Services for reducing duration of hospital care for acute stroke patients

Early Supported Discharge Trialists


A substantive amendment to this systematic review was last made on 15 March 2001. Cochrane reviews are regularly checked and updated if necessary.

Background: Stroke patients conventionally receive a substantial part of their rehabilitation in hospital. Services have now been developed which offer patients in hospital an early discharge with rehabilitation at home (early supported discharge, ESD).

Objectives: To establish the costs and effects of ESD services compared with conventional services.

Search strategy: The Stroke Group Specialist Register of Controlled Trials was searched and supplemented with information from individual trialists. Searching was completed in December 2000.

Selection criteria: Randomised controlled trials recruiting stroke patients in hospital to receive either conventional care or any service intervention which has provided rehabilitation and support in a community setting with an aim of reducing the duration of hospital care.

Data collection and analysis: Two reviewers scrutinised trials and categorised them on their eligibility. Standardised information was then obtained from the primary trialists. Results were analysed for all trials and for subgroups depending on whether the intervention was provided by a coordinated multidisciplinary team (coordinated ESD team) or not.

Main results: Outcome data are currently available for four trials. Patients tended to be a selected elderly group with disability. Overall, the odds ratios (95% confidence interval) for death, death or institutionalisation, death or dependency at the end of scheduled follow up were 0.87 (0.39-1.93), 0.69 (0.36-1.31) and 0.88 (0.49-1.57) respectively. Apparent benefits were more evident in the three trials evaluating a coordinated ESD team. The ESD group showed significant reductions (P <0.001) in the length of hospital stay equivalent to approximately nine days.

Reviewers' conclusions: ESD services provided for a selected group of stroke patients can reduce the length of hospital stay. However, the relative risks and benefits and overall costs of such services remain unclear.
Background

Stroke is one of the major causes of death and disability in the Western world and consumes about 5% of health service resources within the National Health Service (Isard 1992). Much of this cost is attributable to the care of disabled patients in hospital (Warlow 1996). A recent systematic review (SUTC 1998) evaluating in-patient stroke care has indicated that organised in-patient (stroke unit) care is effective in reducing death and disability. However, many questions about stroke service provision remain unanswered (Langhorne 1995). In particular, are there effective alternatives to in-patient care and how can care be best provided after discharge from hospital?

A previous review (Services for helping avoid hospital admission) has focused on those systems of care which have been set up as complete alternatives to in-patient care; ie. services such as "hospital at home" which aim to prevent stroke patients being admitted to hospital. A second approach has been to develop services which may accelerate the discharge of patients already admitted to hospital. These services have variously been termed "early supported discharge schemes", "accelerated discharge schemes" and "post discharge support services" and form the basis of this review.

Objectives

We addressed the following questions of services which offered stroke patients in hospital an alternative to conventional systems of care through a policy of early discharge from hospital with community-based rehabilitation (early supported discharge):
1. Can these alternative services accelerate the return home of stroke patients who are admitted to hospital?
2. Can such care produce equivalent or better patient and carer outcomes than conventional care?
3. Which approaches are most satisfactory to patients and carers?
4. What are the resource implications of such services?

Criteria for considering studies for this review

Types of studies

We included all unconfounded randomised trials which have compared conventional hospital care and discharge procedures with alternative services which aimed to accelerate the patient's discharge from hospital. Therefore randomisation will have taken place relatively early after hospital admission and before discharge.

Types of participants

Any patient who has been admitted to hospital with a clinical diagnosis of stroke (defined as an acute focal neurological deficit caused by cerebrovascular disease).

Where possible we tried to record stroke severity (level of disability) at randomisation using activities of daily living (ADL) status.

Types of intervention

We included trials evaluating any intervention which aimed to accelerate discharge from hospital with the provision of support (with or without a "therapeutic" rehabilitation intervention) in a community setting (early supported discharge; ESD). The specific type of intervention was recorded but not used as an exclusion criterion. We aimed to include trials which focused largely or entirely on stroke patients. Prespecified
subgroups were derived from recognised indicators of inpatient stroke service quality in particular whether care was planned and provided by a specialist team whose work was coordinated through regular multidisciplinary meetings.

**Types of outcome measures**

Where possible, we aimed to record outcomes which reflect the spectrum of a disabling illness. Primary outcomes included;
a) death  
b) place of residence  
c) physical dependency (ie. dependent on help for transfers, mobility, washing, dressing or toileting) and/or an activities of daily living (ADL) score.  
Secondary outcomes included;
d) social activity or extended ADL  
e) subjective health status (quality of life score)  
f) mood (mood or depression score)  
g) carer outcomes (carer mood and quality of life)  
h) patient and carer satisfaction and/or preference
These were recorded at the end of scheduled follow-up.

We also aimed to record resource outcomes (ie. duration of the hospital stay, number of re-admissions, number of re-admission days, cost of in-patient stay, total cost of service interventions).

**Search strategy for identification of studies**

See: Collaborative Review Group search strategy

This review has drawn on the search strategy developed for the Stroke Group as a whole. Relevant trials were identified in the Specialised Register of Controlled Trials (see Review Group Details for more information) which was last searched in April 2001. We supplemented this information through discussions with current trialists.

