Is stroke unit care portable? A systematic review of the clinical trials

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Abstract

Background: it is not known if mobile stroke teams can achieve the good results seen in trials of geographically discrete stroke wards (stroke units).
Objective: to establish the effectiveness of mobile stroke teams.
Design: systematic review of controlled clinical trials that compared peripatetic systems of organised stroke care (stroke team care) with alternative hospital services.
Methods: systematic review and meta-analysis (using Cochrane Collaboration methodology and involving the primary trialists). Clinical outcomes included death, dependency, the need for institutional care and measures of the process of care such as the delivery of key investigations and treatments.
Results: six clinical trials (1,085 patients) were identified; five (781 patients) compared some form of stroke team care with conventional care in general medical wards and one (304 patients) compared team care with a comprehensive stroke unit. Compared with care in general wards, stroke team care improved some aspects of the process of care, but clinical outcomes were similar. Compared with a comprehensive stroke unit, stroke team patients were significantly less likely to survive ($P<0.001$), return home ($P<0.001$) or regain independence ($P<0.0001$). Most aspects of the process of care were also poorer than in the stroke unit.
Conclusions: care from a mobile stroke team had no major impact on death, dependency or the need for institutional care.

Keywords: stroke team, stroke unit, systematic review, meta-analysis, elderly

Introduction

The term organised (stroke unit) care has been used to cover a broad definition of care in hospital that is provided by a multidisciplinary team with a specialist interest in stroke management [1]. Systematic reviews that used this broad definition have shown that, compared with conventional care in general wards, organised (stroke unit) care can increase the proportion of stroke patients who survive, return home and regain independence [2, 3].

Most of the clinical trials of organised stroke care have explored the impact of a multidisciplinary stroke team that was housed in a specific ward [2, 3]. However, a few studies have evaluated mobile stroke teams — which can travel to provide care to patients in a variety of settings. This system of care may be more intuitively appealing. Mobile teams can be established with fewer organisational changes [4], they can function more flexibly (for example, with varying numbers of stroke patients) and they can serve to educate a wider group of staff. However, there have been very few trials evaluating mobile stroke teams and their potential impact is unclear.

A recent report from Manchester describes the largest randomised trial to date of a mobile stroke team [5], but even it could have been underpowered to identify potentially important clinical outcomes. We have therefore carried out a systematic review of the controlled clinical trials of mobile stroke teams and other peripatetic systems of organised stroke care.
Mobile stroke teams

Methods

This project was carried out as part of the Cochrane Systematic Review of organised in-patient (stroke unit) care, and used standard methodology that appears in an expanded version in the Cochrane Library [3]. We searched the Stroke Group Trials Register (last search by the review group coordinator in November 2004) and also obtained further information from individual trialists. The Stroke Group Trials Register is compiled from highly sensitive searches of databases including Medline, EMBASE, BIOSIS, Derwent Drug File, Scisearch, AMED, CINAHL, Cochrane Controlled Trials Register, Dissertation Abstracts, Healthstar, National Research Register, Psych INFO and SIGLE. This is supplemented with hand-searching of over 40 journals, over 100 textbooks and several hundred conference proceedings. It includes articles in all languages.

Selection criteria

Studies

We included any randomised controlled trial or controlled clinical trial, i.e. a prospective clinical study using a potentially random process to allocate treatment, but which was subject to potential bias (for example, allocation by day of admission, bed availability, date of birth).

Participants

We included studies of patients admitted to hospital with a clinical history of stroke with or without confirmation on brain imaging.

Interventions

Peripatetic stroke care (such as a mobile stroke team) was defined as a multi-disciplinary team (typically involving medical nursing, physiotherapy, occupational therapy and speech and language therapy staff) with an interest in stroke care who provided care for stroke patients in several sites within hospital, i.e. they were not exclusively based within a single ward. This intervention could be compared with any alternative system of hospital care. We defined other systems of hospital care as in the stroke unit review [3].

Outcomes

Clinical outcomes were recorded at the end of scheduled follow-up and included death, the need for institutional care and dependency. Secondary outcomes included the following: clinical processes (number of patients receiving investigations and treatments); delays to clinical processes (time to receive investigations and treatments); activities of daily living (ADL) scores; mood or depression scores; subjective health or quality of life scores; length of hospital stay.

Methods

Potentially eligible studies were identified by one reviewer. The primary trialists were then invited to contribute to the review and to provide additional unpublished data. Trial eligibility and data extraction were checked and approved by the primary trialists.

Analysis

Eligible studies were initially described and categorised using a descriptive schedule [2]. Dichotomous outcomes were analysed using the odds ratio and 95% confidence interval (CI), and continuous outcomes using the weighted mean difference (95% CI) for the same outcome measure and the standardised mean difference (95% CI) for different outcome measures. Analyses were carried out using Revman 4.1 software (Update Software, Oxford, UK).

Results

The original search strategy identified 30 trials of organised stroke care, of which four were excluded and the remaining 26 included six that tested a mobile stroke team. Three of the trials used clearly concealed methods of treatment allocation [5–7] and blinded follow-up. The other three trials [8–11] allocated patients by an admission rota or unclear method of randomisation and did not have clearly blinded follow-up. Four trials [5–7, 9] evaluated a mobile stroke team who travelled to stroke patients housed in several wards. The other two trials [8, 10, 11] tested peripatetic systems of care where the stroke team took over the care of a group of stroke patients housed on a general medical ward.

Table 1 outlines the characteristics of the six identified trials. Five trials [5, 6, 8–11] compared different forms of peripatetic care with variations of conventional care in a general medical ward. The sixth trial [7] compared care from a mobile stroke team with admission to a stroke unit. We excluded the third treatment arm of this trial as it did not involve care in hospital.

