there were differences at baseline in the two groups, with the home rehabilitation group having a higher rate of associated diseases such as diabetes and having a 10% lower coping capacity. This bias would tend to result in an underestimation of the effectiveness of home-based rehabilitation.
- There was a lower rate of stroke patients who were aphasic in this study compared to the rate expected.
- The study was set in Sweden so its generalisability should be interpreted with caution.

A randomised-controlled trial (Grade I evidence) evaluated an early discharge scheme in an English setting (Rodgers et al., 1997). There were 92 participants who were followed for three months. Follow-up was 100%.
There was no significant difference in the readmission rate, mortality rate, global health status (assessed using the Dartmouth Coop Function Charts), functional abilities (measured using the Nottingham extended activities scale) or level of carer stress (measured with the general health questionnaire) between the two groups. The length of hospital stay was significantly shorter in the intervention group (median 13 days versus median 22 days in the usual care group, p=0.02).

Limitations of the study:
- Lack of blinding of the investigators
- Low study power (the authors suggested a study of adequate power would need 550 participants to determine efficacy and cost effectiveness of early discharge)
- The study was set in England so has uncertain generalisability to New Zealand.

A cost component comparison was included in this study (McNamee et al., 1998). The costs measured were those incurred by the health and personal social services. There was no significant difference in the cost between the two groups with the cost per patient in the early discharge group £7155 and £7480 for the conventional care group suggesting the personal services in the early discharge group were expensive. Sensitivity analysis based on upper and lower bounds of the cost of inpatient stay did not produce a statistically significant difference in cost between the two groups.

This study was limited by the lack of cost per unit of outcome data. Given the problems of low power discussed in the limitations above, the outcome data were not sufficiently robust to provide a cost effectiveness comparison.

**SUMMARY**

Five studies that evaluated the effectiveness of early discharge were identified. One of these studies included a cost component (McNamee et al., 1998) derived from a randomised-controlled trial (Rodgers et al., 1997) included in this section. Three of the studies were randomised-controlled trials (Rudd et al., 1997, Widen Holmqvist et al., 1998, Rodgers et al., 1997) and they did not find any significant difference in outcome between those discharged early compared with those in the “conventional care” groups. These outcomes included mortality; readmission and rehabilitation based outcomes. In all cases, those randomised to the early discharge group had significantly shorter lengths of stay. The studies had small sample sizes so there might have been significant differences in outcome if a larger study was performed (Widen Holmqvist et al., 1998, Rodgers et al., 1997, McNamee et al., 1998). Lack of blinding was also a consistent limitation to these studies. The one study that included a cost component did not identify a significant difference in cost between the two groups.

Therefore, it was concluded that:

There is currently insufficient evidence to suggest that early discharge from hospital after a stroke confers any advantage in terms of effectiveness or cost effectiveness compared with conventional care. A well-designed study based in a New Zealand setting using appropriate methodology is required in order to provide further evidence for a change in current management practices of stroke patients in New Zealand.²

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² The consultant for this report was aware of two further unpublished studies assessing the use of early supported discharge. The main findings from these unpublished studies should be considered in the light of this conclusion when available. One was set in Adelaide (conducted by Rulest et al.) and the other was based in the United States (conducted by Mayo et al.)
<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design and evidence grading</th>
<th>Age Mean (years)</th>
<th>Sample size</th>
<th>Follow-up</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
</table>
| (Rudd et al., 1997) England | RCT^3  
Grade I | 71 | 331 | One year | No significant difference in mortality (ARR^4 41/1000), readmission (ARR - 7/1000) or stroke recurrence (ARR - 30/1000).  
Significantly shorter length of inpatient stay post randomisation (12 v 18 days, p = 0.0001). | Refusal rate not documented  
Blinding at follow-up was unclear  
Randomised in blocks of 10 |
| (Widen Holmquist et al., 1998) Sweden | RCT  
Grade I | 72 | 83 | Three-months | No significant difference in rehabilitation based outcomes.  
Shorter duration of inpatient stay in early discharge group (14 v 29 days, p = 0.0008). | Early discharge group had a higher rate of associated diseases and lower coping capacity at baseline  
Lower rate of aphasia in study participants than expected |
| (Rodgers et al., 1997) England | RCT  
Grade I | 73 | 92 | Three-months | No significant difference in readmission rate, mortality rate,  
global health status, or functional abilities.  
Shorter length of stay in the intervention group (13 v 22 days, p = 0.02). | Unblinded study  
Low study power |
| (McNamee et al., 1998) England | Cost comparison | 73 | 92 | Three-months | No significant difference in cost per patient in the early discharge group versus conventional care | Based on the above RCT and had the same limitations |

^3 RCT = randomised controlled trial  
^4 ARR = absolute risk reduction
What is the relative effectiveness of home-based versus hospital-based care?

The results of the studies that compared home-based rehabilitation and hospital-based rehabilitation are summarised in Table 3 (p. 14). There were three studies identified and all studies were RCTs with two including a cost component.

The DOMINO study conducted in Nottingham, England compared hospital-based rehabilitation with domiciliary rehabilitation (Gladman et al., 1993). Patients were randomised into the two groups prior to discharge. The randomisation process was stratified by location of inpatient care: stroke unit, general medical ward or health care for the elderly. The last group were older, more likely to live alone and have a past history of stroke and immobility. The treatment received by the hospital care group varied by initial patient location. If inpatient care was initially located in the stroke unit or general medical wards, follow-up care was conducted in occupational therapy and physiotherapy units. For those initially admitted to the health care for the elderly, follow-up care was conducted in a day hospital.

This study was designed to have 80% power to detect a difference of two points in the extended activities of daily living scale (Nouri and Lincoln, 1987) at the 5% significance level. Follow-up was assessed at six months by an investigator blinded to the group assignment made this assessment. Follow-up was 99% complete. There was no overall difference in mortality, (domiciliary-based care versus hospital-based care) (RR 2.3, 95%CI 1.0-5.5, ARR 5.6 per 100). There was no statistically significant difference in “bad outcomes” (based on mortality, long term hospitalisation or a move into institutional care) between the two groups (RR 1.7, 95%CI 1.0-2.9, ARR 7.0 per 100) or in Barthel activities of daily living score. However, those in the health care for the elderly subgroup were more likely to have had a “bad outcome” associated with domiciliary care compared with hospital-based care (RR 2.4, 95%CI 1.1-5.1, ARR for hospital-based treatment 15 per 100, NNT 7 95% CI 4-33).

A longer period of follow-up (one year) did not alter the findings (Gladman and Lincoln, 1994). There were no significant differences in outcome between the two groups at that time. The advantage of hospital-based rehabilitation was less clear in the health care of the elderly subgroup (RR of “bad outcome” 1.6, 95%CI 1.0-2.6).

Limitations of the study included:

- Despite the use of consecutive, sealed envelopes that were generated through the use of a random number table, those randomised to the hospital-based group had a significantly higher Barthel score at baseline (p<0.05) compared with the domiciliary group indicating a greater degree of dependency in the latter group. Therefore, this bias would tend to favour the hospital-based group.
- The study was conducted in Nottingham so has uncertain generalisability to New Zealand.

A comparison of direct costs (Gladman et al., 1994) between domiciliary and hospital-based rehabilitation suggested that the cost to the health service of the hospital-based services was 27% less per patient than in the domiciliary group. However, comparative costs differed between the three groups of patients. In the health care for the elderly group, the cost of hospital-based care was 26% higher per patient. In the stroke unit group the cost of domiciliary care was 2.6 times higher and in the general medical group the cost of the outpatient service was 56% higher than the domiciliary service per patient. The cost of the ambulance service in transporting the hospital-based group appeared low in comparison with other research and this might have had a significant bearing on the relative costs based on the sensitivity analysis for this study.