**Methods of the review**

**SELECTION OF TRIALS:**
Trials were scrutinised by two independent reviewers who decided on eligibility based on the following criteria:
i) randomised controlled trial  
ii) service intervention providing rehabilitation and/or physical support in a community setting.  
iii) service aim is to accelerate discharge home from hospital (ie. randomisation takes place during hospital admission)  
iv) trial of stroke patients

**ASSESSMENT OF METHODOLOGICAL QUALITY:**
The method of concealment of treatment allocation, the presence of an intention to treat analysis and the presence of blinding of outcome assessment were identified as important factors for sensitivity analyses, but not used as exclusion criteria.

**DATA EXTRACTION:**
Our primary aim was to obtain standardised outcome data through collaboration with the original trialists. Where data were taken only from published sources, they were extracted by two independent reviewers using a standard data extraction form.
DATA SYNTHESIS:
Binary outcome data were analysed using the odds ratio and 95% confidence interval. Where data were missing we assumed the patient to be alive, independent and living at home. If possible continuous outcome data (eg. ADL scores) were analysed using the weighted mean difference (and 95% confidence interval) for identical outcomes and the standard mean difference where different measurement techniques were used to measure the same outcome domain.

SENSITIVITY ANALYSIS:
Sensitivity analyses were planned around the method of randomisation (concealment of treatment allocation), an intention-to-treat analysis, blinding of outcome assessment, the type of intervention employed (eg. staff mix, intensity of input, supportive vs rehabilitative interventions) and the type of control intervention (ie. services available in conventional care). We hoped to analyse by stroke subtype and severity, presence of carers, and duration of follow up if data became available.

HETEROGENEITY TESTS:
Heterogeneity tests were carried out and sources of heterogeneity explored.

Description of studies

See: Tables of studies

The search strategy identified 21 potentially eligible trials of which two (Auckland, Ayr) were in the early stages of planning but never started. The remaining 19 were suitable for consideration by two independent assessors using the four selection criteria. The two assessors agreed on the inclusion of seven trials, the exclusion of 10 trials and disagreed on two trials (Akershus; New York); after discussion and obtaining more information both these trials were considered eligible. No further information has yet been obtained for the New York trial so it is listed as a trial awaiting assessment.

The coordinators of the eligible trials were contacted and invited to join a collaborative group. They were asked to provide a detailed description of their intervention and control services and also to provide basic outcome data where available. This descriptive information was collected using a standard questionnaire prior to the identification and analysis of outcome data. We are currently undertaking a detailed individual patient data meta-analysis and currently have only limited outcome data on the four trials published before 2000 (see Included studies table). We have available descriptive information for the three trials published recently (Adelaide; Montreal; Trondheim) and two unpublished trials nearing publication (Belfast; Oslo).

The services under comparison are outlined in detail (see Included studies and Ongoing studies tables). We were particularly interested in establishing the degree of coordination and organisation of the community and hospital services (ie. what percentage of patients received care from a coordinated multidisciplinary team with some specialist interest in stroke which met on a regular basis). By this definition the following classifications can be made:

Intervention services:

a) ESD team coordinated and provided care: In six trials (Adelaide; Belfast; London; Montreal; Newcastle; Stockholm) the ESD service comprised a coordinated multidisciplinary team which planned, coordinated and delivered patient care at home.

b) ESD coordinated care only: In two trials (Trondheim; Oslo) discharge home and subsequent care was planned and supervised by a coordinated multidisciplinary team but much of the care at home was provided by other existing community-based agencies. These services did not usually provide coordinated multidisciplinary team care.

c) No ESD coordination: One trial (Akershus) evaluated a range of community stroke services which were not planned or provided by a coordinated team.

Control services:
a) Organised stroke unit care for majority of patients: In seven trials (Adelaide; Akershus; Belfast; London; Oslo; Stockholm; Trondheim) the majority of patients were recruited from an organised stroke unit setting which formed the control service.

b) Organised stroke unit care for minority of patients: In two trials (Montreal; Newcastle) less than half of the patients were recruited from an organised stroke unit setting. Therefore the control service was frequently provided in general wards.

Settings of services
The trials identified come from five Western countries (Australia, Canada, Norway, Sweden, UK, USA). Eight trials were established in city hospitals servicing urban areas while one (Belfast) covered a mixture of rural and urban areas.

Patient characteristics
Patients tended to be elderly (average age 69-75 years) with a clinical diagnosis of stroke. In general patient selection was based on need (persisting disability), stability of their medical condition, and practicability (living within the local area). There appeared to be a degree of selection of patients deemed suitable for the early supported discharge services. None of the trials recruited more than 70% of hospitalised stroke patients; a median of 38% (range 13-68%) patients met the criteria for the early discharge service (NB. in some trials a further group of patients did not meet research criteria such as an ability to complete research assessments).

Outcomes
Primary outcome data are currently only available for four trials (Akershus, London, Newcastle, Stockholm) which together with the remaining trials are being included in an individual patient data analysis.

Methodological quality

See: Table of included studies

Treatment allocation: Eight trials (Adelaide, Akershus, Belfast, London, Montreal, Newcastle, Oslo, Stockholm) used a clearly concealed randomisation procedure. In one trial (New York) the exact method of randomisation is unclear.

Completeness of follow up: This was generally complete (see Results) particularly for the primary outcomes of death, death or institutionalisation, and death or dependency.


Results

- List of comparisons
- Tables of other data

Results were analysed for all comparisons of early supported discharge services (policy of early discharge with home-based support/rehabilitation) versus conventional services (policy of hospital rehabilitation and conventional discharge arrangements) at the end of scheduled follow up (median 6 months; range 3-12). In order to reflect the diversity of services they were divided into two prespecified subgroups (coordinated early supported discharge team; no coordinated early supported discharge team). This subdivision may be oversimplistic and so further sensitivity analyses of service characteristics are presented below.

1. PATIENT OUTCOMES

1.01 Death - Outcome data were complete for all but 10 (2.6%) intervention patients and six (1.6%) controls. Overall there was no significant difference in case-fatality between the early supported discharge (ESD) team and conventional services (odds ratio 0.87; 95% confidence interval 0.39-1.93). However there was some statistical heterogeneity (chi-square 5.91, df=3, P >0.1) with a trend towards lower case fatality with the
coordinated ESD team (0.65; 0.38-1.11) which was reversed in the "no coordinated ESD team" group where conventional services were provided by a coordinated hospital team (1.84; 0.86-3.95).

1.02 Death or requiring institutional care - Outcome data were complete for all but 10 (1.6%) intervention patients and six (1.6%) controls. Overall there was no significant difference in the odds of patient dying or requiring long term institutional care (0.69; 0.36-1.31). Once again there was some heterogeneity (chi-square 6.12; df=3, P >0.1) with trends in favour of the coordinated ESD team group (0.53; 0.33-0.83; P=0.009) and against the "no coordinated ESD team group (1.28; 0.72-2.29).

1.03 Death or dependency - Outcome data were complete for all but 17 (4.5%) intervention patients and 18 (4.8%) controls. Overall there was no significant difference in the odds of the combined adverse outcome of death or dependency (0.88; 0.49-1.57). Once again there was substantial heterogeneity (chi-square 9.11; df=3, P=0.03) with trends in favour of the coordinated ESD team (0.67; 0.46-0.98; P <0.05). However, this trend was reversed in the "no coordinated ESD team" group where the control group receiving conventional services had improved outcomes (1.88; 1.07-3.28; P=0.03).

1.04 Activities of Daily Living - These data are currently available as summary results. In the coordinated ESD team group there were non-significant trends in favour of the ESD service. Trends were reversed in the "no coordinated ESD team" group where the conventional care patients tended to have better results.

1.05 Extended Activities of Daily Living - These data are currently available as summary scores from three trials (London, Newcastle, Stockholm) where non-significant trends were in favour of the coordinated ESD team group.

1.06 Subjective Health Status - These data are currently available as summary scores from three trials (London, Newcastle, Stockholm) where there were non-significant trends towards poorer outcomes in the coordinated ESD team group.

1.07 Mood Status - Data are currently available from one trial (London) where the ESD service group had higher levels of anxiety (P <0.02) and non-significant trends towards higher levels of depression.

1.08 Patient satisfaction - These data are currently incomplete; data from two trials (London, Stockholm) indicate trends in favour of the ESD service group.

2. CARER OUTCOMES
2.01 Subjective Health Status - No data available.

2.02 Mood Status - No data available.

2.03 Carer Satisfaction - Data from one trial (London) indicate no difference between groups.

3. RESOURCE USE
3.01 Length of initial hospital stay - Exact quantification of any reduction in length of stay is difficult because a number of assumptions were required in the analysis. Two trials (Akershus, London) provided length of stay after randomisation to which was added the mean stay pre-randomisation. Two trials (London, Stockholm) could provide mean and standard deviation data but the remainder were available as median and interquartile ranges (Newcastle) or mean length of stay with inference of standard deviations from comparable data (Akershus). Each of these assumptions are probably conservative (ie tending to favour the null hypothesis). Across all trials and within each subgroup of trials, there was a significant reduction (P <0.001) in the length of hospital stay which is probably equivalent to about nine days in the coordinated ESD team group and substantially more in the "no coordinated ESD team" group.

3.02 Length of total hospital stay - Data were available from one trial (Newcastle) on the median (interquartile range) of total hospital stay which included readmissions. The reduction in length of stay remained significant (P <0.05) for the ESD service group.
3.03 Hospital readmissions - Two trials (London, Newcastle) provided data on the number of readmissions to hospital which were almost identical between the ESD service and conventional care groups.

3.04 Costs - Costing data are currently available from two trials which estimated total costs up to six months (Newcastle) or one year (London) after randomisation. Estimated costs per patient were:
- London - £6800 for the ESD service and £7432 for controls
- Newcastle - £7155 for the ESD service and £7480 for controls
These estimates were reported to be relatively stable in sensitivity analyses.

4. SENSITIVITY ANALYSES
All four trials showed good methodological quality and there was insufficient heterogeneity to allow useful sensitivity analyses by randomisation method, blinding of outcome assessment, and completeness of follow up.

Service organisation - Trials were ranked by the intervention and control characteristics outlined above. There are insufficient data to draw firm conclusions at present. ESD services which are coordinated and delivered by a multidisciplinary team appeared to be effective whereas early discharge without any multidisciplinary coordination showed a trend towards harm (4.01 Death or dependency). There are insufficient data to comment on the impact of control services (4.03 Death or dependency).

Reductions in length of stay were achieved by the ESD services across all trials (4.02 & 4.04 Length of hospital stay). More data would be required to further explore the possible relationship between service quality and outcome.