The authors concluded that a range of services would produce the best option for cost effective services.

A study in Bradford, England, randomly assigned 124 participants to either day hospital rehabilitation (two days per week) or community physiotherapy rehabilitation (mean of 11.5 visits per patient) (Young and Forster, 1992). The participants were over 60 years and were followed for six months. Follow-up was 87% complete.

The day hospital group had a significantly lower Barthel index and motor club assessment at six months (p=0.01) despite having significantly more treatment sessions. Five per cent of participants changed from community physiotherapy to day hospital care during the six months follow-up but an intention to treat analysis was used.

Limitation of the study:

- The study was conducted in Bradford so has uncertain generalisability to New Zealand.

Possible explanations for the discrepant results between the Bradford and DOMINO studies included (Gladman et al., 1995):

- There were intrinsic differences between the Bradford and Nottingham stroke patient populations.
Differences in the trial protocols could explain the results.

The two studies give different estimates of the same effect.

There was no evidence of a difference in frailty of the participants from the two studies. Those in the Bradford study received more treatment than those in the DOMINO study for both the hospital and home-based arms. Overall, there was a greater improvement in the Barthel score in the home treated group on pooled results at six months. When the Bradford and Nottingham populations were further matched on age and baseline Barthel scores, there were no significant differences in outcome.

The authors postulated that effective home therapy requires 15-20 visits per patient given the apparent dose-response relationship seen with greater intensity of treatment.

Limitations of the study included:

- There were differences in selection procedures and study populations between the two studies.
- There was a lack of evidence concerning dose-response relationships on which to determine the number of visits required for effective outcomes. Such a relationship should be evaluated in a range of studies each of which had different intensities of treatment within the individual study.
- A degree of overmatching might have explained the lack of significant results between home and hospital based therapy when some patients were excluded from analysis.
- It is unclear whether the results can be generalised to New Zealand.

Intensity of physiotherapy services has been investigated in a meta-analysis of predominantly randomised-controlled trials (Grade I evidence) (Langhorne et al., 1996). This meta-analysis included seven studies that compared more intensive physiotherapy with “conventional” levels of care in a variety of settings. There was some evidence for a reduction in “poor outcome” (based on death and deterioration) in the intensive physiotherapy group with an odds ratio of 0.54 (95%CI 0.34-0.85) but a lack of significantly different results based on impairment and disability scores. However, this meta-analysis was limited by the trials included being heterogenous in nature and the interventions being poorly defined. The authors suggested that further large randomised-controlled trials should be set up to investigate this issue.

A cost minimisation analysis was performed in conjunction with the Bradford randomised-controlled trial (Young and Forster, 1993). Both direct and indirect costs at eight weeks of follow-up were calculated and refer to the 1988/89 financial year. The costs were calculated after eight weeks follow-up. The median direct cost per patient in the home physiotherapy group was £385 and £620 in the day hospital group. Indirect costs were judged to be equal in the two groups. Therefore, home physiotherapy was judged to be more cost effective.

Limitations of the study were:

- The study population only included those initially treated as an inpatient.
- Indirect costs did not consider lost earnings for the patient or carer.
- It was assumed that outcome was identical in the two groups but the results from the RCT suggested those in the home physiotherapy group had more favourable outcomes. Therefore the cost effectiveness of home physiotherapy would tend to be underestimated in comparison with day hospital rehabilitation.
- The generalisability to New Zealand is uncertain and the absolute costs should not be considered as applicable to New Zealand.

An Auckland-based study randomised 100 patients discharged from hospital following a stroke to either receive self-directed exercises in the home setting that were supervised once a week (experimental group) or continuing follow-up at outpatients or the day hospital (Baskett et al., 1999). The patients were followed for three months. The assessor was blind to the participants’ group assignment. The study was designed to have 90% power to detect a four second difference between subjects in a 10 metre walk and 80% power to detect a 20% difference in the other measure used (α=0.05).

There was no statistically significant difference in outcome measures (including patient and caregiver depression, walking speed, Barthel index, motor assessment, nine-hole peg test) between the two groups except the period over which contact was maintained was greater in the experimental group (56.1 days versus 39.9 days, p=0.003). There was no significant difference in total therapist time spent providing therapy.

Limitations of the study included:

- The follow-up rate was 90%.
- The follow-up period was short.
- Quality of life was not assessed.
SUMMARY

Two randomised-controlled trials comparing domiciliary-based rehabilitation with hospital-based rehabilitation from England and using similar methodologies suggested there was no difference in outcome between the two trials. The results favoured the use of home-based therapy. However, subgroup analysis of one study (Gladman et al., 1993) suggested the effectiveness of home-based and hospital-based services was dependent on patient characteristics. Therefore, the authors suggested a range of service options should be maintained. The same comments applied to the cost effectiveness of the services.

Therefore, it was concluded that:

A range of services should be maintained for the management of patients following a stroke. Home-based services do have a role to play in the rehabilitation of stroke patients.
Table 3. Effectiveness of home-based versus hospital-based rehabilitation

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design and evidence grading</th>
<th>Age Mean (years)</th>
<th>Sample size</th>
<th>Follow-up</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Gladman et al., 1993)  England</td>
<td>RCT Grade I</td>
<td>70</td>
<td>327</td>
<td>Six months</td>
<td>No statistically significant difference in mortality, “bad outcome” or activities of daily living. RR (“bad outcome” domiciliary group in HCE patients) 2.4, 95%CI 1.1-5.1, ARR 15/100. NNT 7 95% CI 14-33 at 6 month follow-up.</td>
<td>Significantly higher Barthel score (lower level of dependency) at baseline for the hospital-based group. Similar results were found at one year follow-up.</td>
</tr>
<tr>
<td>(Gladman et al., 1994)  England</td>
<td>Cost Comparison</td>
<td>70</td>
<td>327</td>
<td>Six months</td>
<td>Overall hospital-based group had 27% lower direct service costs per patient but costs varied between different subgroups of patients.</td>
<td>Cost comparison based on the above RCT. Ambulance service costs were low compared with other research.</td>
</tr>
<tr>
<td>(Young and Forster, 1992)  England</td>
<td>RCT Grade I</td>
<td>71 (median)</td>
<td>124</td>
<td>Six months</td>
<td>Day hospital group had inferior Barthel index and motor function compared with home physiotherapy.</td>
<td>All participants were initially inpatients.</td>
</tr>
<tr>
<td>(Young and Forster, 1993)  England</td>
<td>Cost minimisation</td>
<td>71 (median)</td>
<td>124</td>
<td>Eight weeks</td>
<td>Home physiotherapy adjudged to be more cost effective.</td>
<td>Performed as part of the above RCT. Indirect costs did not consider lost earnings. Assumed identical outcomes between the two groups.</td>
</tr>
<tr>
<td>(Baskett et al., 1999)  Auckland</td>
<td>RCT Grade I</td>
<td>70</td>
<td>100</td>
<td>Three months</td>
<td>No significant difference in outcome (depression, walking speed, Barthel index, motor assessment, nine-hole peg test) between the two groups.</td>
<td>90% follow-up. Short follow-up period. Quality of life not assessed.</td>
</tr>
</tbody>
</table>
Community-based management

BACKGROUND

What factors predict successful outcome after home placement?

A case control study (Grade II-2 evidence) examined factors that promoted successful outcome after home placement by separating participants into two groups - successful outcome at one year post stroke and unsuccessful outcome (Evans et al., 1991). Classification of outcome was based on the ESCROW measure, which uses six dimensions: environment, social support, cluster of family members, resources, outlook and work or social activities (Granger and Gresham, 1984).