Discussion

Setting the question
When interpreting the results of this review it is important to remember that the basic question addressed was whether a policy of early hospital discharge with support could be as effective and efficient as conventional care. Therefore our inclusion criteria were broad and focused on trials which compared two policies of care for stroke patients in hospital; 1) conventional care ie. the usual hospital care and discharge procedures, and 2) an alternative system of care which aimed to provide an earlier discharge with rehabilitation and/or support in a home based setting ("early supported discharge"; ESD). Within this broad question we anticipated that a substantial subgroup of trials would be testing a specialist coordinated ESD team which had been established solely to provide this form of care to stroke patients. However, we also wished to retain the option of including other trials where a policy of early discharge was tested in other ways (eg. Akershus). The advantage of this broad approach is that it can allow us to examine both the effectiveness of a reasonably specific coordinated ESD team "package" of care, and also to explore the broader issues of which service factors (both inpatient and outpatient) may influence patient outcomes. One potential hazard is that it is difficult to conduct such an exercise in a truly objective manner.

We have tried to develop a clear question to guide this review. We have chosen to focus the question around the policy of the service intervention in order to avoid terms such as "hospital at home" which may have a different meaning to different people. However we should acknowledge that some services (Wade 1985) aim to both help avoid hospital admission and accelerate discharge. We have not excluded any trials from the review solely on the basis of their service having this "dual" function. We have also focussed the review on services specifically for stroke patients. There are several potentially complementary trials which have recruited a mixed geriatric medical patient population. These have recently been reviewed (Shepperd 1997).

Trial Outcomes
It is clear from this analysis of the randomised trials that services aiming to accelerate discharge from hospital can bring about a reduction in the length of hospital stay and that this reduction can be substantial. However, we currently lack conclusive information on the impact on patient and carer outcomes, patient and carer
preferences and the resource implications of such services. There were trends in favour of the coordinated ESD team interventions in terms of preventing the combined adverse outcomes of death/institutional care and death/dependency. However there were also trends indicating a poorer subjective health status and mood level in ESD team patients. There is also very limited information on the impact of such services on the mood and wellbeing of carers. Finally more detailed costing is required to balance the costs of an ESD team with the potential savings in hospital costs. It may be the case that improved outcomes are achieved by providing a more "intensive" input in which case resource use is an important unresolved issue. For these reasons much more information is required from ESD trials to inform decision making. We are aware of ongoing trials with at least 400 patients which we intend to incorporate in future analyses.

External validity
Most of the trials included within this review have recruited only a minority (30-40%) of stroke patients admitted to urban hospitals. Therefore the results of these trials may only be relevant to a proportion of all stroke patients; particularly those who live within a relatively local area and have residual disability which is neither too severe nor complicated by severe comorbidities. Future analyses will need to explore the relative benefits of conventional and ESD care for patients with different levels of disability and case mix characteristics. Furthermore, most of the trials identified have operated within a developed urban setting. The role of ESD services in more remote rural communities has not really been addressed.

There is considerable heterogeneity in the results of the trials identified which, in part at least, appears to relate to service organisation (in particular whether care was provided by a multidisciplinary team with an interest in stroke rehabilitation whose care was coordinated through regular meetings). We must recognise that interpretation of service characteristics raises the potential risk of a post-hoc explanation of results. However, it is possible that the degree of organisation of the service may be an important factor in determining its effectiveness. This raises the important possibility that subtle aspects of service quality, regardless of whether that service is delivered in a hospital or community setting, may have a measurable impact on patient outcomes. This important possibility warrants consideration in future analyses.

Reviewers' conclusions

Implications for practice
Early supported discharge services can reduce the length of hospital stay but the relative risks and benefits of this type of service remain unclear. We await data from several ongoing trials before further implications can be drawn.

Implications for research
The current analysis is based on very little information; from four single centre trials carried out in an urban setting. Information from further similar trials is required either in the form of a larger multi-centre trial or an individual patient data meta-analysis of all the available smaller trials. The latter proposal is currently underway.

Acknowledgements
The Early Supported Discharge Trialists' group includes:
Craig Anderson (Auckland); Erik Bautz-Holter (Oslo); Neil Craig (Health Economist); Martin Dennis (Secretariat); Jean Douglas (Administrator); Ken Fullerton (Belfast); Lotta Holmqvist (Stockholm); Bent Indredavik (Trondheim); Peter Langhorne (Coordinator); Nancy Mayo (Montreal); Gordon Murray (Statistician); Michael Power (Belfast); Helen Rodgers (Newcastle); Ole Morten Ronning (Akershus); Sally Rubenach (Adelaide); Anthony Rudd (London); Charles Wolfe (London).
Potential conflict of interest

Most of the early supported discharge trialists carried out randomised trials which are included in the review.

References

References to studies included in this review

Adelaide (published and unpublished data)


Akershus (published and unpublished data)


London (published data only)


Montreal (unpublished data only)


Newcastle (unpublished data sought but not used)


Stockholm (published and unpublished data)


Trondheim (published and unpublished data)


* indicates the major publication for the study

References to studies excluded from this review

Challis 1991


Donald 1995


Dunn 1994


Kalra


LHEC 1997

Martin 1994


Shepperd 1998


Townsend 1988


Victor 1988


Wade 1985


Ongoing studies

Belfast


New York


Oslo


Additional references

Isard 1992


Langhorne 1995

Langhorne P. Developing comprehensive stroke services: an evidence-based approach. Postgrad

Shepperd 1997


SUTC 1998


Warlow 1996


Cover sheet

<table>
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<th>Services for reducing duration of hospital care for acute stroke patients</th>
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<td><strong>Reviewer(s)</strong></td>
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<td><strong>Issue protocol first published</strong></td>
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<td><strong>Issue review first published</strong></td>
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We have also slightly modified the classification of Early Supported Discharge services (into three subgroups) to reflect the variety of trials being published.

| Date new studies sought but none found | Information not supplied by reviewer |
| Date new studies found but not yet included/excluded | Information not supplied by reviewer |
| Date new studies found and included/excluded | Information not supplied by reviewer |
| Date reviewers' conclusions section amended | Information not supplied by reviewer |

Contact address
Prof Peter Langhorne
Stroke Unit Trialists' Collaboration
Academic Section of Geriatric Medicine
3rd Floor, Centre Block, Royal Infirmary
Glasgow
UK
G4 0SF
Telephone: +44 141 211 4976
Facsimile: +44 141 211 4944
E-mail: p.langhorne@clinmed.gla.ac.uk

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Internal sources of support to the review
- University of Glasgow, University of Edinburgh UK

Synopsis

Early discharge services can allow stroke patients to return home early but their effect on recovery is not yet clear.

Early supported discharge services are provided by teams of nurses, therapists and doctors. They aim to allow stroke patients to return home from hospital earlier than usual and receive more rehabilitation at home. These services can allow an earlier return home but their effect on the patients recovery and well-being is less clear.
More research will be available in the near future.

**Keywords**

Cerebrovascular Accident [*rehabilitation]; *Home Care Services; *Home Nursing; Human; Length of Stay

**Tables & Graphs**

- [MetaView graphs](#)
  
The figures and graphs in Cochrane Reviews display the Peto Odds Ratio and the Weighted Mean Difference by default. These are not always the methods used by reviewers when combining data in their review. You should check the text of the review for a description of the statistical methods used.

- [List of comparisons](#)
- [Tables of other data](#)
- [Table of included studies](#)
- [Table of excluded studies](#)
- [Table of ongoing studies](#)

**List of comparisons**

**Fig 01 EARLY SUPPORTED DISCHARGE (ESD) VS CONVENTIONAL CARE - PATIENT OUTCOMES**

- 01.01.00 Death
- 01.02.00 Death or requiring institutional care
- 01.03.00 Death or dependency
- 01.04.00 Activities of daily living (ADL) score See: Tables of other data
- 01.05.00 Extended activities of daily living (EADL) score See: Tables of other data
- 01.06.00 Subjective health status See: Tables of other data
- 01.07.00 Mood status See: Tables of other data
- 01.08.00 Satisfaction with care See: Tables of other data

**Fig 02 EARLY SUPPORTED DISCHARGE VS CONVENTIONAL CARE - CARER OUTCOMES**

- 02.01.00 Subjective health status of carers See: Tables of other data
- 02.02.00 Mood status of carers See: Tables of other data
- 02.03.00 Satisfaction of carers See: Tables of other data

**Fig 03 EARLY SUPPORTED DISCHARGE VS CONVENTIONAL CARE - RESOURCE USE**

- 03.01.00 Length of initial hospital stay (days)
- 03.02.00 Length of total hospital stay (days)
- 03.03.00 Number of readmissions to hospital
- 03.04.00 Service costs See: Tables of other data

**Fig 04 EARLY SUPPORTED DISCHARGE SERVICE VS CONVENTIONAL CARE - SENSITIVITY ANALYSIS BY SERVICE ORGANISATION**

- 04.01.00 Death or dependency
- 04.02.00 Length of hospital stay (days)
- 04.03.00 Death or dependency
- 04.04.00 Length of hospital stay (days)
## Tables of other data

### Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Activities of daily living (ADL) score: Coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>ESD service - Mean Barthel index 16 (standard deviation 4)</th>
<th>Conventional care - Mean Barthel index 16 (standard deviation 4)</th>
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<tbody>
<tr>
<td>London</td>
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<tr>
<td>Newcastle</td>
<td>ESD service - 28 (62%) were independent (Rankin score 0-2)</td>
<td>Conventional care - 22 (52%) were independent (Rankin score 0-2)</td>
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<tr>
<td>Stockholm</td>
<td>ESD service - 36 (88%) independent in Katz ADL; 28 (69%) in Barthel ADL</td>
<td>Conventional care - 32 (80%) independent in Katz ADL; 25 (63%) in Barthel ADL</td>
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### Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Activities of daily living (ADL) score: No coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>ESD service - 69/92 (75%) survivors had Barthel index &gt; 75/100</th>
<th>Conventional care - 92/108 (85%) survivors had Barthel index &gt; 75/100</th>
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<tr>
<td>Akershus</td>
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### Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Extended activities of daily living (EADL) score: Coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>ESD service - Mean (SD) Rivermead extended ADL scale 27 (12)</th>
<th>Conventional care - Mean (SD) Rivermead extended ADL scale 27 (11)</th>
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<tr>
<td>London</td>
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<tr>
<td>Newcastle</td>
<td>ESD service - Median (range) Nottingham extended ADL 10 (0-18)</td>
<td>Conventional care - Median (range) Nottingham extended ADL 7 (0-21)</td>
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<tr>
<td>Stockholm</td>
<td>ESD service - Frequency of lifestyle activities median 20 (interquartile range 16-27)</td>
<td>ESD service - Frequency of independence in Katz extended ADL = 16 (39%) of survivors</td>
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<td></td>
<td>Conventional care - Frequency of lifestyle activities median 18 (interquartile range 11-25)</td>
<td>Conventional care - Frequency of independence in Katz extended ADL = 12 (30%) of survivors</td>
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### Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Subjective health status: Coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>ESD service - Mean (SD) Nottingham health profile 14 (9)</th>
<th>Conventional care - Mean (SD) Nottingham health profile 12 (9)</th>
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<tr>
<td>London</td>
<td></td>
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<tr>
<td>Newcastle</td>
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<td>No difference between groups in any of the Dartmouth COOP Global Health Status categories.</td>
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Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Mood status: Coordinated ESD team