Factors associated with a higher rate of successful outcome (P<0.01) included:

- better general family function at baseline (measured with the McMaster family assessment device)
- less caregiver depression at baseline (measured with the center for epidemiologic studies – depression scale)
- caregiver married to the patient
- caregivers completing stroke education at baseline
- greater follow-up with provision of social resources.

Limitations of the study included:

- The measure used to define successful outcome represents one of a range of potential measures for this assessment.
- There was no information on the rate of health service utilisation between the two groups.
- The study was set in the United States so has uncertain generalisability.

What advantages and disadvantages are associated with community-based physiotherapy?

A non-systematic review examined arguments for and against community physiotherapy of stroke patients (Forster and Young, 1990). Advantages included:

- Improved community-based services might reduce the need for hospital admissions and improve the service offered to all patients.
- The community-based therapist is in an ideal position to provide a coordinating role.

A disadvantage included the isolation felt by stroke patients and their caregivers.

Does the availability of carers influence the use of other management options available in the community?

A cross sectional study (Grade III evidence) assessed the role unpaid carers had on the use of community supports available for rehabilitative purposes in the United States (Safran et al., 1994). There were 79 participants with a stroke and 58 with a hip fracture who were assessed 12 months after admission. Multivariate regression was used to control for confounding.

Social support from family members and friends was a critical factor in reducing the use of personal health services available to the patient regardless of whether they could be reimbursed.

Limitations of the study:

- Patients with hip fracture were included.
- Participation and follow-up rates were not documented.
- There are major differences in health systems between the United States and New Zealand that severely limit the generalisability of this study to New Zealand. Dependent variables from the regression model involved cost data that was not applicable to New Zealand.

WHAT EFFECT DO ADDITIONAL HOME-BASED SERVICES HAVE ON PATIENT OUTCOME?

The studies in this section are summarised in Table 4 (p. 19).

Is occupational therapy effective in the home setting?

A randomised-controlled trial (Grade I evidence) compared a group receiving occupational therapy in the home setting with those randomised to usual domiciliary services who did not receive the additional occupational therapy (Corr and Bayer, 1995). There were 110 participants with a mean age of 75 years who were followed for one year. The follow-up rate was 99%.
Those receiving the intervention had a significantly lower rate of readmission (ARR 17 per 100, NNT 6 95% confidence interval 3-62, p=0.03) and greater independence in feeding (p=0.04). There was no significant difference in living circumstance (using the Nottingham extended activities of daily living scale), Barthel index and the geriatric depression scale between the two groups.

Limitations of the study included:
- There was a significantly higher rate of males in the control group compared with the intervention group at baseline (p=0.03).
- It was unclear whether the follow-up assessment was performed in a blinded manner.
- The participants tended to have disabilities at the severe end of the spectrum, potentially limiting generalisability.
- The study was conducted in Wales, also limiting its generalisability.

Another study compared an enhanced domiciliary occupational therapy service with usual occupational therapy services (Logan et al., 1997). There were 111 participants who were followed for six months. The investigator assessing outcome was blinded to the intervention group.

Better mobility in the patient and better health in the carer was observed in the enhanced group at six months (p<0.01). There was no significant difference in total score for the extended activities scale, Barthel index or general health questionnaire among the patients in both groups at six months.

Limitations of the study:
- Participation rates were uncertain and there were different numbers in the two groups, which might have been due to differential participation rates in the two groups (consent was obtained after the randomisation process).
- There was no baseline data on levels of disability in the two groups.
- The study was small so lacked adequate power.
- The study was conducted in England so was of uncertain generalisability.

Is the use of a stroke family care worker effective?

The effectiveness of a stroke family care worker (with a social work background) was evaluated in a randomised-controlled trial (Dennis et al., 1997). There were 417 patients with a stroke who were enrolled from either an outpatient or an inpatient setting. Those with a subarachnoid haemorrhage were excluded from the study. Outcome was assessed at six months by an observer blinded to the patient’s group. The follow-up rate was 89% and 1% of those randomised to the family care worker group did not receive a visit from that worker.

The patients did not show a significant difference in the Barthel index, Frenchay activities index, General Health Questionnaire or length of hospital stay. The carers in the family care worker group showed a significantly better result on assessment with the general health questionnaire (absolute difference 3.5 points, 95% confidence interval 0.7-7.0).

Limitations included:
- The sensitivity of the instruments used for measuring outcome might be low given that, of the instruments used, only the Frenchay activities index had been specifically designed for patients with stroke.
- The generalisability was limited since the study involved a single social worker and only 67% of all eligible stroke patients were randomised in the study. Those randomised were significantly older and more likely to live alone than those not randomised.
- The study was conducted in Scotland, limiting its generalisability.

Does specialist nurse support help improve the outcome of patients with stroke and their carers?

A randomised-controlled trial (Grade I evidence) conducted in Bradford compared a group of 120 patients randomised to receive specialist outreach nurse visits with 120 patients who did not receive those visits (Forster and Young, 1996). The study was restricted to patients with a permanent disability resulting from a stroke who were 60 years or over. The participants were followed for 12 months and follow-up was complete in 99.6%. The study had 90% power to detect a clinically significant difference in the Frenchay activities index (four points) at the 5% significance level.

There was no significant difference in outcome between the two groups on the social activities index, perceived wellbeing, the Barthel index or stress in carers.

Potential limitations included:
- possible contamination of the patients and community staff between the two groups
- uncertain generalisability to New Zealand.

Can an additional home-based rehabilitation service improve outcome of patients following a stroke?

The use of a social support programme was assessed in a randomised-controlled trial (Grade I evidence) in
There were 88 participants with a mean age of 69 who were followed for three months. Those randomised to the social support intervention were compared with a “conventional care” group. The follow-up rate was 89%.

There was no significant difference in social support or psychosocial outcomes (measured with the general health questionnaire and the sickness index profile) between the two groups.

Potential limitations of the study included:
- Lack of responsiveness in the instrument used to measure social support. The social support inventory for stroke survivors (McColl and Friedland, 1989) was the instrument used.
- The study had low power and a short follow-up period.
- Uncertain generalisability since the study was set in Canada.

A non-randomised controlled study (Grade II-1 evidence) based in Bristol investigated the effect an additional home-based rehabilitation service had on outcome of stroke patients (Wade et al., 1985). Participants were placed in the experimental and control (usual care) groups based on the geographical location of their general practitioner. Those in the experimental group had access to a supplementary domiciliary service that included physiotherapy, occupational therapy, speech therapy, social worker and district nurse services.

There were 857 participants enrolled and outcome was measured at six months post onset of stroke. There was no significant difference in mortality, the Frenchay social activities index or the Barthel activity of daily living scale between the groups at follow-up. There was a greater rate of depression in the experimental group (p<0.001) and there was a greater length of stay among the inpatients in the experimental group (p<0.1) and there was a greater rate of depression in the experimental group.

Limitations of the study included:
- Those admitted to hospital in the experimental group might have had more severe illness than those not admitted in that group (given the greater community support available for that group) hence the significant difference in length of stay might be invalid. There were baseline differences in the two groups although these differences were consistent with less severe disease in the experimental group.
- There might have been systematic differences in the management of patients between the two groups based on the lack of randomisation.
- The follow-up rate was low and some patients varied in their ability to perform the various outcome tests. The maximum rate of specific outcome measurements performed was 50% and the minimum rate was 28%.
- The study was conducted in Bristol so was of uncertain generalisability to New Zealand.