<table>
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<tr>
<th>Study</th>
<th>Anxiety</th>
<th>Depression</th>
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<td>London</td>
<td>ESD service group had higher frequency (P=0.02) of anxiety on HADS; 20 (17%) abnormal and 16 (14%) borderline compared with 7 (7%) abnormal and 12 (12%) borderline in conventional care.</td>
<td>ESD service group showed slightly higher frequency (P=0.9) of depression on the HADS; 24 (21%) abnormal and 16 (14%) borderline compared with 21 (21%) abnormal and 19 (19%) borderline in conventional care.</td>
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Early Supported Discharge (ESD) vs Conventional Care - Patient Outcomes: Satisfaction with care: Coordinated ESD team

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<tr>
<th>Study</th>
<th>London</th>
<th>Number (%) satisfied with:</th>
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<td></td>
<td>Hospital Care: ESD service 78 (79%), Conventional care 59 (65%); P=0.03</td>
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<td>Therapy Provision: ESD service 56 (58%), Conventional care 46 (51%); P=0.29</td>
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<td></td>
<td>Community Support: ESD service 44 (56%), Conventional care 35 (50%); P=0.44</td>
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<td></td>
<td>General: ESD service 58 (59%), Conventional care 43 (48%); P=0.14</td>
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</table>

Stockholm: ESD service group reported greater satisfaction with active participation in treatment planning compared with conventional care patients (P=0.02). All other aspects of satisfaction did not differ significantly.

Early Supported Discharge vs Conventional Care - Carer Outcomes: Satisfaction of carers: Coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>London</th>
<th>Number (%) satisfied with:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hospital care: ESD service 60 (74%), Conventional care 41 (67%); P=0.37</td>
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<tr>
<td></td>
<td>Therapy provision: ESD service 40 (53%), Conventional care 28 (46%); P=0.39</td>
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<td></td>
<td>Community support: ESD service 28 (42%), Conventional care 29 (51%); P=0.35</td>
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<tr>
<td></td>
<td>General: ESD service 68 (83%), Conventional care 52 (83%); P=0.95</td>
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</tbody>
</table>

Early Supported Discharge vs Conventional care - Resource Use: Service costs: Coordinated ESD team

<table>
<thead>
<tr>
<th>Study</th>
<th>London</th>
<th>Newcastle</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Average annual costs were £6800 for the intervention group versus £7432 for controls. Estimates were stable in sensitivity analyses.</td>
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<td></td>
<td>Intervention service costs were calculated at £7155 per patient compared with £7480 in the controls. Sensitivity analysis demonstrated the result was stable to different costings. The savings were most apparent in the more disabled patient group.</td>
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</tbody>
</table>