In a non-randomised controlled trial (Grade II-1 evidence) a group initially randomised to receive outpatient rehabilitation four times per week for 12 weeks was compared to a group initially randomised to not receiving the intervention (Werner and Kessler, 1996). However, the randomisation process was lost when the investigators added five selected controls to overcome a high drop out rate in the control population. There were 49 participants with 33 in the intervention group. The patients were followed for nine months. The investigator evaluating outcome was blinded to the participant’s group.

Those receiving the intervention showed a significantly greater improvement in motor function (assessed with Jepsen’s hand function and Brunnstrom’s motor testing instruments) at three months (p<0.03) and a greater improvement in the sickness index profile at three months (p<0.04).

This study had the following limitations:
- Loss of randomisation due to the addition of selected controls was a major problem.
- Follow-up rate was only 61%.
- Intention to treat analysis was not used.
- Compliance with the intervention was 85% at three months.
- The study was set in the United States so has uncertain generalisability.

A community-based programme designed to improve inpatient care and post-hospitalisation care was evaluated in a non-randomised controlled trial (Grade II-1 evidence) (Dignan et al., 1986). The programme was set in North Carolina and participants were allocated to intervention or control groups based on the location of the hospital used for their inpatient care. The patients were followed for 12 months. The results were analysed using a logistic regression model.

The community-based programme did not have a significant influence on outcome (the Barthel index was used as the dependent variable) at three, six or 12 months. Factors that did predict outcome included age, first versus recurrent stroke and level of consciousness at admission.

Limitations of the study included:
- There was potential selection bias due to the methods used to assign participants. Patients assigned to the intervention were significantly more likely to have lost consciousness at baseline.
Unknown confounders were not controlled since a non-randomised design was used.

The study has uncertain generalisability to New Zealand.

**SUMMARY**

Eight studies were identified that assessed the effectiveness of various community-based interventions in the rehabilitation of patients with a stroke. Five were randomised-controlled trials. The studies were designed to compare “conventional care” with conventional care and a specific additional domiciliary service. In some of the studies the additional service was a package involving various occupational groups (Wade et al., 1985, Werner and Kessler, 1996, Dignan et al., 1986). In others it assessed a more focussed intervention (Dennis et al., 1997, Friedland and McColl, 1992, Forster and Young, 1996, Corr and Bayer, 1995, Logan et al., 1997). In terms of the “packages” it was not possible to assess the relative effectiveness of the various components.

In general, greater credence should be placed on the studies using a randomised-controlled trial design. These studies used the more focussed interventions. There were few significant differences between groups in these studies although there was a lower rate of readmission in one study assessing the role of domiciliary occupational therapy. One other study investigating the role of occupational therapy at home observed there was better patient mobility in those receiving occupational therapy. The readmission rate was not assessed in this latter study. Therefore, it was concluded that:

**Current evidence supports the use of domiciliary occupational therapy in patients following a stroke.** However, further research conducted assessing domiciliary occupational therapy in a randomised-controlled trial with the observer blinded to the patient’s group would provide more robust data.

The non-randomised controlled studies produced conflicting results and should be interpreted with caution.
Table 4. Effectiveness of community-based interventions in improving patient outcome following stroke

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design and evidence grading</th>
<th>Age Mean (years)</th>
<th>Sample size</th>
<th>Follow-up</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Coom and Bayer, 1995) Wales</td>
<td>RCT Grade I</td>
<td>75</td>
<td>110</td>
<td>One year</td>
<td>Lower rate of readmission in those receiving occupational therapy in the home setting (ARR 17 per 100, NNT 6 95% CI 3.6-3.2, p=0.03). No significant difference in living circumstances, Barthel index or depression scale.</td>
<td>Significantly more males in the control group (p=0.03) Unclear blinding status Participants tended to have disabilities at the more severe end of the spectrum.</td>
</tr>
<tr>
<td>(Logan et al., 1997) England</td>
<td>RCT Grade I</td>
<td>73</td>
<td>111</td>
<td>Six months</td>
<td>Better patient mobility (p&lt;0.01) and better health in the carer (p&lt;0.01) in an enhanced domiciliary occupational therapy care. No significant difference in the extended activities scale, Barthel index or general health questionnaire.</td>
<td>Participation rate not documented No baseline data on levels of disability in the two groups Low power</td>
</tr>
<tr>
<td>(Dennis et al., 1997) Scotland</td>
<td>RCT Grade I</td>
<td>67</td>
<td>417 patients</td>
<td>Six months</td>
<td>No significant difference in patient related outcomes (Barthel index, Frenckley activities index, general health questionnaire and length of hospital stay).</td>
<td>Low rate of carers enrolled Limited generalisability since the study was based on a single family care worker.</td>
</tr>
<tr>
<td>(Forrest and Young, 1996) England</td>
<td>RCT Grade I</td>
<td>73 (median)</td>
<td>240</td>
<td>12 months</td>
<td>No significant difference in social activities, perceived wellbeing, Barthel index or stress in carers (intervention – access to specialist nurse care).</td>
<td>Possible contamination of patients and community staff in the control group.</td>
</tr>
<tr>
<td>(Friedland and McColl, 1992) Canada</td>
<td>RCT Grade I</td>
<td>69</td>
<td>88</td>
<td>Three months</td>
<td>No significant difference in social support or psychosocial outcomes between the two groups (social support versus usual care).</td>
<td>Low power Short follow-up Potential lack of sensitivity in the social support instrument used.</td>
</tr>
<tr>
<td>(Wade et al., 1985) England</td>
<td>Controlled trial Grade II-1</td>
<td>73</td>
<td>857</td>
<td>Six months</td>
<td>Increased rate of depression (p&lt;0.1) and greater duration of inpatient stay (p&lt;0.001) in the additional home based rehabilitation group. No significant difference in mortality, social activities or activities of daily living between groups.</td>
<td>Potential for systematic differences in management between the two groups Baseline differences suggested less severe disease in the intervention group Low follow-up rate.</td>
</tr>
</tbody>
</table>
Table 4. Effectiveness of community-based interventions in improving patient outcome following stroke (continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design and evidence grading</th>
<th>Age Mean (years)</th>
<th>Sample size</th>
<th>Follow-up</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Werner and Kessler, 1996) United States</td>
<td>Controlled trial Grade II-1</td>
<td>63</td>
<td>49</td>
<td>Three months</td>
<td>Greater improvement in motor function ($p=0.03$) and sickness index profile ($p=0.05$) in the additional outpatient rehabilitation group.</td>
<td>Investigators added selected controls due to a high drop out of the original controls Follow-up rate of 65% Intention to treat analysis was not used.</td>
</tr>
<tr>
<td>(Dignam et al., 1986) United States</td>
<td>Controlled trial Grade II-1</td>
<td>69</td>
<td>774</td>
<td>12 months</td>
<td>No significant difference in Barthel index in the two groups (community-based programme to improve inpatient and post hospital care versus no access to the community programme).</td>
<td>Potential selection bias due to assignment of intervention No control over unrecognised confounders.</td>
</tr>
</tbody>
</table>
What is the relative effectiveness of nursing home care versus own home-based care?

A study conducted in Taiwan estimated the costs to the family of patients with a stroke in nursing home and own home settings (Chiu et al., 1997). A cost of illness study design was used and the 336 patients were divided into five groups:

1. patients who were sent to a nursing home and had severe physical disabilities
2. patients who received home care in their own homes and had severe physical disabilities
3. patients who returned to their own home without long term care interventions and had severe physical disabilities
4. patients who returned home with moderate disabilities
5. patients who returned home with mild disabilities.

The patients’ families were followed for three months.