Additional tables
### Table of included studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
<th>Notes</th>
<th>Allocation concealment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelaide</td>
<td>Randomised controlled trial. Randomisation using opaque sealed envelopes. Independent (single blind) follow up.</td>
<td>Patients (n=86) recruited from city hospital. Inclusion criteria: Clinical diagnosis of stroke in previous six months, requiring rehabilitation, needing light / moderate assistance with transfers, medically stable, living at a local address with adequate community support. Characteristics: Mean age 72 (SD 11), median Barthel index 85/100 (interquartile range 80-95). Trial included 86/398 (22%) of stroke patients admitted to hospital.</td>
<td>Intervention: Multidisciplinary community rehabilitation team, comprising medical, physiotherapy, occupational therapy, speech and language therapy and social work input. Combination of hospital inreach and community outreach services. Input initially intensive and then tapered off to stop when rehabilitation goals were met. Team had specialist interest in rehabilitation and their activities were coordinated through weekly multidisciplinary meetings.</td>
<td>Outcomes were recorded at 6 months. Death Place of residence Dependency (modified Barthel index, Adelaide activities profile) Subjective health status (Short Form 36) Carer subjective health status (Short Form 36, General Health Questionnaire 28) Patient and carer views, McMaster Family Assessment of recovery</td>
<td>Intervention focussed on patient's own identified goals and received longer contact with the ESD therapy team.</td>
<td>A</td>
</tr>
<tr>
<td><strong>Akershus</strong></td>
<td>Randomised controlled trial (exact methods unclear). Independent (single blind) follow up.</td>
<td>Patients (n=251) recruited from city hospital. Inclusion criteria: clinical definition of stroke, age greater than or equal to 60 years of age, Scandinavian stroke score 12 - 52, conscious and able to cooperate with rehabilitation, living at private address. Characteristics: Mean age 75 (SD 6) years. Initial Barthel Index a median of 50/100 (IQR 30-70). A total of 238/550 (43%) of the patients screened were recruited.</td>
<td>Intervention: Community rehabilitation provided by a variety of municipality based rehabilitation services (41% admitted to nursing homes for rehabilitation, 25% received ambulatory physiotherapy, 4% speech therapy, 30% no treatment). Community rehabilitation services did not specialise in stroke and were not consistently coordinated through regular multidisciplinary team meetings. Medical input from primary care physician with variable degree of nursing input. Control: Control patients received conventional inpatient rehabilitation in a six bed bay of a rehabilitation unit. This comprised multidisciplinary rehabilitation provided by staff with a specialist interest in stroke rehabilitation and coordinated through weekly team meetings.</td>
<td>Outcomes recorded at seven months: Death Place of residence Impairment (Scandinavian stroke scale) Dependency (Barthel Index; in current analysis dependency = Barthel index &lt;15/20) Subjective health status (SF 36) Resource use (length of stay)</td>
<td>This trial was set up as an evaluation of the stroke rehabilitation ward with municipality services acting as controls. 7 intervention and 12 control patients could not be contacted at 7 months</td>
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<tr>
<td>Location</td>
<td>Type of Study</td>
<td>Patients</td>
<td>Intervention</td>
<td>Main Outcomes</td>
<td>Important Characteristics</td>
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<tr>
<td>London</td>
<td>Randomised controlled trial</td>
<td>Patients (n=331) recruited from two city hospitals.</td>
<td>Intervention: Multidisciplinary community therapy team comprising physiotherapy, occupational therapy, speech and language therapy and medical input. The team had a special interest in neurology and stroke and were coordinated through weekly multidisciplinary meetings. The community team liaised with hospital based rehabilitation staff and then provided a package of care after discharge. The maximum duration of the intervention was three months. Team coordinated and delivered care.</td>
<td>Main outcomes were recorded at 12 months (additional details at 2, 4 and 6 months). Death Place of residence Dependency (Barthel index, Frenchay activities index, Rivermead ADL score; in current analysis dependency = Barthel index &lt; 20/20) Subjective health status (Nottingham Health Profile) Patient mood (Hospital anxiety and depression scale) Carer health status (Caregiver strain) Patient and carer satisfaction Resource use (hospital length of stay, place of residence, number of therapy sessions)</td>
<td>Important characteristics were believed to be providing a coordinated package of community rehabilitation. 5 intervention and 4 control patients lost to follow up</td>
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<tr>
<td>Montreal</td>
<td>Randomised controlled trial</td>
<td>Patients (n=115) recruited from five city</td>
<td>Intervention: Community rehabilitation team providing intensive</td>
<td>Outcomes recorded at three months:</td>
<td>A</td>
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</table>
### Newcastle

**Randomised controlled trial.** Zelen randomisation procedure using a computerised randomisation system, accessed by telephone. Independent (single blind) follow up of patients but security of blinding uncertain. Intention-to-treat analysis.

| Recruitment from three city hospitals. Inclusion criteria: Within three days of stroke, Barthel Index 5-19, medically stable, living at private address. Characteristics: Median age 73 (44 - 93 ) years. Median Barthel Index 14/20 (range 2-20) at one week post-stroke. 119/402 (30%) of patients screened were | Interventions: Community-based hospital inreach multidisciplinary rehabilitation team with a specialist interest in stroke and coordinated through weekly multidisciplinary meetings. Medical support by general practitioner and stroke physician. Rehabilitation team contacted patients and carers and carried out assessment of home circumstances prior to discharge. Following discharge, daily therapy and home care could be | Outcomes recorded at 3, 6 and 12 months after randomisation: **Death** Place of residence. **Dependency** (Rankin score, Nottingham extended ADL; in current analysis dependency = Rankin score >2, approximately equivalent to a Barthel index <19/20 ) **Subjective health status** | Staff felt that continuity of care provided in the home environment were key elements. One intervention and three control patients lost to follow up. |

#### Hospitals.

- Randomisation using opaque sealed envelopes held in a central office.
- Single blinding of outcome assessment.
- Inclusion criteria: Clinical diagnosis of stroke in the previous 28 days (mean delay 10 days), moderate disability, living with carer, medically stable.
- Characteristics: Mean age 70 (SD 13) years, mean Barthel index 83/100 (SD 14). Trial included 164/1321 (13%) of patients screened.

#### Home rehabilitation Team comprised nursing, physiotherapy, occupational therapy, speech therapy and dietician input. Intervention was coordinated and individualised. Intervention lasted four weeks with further care as required. Team coordinated and delivered care. Control: Conventional care incorporated a variety of inpatient services (owing to health care cutbacks, only 27% of control patients received home care or rehabilitation centre care).

#### Death

- Place of residence.
- Dependency (Barthel index, instrumental ADL)
- Subjective health status (SF-36)

#### Service costs

- Study resulted in an increase in community services and reduction in inpatient facilities forcing earlier discharges on conventional care patients. As a result, the intervention group received an increased rehabilitation input.
### Stockholm

**Randomised controlled trial.**

Opaque sealed envelopes
Independent (single blind) outcome measurement

**Patients (n=83)** recruited from the Neurology department of a city hospital.

**Inclusion criteria**:
- cerebral infarct or primary intracerebral haemorrhage
- 5-7 days post stroke, continent and able to feed,
- residual impairment, medically stable, intact cognition.

**Characteristics**:
- Median age 72 (range 49 - 89) years.
- Median Lindmark Motor Capacity scale 127/153 (IQR 100-138).
- Trial included 86/220 (38%) of patients

**Intervention**:
- Multidisciplinary hospital outreach early supported discharge team,
  - with special interest in rehabilitation and coordinated through weekly meetings.
  - This was a therapist based service (no nursing input)
  - based in the hospital stroke unit.
  - Pre-discharge home visit carried out with the patient.

**Intervention provided on a less than daily basis for 3-4 months after discharge.**
- Team coordinated and delivered care.

**Control**:
- These patients received conventional hospital care involving coordinated multidisciplinary stroke unit care in a hospital stroke unit.

**Outcomes measured as 3, 6 and 12 months (only 3 month data currently available)**:
- Death
- Place of residence
- Dependency (Katz ADL, Barthel index, Frenchay Activities Index; in the current analysis dependency = Barthel index < 20/20)
- Subjective health status (Sickness impact profile)
- Carer subjective health status (Sickness impact profile)
- Patient and carer preferences (qualitative interviews)
- Resource use (length of hospital stay, costing of services)

Team felt that coordinated continuity of care provided at home was the key element,
- One intervention and one control patient lost to follow up.
screened (approximately 30% of all patients). and conventional discharge procedures. carer satisfaction. Resource use (length of stay and service costs).

| Study | Randomised controlled trial. Opaque sealed envelopes | Unselected acute stroke patients (n=320) admitted to a stroke unit providing acute care and early rehabilitation. Inclusion: Acute stroke (<7 days) patients screened within 3 days of admission. Exclusion: coma (Scandinavian Stroke Scale <2) or full recovery (SSS >57). Characteristics: mean age 74, mean Barthel index 60/100, mean SSS 43/58. Trial included 320/468 (68%) of admissions. | Intervention: Hospital outreach stroke team (physiotherapy, occupational therapy) based in the stroke unit who made contact with patients in hospital, arranged discharge to home or rehabilitation unit, coordinated rehabilitation and support services and provided follow-up. Variable duration of input. Team coordinated care which was largely delivered by other agencies. Control: Conventional procedures with acute care and early rehabilitation in a stroke unit, and discharge home or to a rehabilitation unit. | Outcomes measured at 6 weeks and 6 months. Death Place of residence Barthel index Rankin score Frenchay Activity Index |

### Table of excluded studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Reason for exclusion</th>
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<tbody>
<tr>
<td>Challis 1991</td>
<td>Patients had a variety of diagnoses</td>
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<tr>
<td></td>
<td>Non-randomised trial</td>
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<tr>
<td>Donald 1995</td>
<td>Patients had a variety of diagnoses.</td>
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<tr>
<td>Dunn 1994</td>
<td>Patients had a variety of diagnoses.</td>
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<tr>
<td>Kalra</td>
<td>Service to prevent admission to hospital</td>
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<tr>
<td>Study</td>
<td>Trial name or title</td>
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<tr>
<td>Belfast</td>
<td>Belfast: Randomised controlled trial Central randomisation system using random number sequence. Independent (single blind) follow up.</td>
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<tr>
<td><strong>New York</strong></td>
<td>Randomised controlled trial using Zelen design. Exact method unclear. Unclear if outcome assessment was blinded.</td>
</tr>
<tr>
<td><strong>Oslo</strong></td>
<td>Oslo: Randomised controlled trial using Zelen procedure.</td>
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</tbody>
</table>

Inclusion criteria:
- Acute stroke (excluding subarachnoid haemorrhage) within five days of onset, residual disability (Barthel index 5-19), no significant cognitive impairment.

Characteristics:
- Mean age 74 (range 28-95) years.
- Initial Barthel index 14 (range 6-20).
- 37/185 (20%) of patients screened were recruited into the trial.

therapy, medical input) with an interest in stroke rehabilitation. This team planned discharge, carried out a pre-discharge home visit, liaised with community services, and advised community staff on care. Most of the post-discharge input was provided by community rehabilitation staff whose work was not usually coordinated through weekly multidisciplinary team meetings?

Control:
- Conventional care was provided on a stroke unit by a multidisciplinary team with an interest in stroke rehabilitation whose work was coordinated through weekly team meetings.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
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<tbody>
<tr>
<td>Central randomisation</td>
<td>Stratified by continence status.</td>
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<tr>
<td>Intention-to-treat analysis planned</td>
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<td>Most of the post-discharge input was provided</td>
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<td>through weekly multidisciplinary team meetings?</td>
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<tr>
<td>Control</td>
<td>Conventional care was provided on a stroke unit by a</td>
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<td></td>
<td>multidisciplinary team with an</td>
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<tr>
<td>Resource use (length of stay)</td>
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<tr>
<td>Satisfaction</td>
<td>Subjective health status (General Health Questionnaire)</td>
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<tr>
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<td>(General Health Questionnaire)</td>
</tr>
<tr>
<td>Satisfaction</td>
<td><strong>Dependency (Nottingham extended ADL score)</strong></td>
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<tr>
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<td><strong>Resource use (length of stay)</strong></td>
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