The total family cost for patients receiving nursing home care was substantially lower than for those staying at their own home. There was no significant improvement in physical function for those who were severely disabled at the start of the study. Those with moderate disability at baseline showed significant improvement (p<0.01) in function by three months (all patients were in the own home group).

Limitations of the study included:

- A cost benefit design would have been more appropriate.
- The duration of inpatient stay prior to discharge was not stated and if this varied between groups might have resulted in a selection bias.
- No attempt was made to cost intangibles.
- Cost information from the societal or health funder perspective was not offered.
What effect does home-based rehabilitation have on the caregiver?

BACKGROUND

A study that assessed the health of 302 carers up to two years following a stroke identified that 21% of carers had abnormal general health questionnaire results at three weeks, 12% at six months, 11% at one year and 13% at two years. However, the rate of abnormality in the general population was not assessed so it was unclear whether this represented an excess of poor health (Wade et al., 1986).

Another study (Schulz et al., 1988) suggested carers of stroke patients had a greater rate of depression than that in a representative sample of middle-aged and elderly people in the general population.

Anderson et al. (1995) assessed caregivers of 84 handicapped stroke patients at one year. At that time, 55% were above the emotional illness cut off on the hospital anxiety and depression scale or the general health questionnaire. Seventy-nine percent of caregivers reported disruption in social activities and 55% in leisure time (Anderson et al., 1995).

One study assessed the effect caregiver anxiety had on patient outcome after a stroke (Evans et al., 1989). There were 80 caregivers included in the study and anxiety was measured using the State Trait Anxiety Inventory (Spielberger et al., 1983). Increased caregiver anxiety was significantly associated with patient adjustment (explaining 28% of the variance in outcome, P<0.05). However, both the level of caregiver anxiety and patient adjustment were rated by the caregiver, potentially explaining the association.

INTERVENTIONS

The studies assessing the impact of stroke patient oriented interventions on carer health are summarised in Table 5 (p.25).

A cohort study (Grade II-2 evidence) compared outcomes among actual caregivers with potential caregivers (who would have assumed the caregiving role had the patient been sent home rather than to a nursing home) (Silliman et al., 1986). There were 101 patients who were 65 years or over, discharged from hospital following a stroke and who had previously lived in a private home. The caregiver was interviewed at between six and 19 months and the follow-up rate was 88%.

There were no significant differences between actual and potential caregivers for perceived health including emotional health (using the general health questionnaire) or in social activity.

Potential limitations of the study included:
- There was no baseline data on actual or potential caregivers. A potential selection bias might exist since part of the decision on patient discharge location might have concerned the health status of the caregiver. It is likely that patients of caregivers who were less well would tend to be sent to a nursing home. Therefore, any differences on the caregiver's health would be reduced in the analysis.
- The power of the study was not documented.
- The study was of uncertain generalisability since it was set in North Carolina.

A cohort study set in Finland compared two districts with an active stroke rehabilitation programme set in the community with two districts that did not have such a programme (control group), (Kotila et al., 1998). There were 228 caregivers eligible for selection. The caregivers were assessed for depression (using Beck’s depression inventory) at three months and one year.

There was no significant difference in the rate of depression for the two groups at three months (42% in the active programme and 41% in the control group) or at one year (39% versus 42% respectively). However, more caregivers in the control group were severely depressed at one year (7.2% versus 0.9%, p=0.04).

Limitations of the study included:
- The participants and observers were not blinded to the patient’s group.
- There was a lower rate of follow-up in the active rehabilitation group and the overall follow-up rate was 78%.
- The generalisability was uncertain.

The effectiveness of a stroke family care worker discussed earlier (see p. 16) contained information concerning health effects on carers (Dennis et al., 1997). There were 417 patients with a stroke who were enrolled from either an outpatient or an inpatient setting. A total of 246 carers were enrolled in the study. Outcome was assessed at six months by an observer blinded to the patient’s group. The follow-up rate was 86%.
The carers in the family care worker group showed a significantly better result from the general health questionnaire (difference 3.5, 95% confidence interval 0.7-7.0).

Limitations included:

- Only 59% of patients had a carer identified to participate in the study.
- The generalisability was limited since the study involved a single social worker and only 67% of all eligible stroke patients were randomised in the study. Those randomised were significantly older and more likely to live alone than those not randomised.
- The study was conducted in Scotland also limiting its generalisability.

A randomised-controlled trial (Grade I evidence) conducted in Bradford compared a group of 120 patients randomised to receive specialist outreach nurse visits with 120 patients who did not receive such visits (Forster and Young, 1996). Details of this study are included on p.25. There were 71 carers recruited in the intervention group and 68 in the control group.

There was no significant difference in outcome on the level of stress in carers between the two groups.

Potential limitations included:

- Only 58% of the patients had a carer enrolled in the study.
- There was an 80% follow-up rate in the carers.
- There was possible contamination of the patients and community staff between the two groups.
- Generalisability to New Zealand is uncertain.

**SUMMARY**

Four studies were identified that measured the effect of an intervention on carers’ health. The studies involved disparate interventions and two did not identify significant effects. Of the two studies that did identify significant effects on carers’ health, one lacked generalisability (Dennis et al., 1997). The other study (Kotila et al., 1998) suggested that having community rehabilitation programmes was likely to reduce the rate of severe depression in caregivers. Therefore, it was concluded that:

There was some evidence suggesting that community support programmes reduced caregiver anxiety but further research is required to examine this issue in depth.
Table 5. The impact of stroke patient oriented interventions on carer health

<table>
<thead>
<tr>
<th>Reference</th>
<th>Study design and evidence grading</th>
<th>Sample size</th>
<th>Follow-up</th>
<th>Results</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Silliman et al., 1986) United States</td>
<td>Cohort Grade II-2</td>
<td>89</td>
<td>6-19 months</td>
<td>No significant difference in perceived health between actual and potential carers at follow-up.</td>
<td>No baseline data Potential selection bias due to the lack of randomisation Lack of power calculations</td>
</tr>
<tr>
<td>(Kotila et al., 1998) Finland</td>
<td>Cohort Grade II-2</td>
<td>228</td>
<td>12 months</td>
<td>No significant difference in carer depression between districts with active (community) rehabilitation programmes and no rehabilitation programmes. Higher rate of severe depression in control group at 1 year (ARR 6.3 per 100, p=0.04, NNT 16).</td>
<td>No blinding Follow-up rate 78% and was lower in the intervention group.</td>
</tr>
<tr>
<td>(Dennis et al., 1997) Scotland</td>
<td>RCT Grade I</td>
<td>246</td>
<td>Six months</td>
<td>Significantly better health in carers of patients randomised to the family care worker group.</td>
<td>Follow-up 86% 59% of patients had a carer identified to participate in the study Only one family care worker studied potentially limiting generalizability</td>
</tr>
<tr>
<td>(Forster and Young, 1996) England</td>
<td>RCT Grade I</td>
<td>139</td>
<td>12 months</td>
<td>No significant difference in level of stress in carers of stroke patients who were randomised to receive specialist nurse support and those in the control group.</td>
<td>Possible contamination of patients and community staff between the two groups reducing the impact of the intervention No power calculations Participation rate 58% Follow-up rate 80%</td>
</tr>
</tbody>
</table>
Day hospital rehabilitation

A systematic review of the effectiveness of day hospital rehabilitation identified seven studies of relevance (Dekker, 1998). Six were deemed of sufficient quality to include in the review based on criteria developed by Chalmers et al (Chalmers et al., 1981).

The search was restricted to randomised-controlled trials found in MEDLINE. There was no restriction by age.

The findings were inconsistent. Three studies showed no significant differences in outcome criteria and two identified only short-term differences in outcome. The authors concluded there was insufficient information to determine the effectiveness of day hospital rehabilitation.

The study was limited by:

- restricting the search to the MEDLINE database
- the studies retrieved having different control groups and different rehabilitation programmes between day programmes.
Conclusions

This systematic review was performed to identify tools for the implementation of stroke patient programmes that crossed the primary and secondary care interface. It was therefore necessary to identify services that were effective and cost effective. Areas of research that showed promise in delivering such cross boundary care included the use of early discharge from hospital and the use of community support. To be effective it was anticipated that these interventions would need to have components of coordination between services (potentially including case management). Pollock (Pollock, 1997) identified lack of coordination as a consistent theme in stroke management.

Systematic reviews are reliant on the quality of the studies included and the methodology used in performing the review. Within this review, only studies, which included a control group, have been included in the intervention sections. A significant proportion of these studies were randomised-controlled trials, which provide the best design for comparative evaluation of different services. However, design features of the individual studies are of critical importance in determining the robustness of the analysis. One particular problem of the studies in this area is the difficulty involved in achieving adequate blinding. The best designs would be double blind where both the participant and the observer were unaware of the participant’s group (intervention or control). In terms of community support studies it is not possible to blind the participant. Unfortunately a significant proportion of the studies did not incorporate blinding of the observer into the design. This design fault would tend to favour improved outcomes in the intervention group.

Some of the instruments used to measure outcome were relatively insensitive. The Barthel score was frequently used as an outcome measure in the studies incorporated in this review. However, this score has been criticised as being relatively insensitive to change and tends to have a ceiling effect (Portee, 1997). The Barthel score measures disability but of greater interest is the measurement of handicap. Handicap exists when individuals with a disability are unable to fulfil one or more of the roles that are considered normal for their age and culture. There is an absence of acceptable, validated tools for use in measuring handicap (Portee, 1997). While activities of daily living indices provide information on the patient’s capacity for self care they do not provide information on a patient’s lifestyle (Smith, 1990). The degree to which motor and sensory scales and language tests reflect functional ability is unclear. The geriatric depression score has been criticised for its unreliability on test—retesting methods where Spearman’s correlation coefficient was 0.75 (Gompertz et al., 1993). To the best of our knowledge and others (de Pedro-Cuesta and Widen-Holmqvist, 1993) quality of life has not been assessed.

How to deal with participants who die before the end of the follow-up period is problematic. Some suggest giving this group the lowest score on the various outcome instruments used (Warlow et al., 1996). However, this is clearly arbitrary. Removing this group from the primary analysis potentially biases the results.

Studies in this review typically compare different packages of rehabilitation. The elements of these packages are often poorly described and thus difficult to compare and replicate. Such packages do not allow for specific identification of the reasons for success or failure of the programme.

This review also has inherent limitations. There was no attempt to systematically identify unpublished data. There is a bias in the literature towards publishing studies with statistically significant differences in outcome. The exclusion criteria have been selected in an arbitrary manner but were designed to select studies with higher reliability.

Stroke patients produce a significant burden on New Zealand’s health system both in terms of prevalence and cost. This burden would be expected to rise in future years due to the aging population since stroke incidence increases with age. A range of strategies could be proposed to reduce the burden of stroke. These include primary, secondary and tertiary prevention strategies. However, this review has focussed on rehabilitation strategies.

There were six studies identified that evaluated the effectiveness of early discharge. One of these studies was a cost comparison (McNamee et al., 1998) derived from a randomised-controlled trial (Rodgers et al., 1997). Three of the studies were randomised-controlled trials (Rudd et al., 1997, Widen-Holmqvist et al., 1998, Rodgers et al., 1997) and they did not find any significant difference in outcomes between those discharged early compared with those in the “conventional care” groups. These outcomes included mortality, readmission and disability based outcomes. In all cases those randomised to the early discharge group had significantly shorter lengths of stay.

Three of the studies had small sample sizes (n<100) indicating a lack of power to detect significant differences in outcome. Lack of blinding was also a consistent limitation in these studies. The one cost comparison did not identify a significant difference in cost between the two groups.

Therefore, it was concluded that:

There is currently insufficient evidence to suggest that early discharge from hospital after a stroke confers any advantage in terms of effectiveness or cost effectiveness compared with conventional care. A well-designed study based in a New Zealand setting using

REHABILITATION OF CEREBROVASCULAR DISORDER (STROKE): EARLY DISCHARGE AND SUPPORT
appropriate methodology is required in order to provide further evidence for a change in current management practices of stroke patients in New Zealand.

It is understood that two further studies examining the issue of early discharge have been conducted but are not yet published. The results of these studies may provide more evidence for the increased use of early discharge.

In considering increasing the use of community-based services it is important that the evidence suggests the outcome for the patient and the patient’s carers is at least as satisfactory as that achieved by hospital-based services if such services are to be implemented.

There were two randomised-controlled trials identified that compared domiciliary-based rehabilitation with hospital-based rehabilitation. These studies were both set in England and used similar methodologies. When the two results were matched for age and baseline Barthel score there was no difference in outcome between the two trials. The results favoured the use of home-based therapy. However, subgroup analysis of one study (Gladman et al., 1993) suggested the effectiveness and cost effectiveness of home-based and hospital-based services were partly dependent on patient characteristics. Therefore, the authors suggested a range of service options should be maintained.

Therefore, it was concluded that:

A range of services should be maintained for the management of patients following a stroke. Home-based services do have a role to play in the rehabilitation of stroke patients.

There were eight studies identified that assessed the effectiveness of various community-based interventions in the rehabilitation of patients with a stroke. Five of these were randomised-controlled trials and the other three were non-randomised controlled trials. The studies were designed to compare “conventional care” with conventional care and a specific additional domiciliary service. In some of the studies the additional service was a package involving various occupational groups (Wade et al., 1985, Werner and Kessler, 1996, Dignan et al., 1986). In others it assessed a more focussed intervention (Dennis et al., 1997, Friedland and McColl, 1992, Forster and Young, 1996, Corr and Bayer, 1995, Logan et al., 1997). In terms of the “packages” it was not possible to assess the relative effectiveness of the various components.

In general, greater credence should be placed on the studies using a randomised-controlled trial design. These studies used the more focussed interventions. There were few significant differences between groups in these studies although there was a lower rate of readmission in one that assessed the role of domiciliary occupational therapy. One other study investigating the role of occupational therapy at home noted there was better patient mobility in those receiving occupational therapy. The readmission rate was not assessed in this latter study. Therefore, it was concluded that:

Current evidence supported the use of domiciliary occupational therapy in patients following a stroke. However, further research assessing domiciliary occupational therapy in a randomised-controlled trial with the observer blinded to the patient’s group would provide more robust data.

There were four studies identified that evaluated the impact specific interventions for stroke patients had on the patients’ carers. It was concluded that:

There was some evidence suggesting that community support programmes reduced caregiver anxiety but further research is required to examine this issue in depth.

Methods of coordination between different services were poorly documented within studies that evaluated “packages” of care so it was inappropriate to evaluate the effectiveness of this process.
References


Appendix 1

SEARCH STRATEGIES

The concepts involved in the search were complex, particularly those concerning the interface between primary and secondary care, and those to do with community support. To detect as many relevant studies as possible the search was approached from multiple angles in each database.

MEDLINE

cerebrovascular disorders/
cerebral ischemia/
cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"/
stroke.ti.
or/1-6
(early adj3 discharge).tw.
community.tw.
community health services/
exp home care services/
community networks/
community health nursing/
home.tw.
domicili.tw.
(day adj3 hospital).tw.
outpatients/
ambulatory care/
outpatient:tw.
or/8-19
7 and 20
exp rehabilitation/
rehabilitat:tw.
rh.fs.
or/22-24
21 and 25
letter.pt.
news.pt.
27 or 28
26 not 29
from 30 keep ……

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practice guideline.pt.
expguidelines/
health planning guidelines/
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cerebral hemorrhage/
"cerebral embolism and thrombosis"/
stroke.ti.
cerebral infarction/
or/7-12
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community.tw.
community health services/
exp home care services/
community networks/
community health nursing/
home.tw.
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(day adj3 hospital).tw.
outpatients/
outpatient:.tw.
ambulatory care/
or/14-25
13 and 26
6 and 27
from 28 keep 11,23
randomized controlled trials/
controlled clinical trials/
randomized controlled trial.pt.
controlled clinical trial.pt.
random allocation/
double-blind method/
single-blind method/
placebos/
or/30-37
animal/
human/
39 and 40
39 not 41
38 not 42
27 and 43
limit 44 to (yr=1984 or yr=1985 or yr=1986 or yr=1987 or yr=1988 or yr=1989 or yr=1990 or yr=1991 or
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from 45 keep….
29 or 46

meta-analysis/
exp review literature/
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review, academic.pt.
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historical article.pt.
review multicase.pt.
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16 not 20
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cerebral ischemia/
cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"/
stroke.ti.
or/22-27
(early adj3 discharge).tw.
community.tw.
community health services/
exp home care services/
community networks/
community health nursing/
home.tw.
domicil..tw.
(daily adj3 hospital).tw.
outpatients/
outpatient:.tw.
ambulatory care/
or/29-40
41 and 28
21 and 42
from 43 keep……

cerebrovascular disorders/
cerebral ischemia/
cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"/
stroke.ti.
or/1-6
(early adj3 discharge).tw.
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community health services/
exp home care services/
community networks/
community health nursing/
home.tw.
domicil..tw.
(daily adj3 hospital).tw.
outpatients/
outpatient:.tw.
or/8-19
7 and 20
exp rehabilitation/
rehabilitat..tw.
rh/fs.
or/22-24
21 and 25
letter.pt.
news.pt.
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26 not 29
delivery of health care, integrated/
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patient care team/
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critical pathways/
clinical pathway:.tw.
care path:.tw.
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case management/
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letter.pt.
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from 50 keep….

cerebrovascular disorders/
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cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"
stroke.ti.
or/1-6
interprofessional relations/
7 and 8

exp cerebrovascular disorders/
stroke.ti.
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or/4-6
3 and 7
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random allocation/
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animal/
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exp cohort studies/

Rehabilitation of cerebrovascular disorder (stroke): early discharge and support
exp case-control studies/
cross-sectional studies/
or/26-28
11 and 29
11 and 25
30 or 31
limit 32 to english
from 33 keep …. 11 not 32
from 35 keep …. 34 or 36

EMBASE
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brain infarction/
brain hemorrhage/
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stroke/
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8 and 20
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brain infarction/
brain hemorrhage/
brain ischemia/
stroke/
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stroke.ti.
or/16-22
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home:.tw.
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ambulatory care/
or/24-34
23 and 35
exp rehabilitation/
rehabilitat:.tw.
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or/37-39
36 and 40
limit 41 to letter
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from 43 keep ..... 
15 and 36
45 not 41
from 46 keep ..... 
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care path:.tw.
interdisciplinary.tw.
case management/
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critical path:.tw.
public relations/
interprofessional.tw.
or/1-16
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brain infarction/
brain hemorrhage/
brain ischemia/
stroke/
cerebrovascular accident/
stroke.ti.
or/1-5
caregiver/
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or/7-9
6 and 10
from 11 keep 2,7-8
exp cerebrovascular disorders/
10 and 13
14 not 11
family/
family life/
16 or 17
6 and 18

**HEALTHSTAR**
cerebrovascular disorders/
cerebral ischemia/
cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"/
stroke.ti.
or/1-6
(early adj3 discharge).tw.
community.tw.
community health services/
exp home care services/
community networks/
community health nursing/
home.tw.
domicil:.tw.
(day adj3 hospital).tw.
outpatients/
ambulatory care/
outpatient:.tw.
or/8-19
7 and 20
exp rehabilitation/
rehabilitat:.tw.
rh.fs.
or/22-24
21 and 25
letter.pt.
news.pt.
27 or 28
26 not 29
delivery of health care, integrated/
(integrated adj3 care).tw.
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patient care team/
(care adj3 map:).tw.
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clinical pathway:.tw.
care path:.tw.
interdisciplinary.tw.
case management/
(seamless adj3 care).tw.
or/31-44
7 and 45
46 not 30
limit 47 to (yr=1984 or yr=1985 or yr=1986 or yr=1987 or yr=1988 or yr=1989 or yr=1990 or yr=1991 or yr=1992 or yr=1993 or yr=1994 or yr=1995 or yr=1996 or yr=1997 or yr=1998)
letter.pt.
48 not 49
from 50 keep ….
cerebrovascular disorders/
cerebral ischemia/
cerebral hemorrhage/
cerebral infarction/
"cerebral embolism and thrombosis"/
stroke.ti.
or/1-6
interprofessional relations/
58 and 59
50 or 60
limit 61 to nonmedline
from 62 keep ….
exp cerebrovascular disorders/
stroke.ti.
1 or 2
caregivers/
(carer or caregiver or caring).tw.
((burden or stress) adj3 care).tw.
or/4-6
3 and 7
limit 8 to nonmedline

CLINPSYCH

exp cerebrovascular accidents/
stroke.ti.
cerebral ischemia/
exp cerebral hemorrhage/
exp cerebrovascular disorders/
or/1-5
exp rehabilitation/
rehabilitat.tw.
or/7-8
(home or community or domicil:).tw.
(day adj3 hospital).tw.
outpatient:tw.
ambulatory.tw.
home care/
home.hw.
or/10-15
6 and 16
from 17 keep ….

exp cerebrovascular accidents/
stroke.tw.
exp caregivers/
exp caregiver burden/
(carer or caring or caregiver:).tw.
((stress or burden) adj3 care).tw.
or/3-6
or/1-2
7 and 8
from 9 keep ….

CINAHL

meta analysis/
metaanaly:.tw.
meta analy:.tw.
cochrane:.tw.
nursing interventions.pt.
(review: or overview:).ti.
literature review/
literature searching/
computerized literature searching/
(synthe: adj3 (literature: or research: or studies or data)).tw.
(medline or medlars or embase or schisearch or psychinfo or psychlit or psyclit).tw.
pooled analy:.tw.
((data adj2 pool:) and studies).tw.
((hand or manual: or database: or computer:) adj2 search:).tw.
reference databases/
((electronic: or bibliographi:) adj2 (database: or data base:)).tw.
review.pt.
(review: or overview:).ab.
(systematic: or methodologic: or quantitative: or research: or literature: or studies or trials: or effective:).ab.
17 and 19
18 and (9 or 19)
or/1-16,20-21
editorial.pt.
letter.pt.
record review/peer review/(retrospective: adj2 review:).tw.
(case: adj2 review:).tw.
(record: adj2 review:).tw.
(patient: adj2 chart:).tw.
(peer adj2 review:).tw.
(chart: adj2 review:).tw.
(case: adj2 report:).tw.
exp case control studies/exp prospective studies/case studies/(rat: or mouse or mice or hamster: or animal: or dog: or cat: or rabbit: or bovine or sheep).tw.
(patient: adj2 review:).tw.
animal studies/or/23-40
41 not (41 and 22)
22 not 42
cerebrovascular disorders/cerebral ischemia/
"cerebral embolism and thrombosis"/
cerebral hemorrhage/
cerebral vascular accident/stroke.ti.
or/44-49
(early adj3 discharge:).tw.
community.tw.
home.tw.
domicil:.tw.
home nursing/
community health nursing/
home health aides/
exp home health care/ambulatory care/multidisciplinary care team/outpatient service/outpatient:tw.
(day adj3 hospital:).tw.
ambulatory care facilities/or/51-64
50 and 65
43 and 66
66 not 67

Rehabilitation of cerebrovascular disorder (stroke): early discharge and support
from 68 keep …..
interdisciplinary.tw.
multidisciplinary.tw.
(integrated adj3 care).tw.
(shared adj3 care).tw.
co-ordinated care.tw.
coordinated care.tw.
(care adj3 map:).tw.
health care delivery, integrated/
critical path/
care path:.tw.
clinical path:.tw.
seamless care.tw.
case management/
care management.tw.
or/70-83
41 and 50 and 84
85 not 33
from 86 keep 13,19,21
69 or 87
50 and 84
89 not 68 exp cerebrovascular disorders/
stroke.ti.
1 or 2
caregivers/
(carer: or caring or caregiver:).tw.
((burden or stress) adj3 care).tw.
or/4-6
3 and 7
limit 8 to english
from 9 keep …..

exp cerebrovascular disorders/
stroke.ti.
1 or 2
caregivers/
(carer: or caring or caregiver:).tw.
((burden or stress) adj3 care).tw.
or/4-6
3 and 7
limit 8 to english
from 9 keep …..

OTHER DATABASES
Other databases without controlled vocabulary or thesauri were searched using major keywords identified from
the strategies above.
Appendix 2

STUDY DESIGNS USED IN THIS REVIEW

The study designs considered for this review were:

- Meta-analysis
- Randomised-controlled trial
- Non-randomised controlled trial
- Cohort study
- Case-control study
- Before and after studies (using a before and after comparison of an intervention)
- Cross sectional studies

Before and after studies are poorly described in epidemiology textbooks. Its main advantage is that a comparison can be performed about an intervention that was introduced beyond the control of the investigators. Thus, typically this study design investigates new policies that were introduced and the investigator had no control over the policy’s implementation. Its key limiting factor is a lack of control over changes with time.

The remainder of this appendix is derived from material contained in Elwood (Elwood, 1988). This is presented in Table A2.1.
Table A2.1 Study designs used in this review

<table>
<thead>
<tr>
<th>Study design</th>
<th>Description</th>
<th>Main role</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomized-controlled trial</td>
<td>Random selection of intervention and control arms of the study population.</td>
<td>Assessment of treatment</td>
<td>Controls who receive the intervention</td>
<td>Applicability limited to trials likely to be beneficial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Intervention and control groups should have similar characteristics</td>
<td>Difficulties with ethics, logistics and cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Allows minimisation of bias (through double blinding)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and confounding (through randomisation)</td>
<td></td>
</tr>
<tr>
<td>Non-randomised controlled trial</td>
<td>Study in which the investigators assign the study population to different comparison groups</td>
<td>Useful for testing the validity of screening tests</td>
<td>Useful in the evaluation of conditions where random assignment is not possible</td>
<td>Unable to control for unknown confounding and bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment of treatment</td>
<td>Able to control the number of participants in different groups</td>
<td>Potential for bias if the investigators are not blinded</td>
</tr>
<tr>
<td>Cohort study</td>
<td>Observational study that follows exposed and unexposed participants to defined outcomes.</td>
<td>Useful for prognosis</td>
<td>Good in rare exposures</td>
<td>Often requires many years of follow-up (if performed in a prospective manner)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary method of studying unusual or new exposures</td>
<td>Allows multiple endpoints to be assessed</td>
<td>Needs large numbers of participants if the outcome is rare</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Temporal relationship clear</td>
<td>Susceptible to selection bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Exposure assessed prior to outcome, avoiding bias</td>
<td></td>
</tr>
<tr>
<td>Case-control study</td>
<td>Observational study that starts with an outcome event and (generally) retrospec-</td>
<td>Identification of causes of a new outcome</td>
<td>Efficient in terms of sample size required (particularly rare outcomes)</td>
<td>Unable to calculate absolute or relative risk</td>
</tr>
<tr>
<td></td>
<td>tively analyse exposures.</td>
<td>Useful in evaluations of population screening</td>
<td>Retrospective method is rapid</td>
<td>Susceptible to recall bias</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Multiple exposures can be assessed</td>
<td>Retrospective methods limit exposure information</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Relatively low resource use</td>
<td>Adequate control group may be difficult to define or obtain</td>
</tr>
<tr>
<td>Cross sectional study</td>
<td>Makes observations at one point in time</td>
<td>Measure prevalence</td>
<td>Relatively simple so participation tends to be relatively high</td>
<td>Does not allow assessment of causation due to lack of time dimension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment of associations</td>
<td>Representative samples of a population can be drawn</td>
<td>Inefficient when prevalence or exposure is low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Methods can be standardised, reliable and single blind</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Can be repeated using similar methods</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3

EXCLUDED REFERENCES


Appendix 4

FORMULAE FOR SUMMARY MEASURES OF EFFECT

**Absolute risk reduction (ARR).** Incidence in the exposed group \( (I_E) \) minus the incidence in the non-exposed group \( (I_o) \).

\[
\text{ARR} = I_E - I_o.
\]

**Odds ratio (OR).** \( OR = \frac{ad}{bc} \) where a, b, c, and d are:

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>Non-exposed</td>
<td>c</td>
<td>d</td>
</tr>
</tbody>
</table>

**Number needed to treat (NNT).** \( NNT = \frac{1}{ARR} \).

**Relative Risk.** \( RR = \frac{I_E}{I_o} \).
Appendix 5

INSTRUMENTS USED IN STUDIES INCLUDED IN THIS REVIEW

Barthel index (Mahoney and Barthel, 1965) ~ Measures independence on 10 activities

Beck’s depression inventory (Beck et al., 1961) ~ A validated instrument for measuring depression (including severity).

Brunnstrom’s motor rating (Shah et al., 1986)

Center for epidemiologic studies-depression scale (Radloff, 1977) ~ A self report scale designed to identify individuals at risk for depression.


ESCROW (Granger and Gresham, 1984) ~ Profiles environmental, social support, cluster of family members, resources, outlook and work or school activities.

Extended activities of daily living (Nouri and Lincoln, 1987) ~ Assesses mobility, household and leisure activities.

Family assessment device (Epstein et al., 1983) ~ Contains items on six areas of family behaviour.

Frenchay activities index (Holbrook and Skillbeck, 1983) ~ Measures the frequency of 15 separate activities.

General health questionnaire (Goldberg and Hillier, 1979) ~ Designed to detect non-psychotic psychiatric symptomatology in the general population.

Geriatric depression scale (Sheikh and Yesavage, 1986) ~ A validated instrument for assessing depression in the elderly.

Hospital anxiety and depression scale (Zigmond and Snaith, 1983) ~ A measure of burden and emotional distress.

Jebsen hand function evaluation (Jebsen et al., 1969) ~ Assesses hand function through the use of seven tests.

Katz activities of daily living (Katz et al., 1963) ~ Assesses independence in activities of daily living.


Sickness impact profile (Bergner et al., 1976) ~ Assesses changes in usual behaviours that result directly from illness or disability.

Social support inventory for stroke survivors (McColl and Friedland, 1989) ~ A multidimensional index that assesses social support from personal, family and friends, community individuals, community groups and professional sources.

State Trait Anxiety Inventory (Spielberger et al., 1983) ~ consists of 20 questions that evaluate the respondents emotions.