Table 2 outlines the impact of mobile stroke teams on the process of care. Treatment from a mobile stroke team (as opposed to conventional care in general wards) was associated with a greater proportion of patients having swallowing assessments and occupational therapy assessments. Length of stay was not significantly altered by stroke team care (weighted mean difference +1 days; 95% CI = −6–7). Insufficient data were available to allow useful analysis of activities of daily living scores, mood scores or subjective health status.

Table 3 outlines a single trial comparing care by a mobile stroke team with admission to a comprehensive stroke unit. Significantly greater proportions of stroke unit patients had CT brain scanning within 24 hours, swallowing assessments and occupational therapy assessments. Length of stay was not significantly reduced by stroke team care (weighted mean difference −3 days; 95% CI = −11–5).

The main clinical outcomes are summarised in Figure 1. Compared with conventional care in general wards, there was no apparent impact of mobile stroke team care on the outcomes of early death, death at the end of follow-up, death or institutionalisation and death or dependency. Receiving care from a mobile stroke team appeared to result in significantly poorer clinical outcomes than those managed in a
Table 1. Characteristics of trials

<table>
<thead>
<tr>
<th>Trial</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Control</th>
<th>Outcomes</th>
<th>Follow-up</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke team vs general ward Manchester (5) (n = 308)</td>
<td>RCT (two Centre). Telephone randomisation. Blinded follow-up</td>
<td>Clinical diagnosis of acute stroke (within 5 days) Mean age 73 years</td>
<td>Mobile acute stroke team (consultant stroke physician, senior therapist) who visited and advised on investigation, management and coordinated rehabilitation Regular team meetings Not responsible for care</td>
<td>Conventional care in general wards</td>
<td>Death Residence Dependency Barthel Index NEADL HADS Number and time of input Length of stay in acute hospital</td>
<td>6 weeks 12 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Cape Town (8) (n = 149)</td>
<td>CCT with ward as unit of allocation (i.e. day of admission) Telephone follow up</td>
<td>Clinical diagnosis of acute stroke Mean age 61 years</td>
<td>Stroke team (stroke physician, nurse, therapists) operating from four beds in a general medical ward Regular team meetings Team responsible for care</td>
<td>Conventional care in general medical wards or Guidelines card (conventional care plus guidelines)</td>
<td>Death Residence Dependency Barthel Index Number and time of inputs Length of stay</td>
<td>Discharge (1–2 weeks) Follow-up (3–5 months) Guideline ward not included here</td>
<td></td>
</tr>
<tr>
<td>Montreal (6) (n = 130)</td>
<td>RCT (opaque sealed envelopes) Blinded follow-up</td>
<td>Clinical diagnosis of acute stroke (within 7 days) Mean age 75 years</td>
<td>Mobile acute stroke team (medical, nursing, physio, OT, SALT, social work) Regular team meetings Responsible for care</td>
<td>Conventional care in general medical ward</td>
<td>Death Residence Dependency Barthel Index Number and time of inputs Complication Length of stay in acute hospital</td>
<td>5 weeks</td>
<td></td>
</tr>
</tbody>
</table>

continued
### Table 1. continued

<table>
<thead>
<tr>
<th>Trial</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Control</th>
<th>Outcomes</th>
<th>Follow-up</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York (9)</td>
<td>RCT (unspecified method)</td>
<td>Stroke patients up to 2 months after stroke</td>
<td>General multidisciplinary rehabilitation team care provided in a rehabilitation centre or in the patients’ base ward</td>
<td>Programme of care in general wards that had some specialist nursing input</td>
<td>Death</td>
<td>End of follow up (approximately 1 year)</td>
<td>Unclear what number of patients were managed in a peripatetic way</td>
</tr>
<tr>
<td>(n = 82)</td>
<td>Follow-up unclear</td>
<td>Appropriate for rehabilitation centre</td>
<td>Unclear to what extent the team was responsible for care</td>
<td></td>
<td>Residence, Functional status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uppsala (10)</td>
<td>CCT with ward as unit of allocation</td>
<td>Stroke patients up to 2 months after stroke</td>
<td>Stroke team care (with programme of 'early activation') provided in 30-bed general ward</td>
<td>Conventional care in general medical wards</td>
<td>Death</td>
<td>Discharge</td>
<td></td>
</tr>
<tr>
<td>(n = 112)</td>
<td>(i.e. day of admission)</td>
<td>Appropriate for rehabilitation centre</td>
<td>Regular team meeting</td>
<td>Team responsible for advising on patient care</td>
<td>Residence, Dependency</td>
<td>3 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unclear to what extent the team was responsible for care</td>
<td></td>
<td></td>
<td>Activity index, Length of stay</td>
<td>12 months</td>
<td></td>
</tr>
<tr>
<td>Stroke team vs comprehensive stroke unit</td>
<td></td>
<td>Clinical diagnosis of acute stroke within 2 days</td>
<td>Stroke team care (stroke physician, nurse, physio, OT) provided advice on assessment, management, discharge planning Regular team meetings</td>
<td>Comprehensive care (acute and rehabilitation) Stroke unit staffed by specialist multidisciplinary team</td>
<td>Death</td>
<td>3 months</td>
<td>Home care team not included here</td>
</tr>
<tr>
<td>Orpington (7)</td>
<td>RCT with telephone randomisation</td>
<td>Stroke patients up to 2 months after stroke</td>
<td>Stroke team care (stroke physician, nurse, physio, OT) provided advice on assessment, management, discharge planning Regular team meetings</td>
<td>Comprehensive care (acute and rehabilitation) Stroke unit staffed by specialist multidisciplinary team</td>
<td>Death</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>(n = 304)</td>
<td>Blinded follow-up</td>
<td>Appropriate for rehabilitation centre</td>
<td>Regular team meetings</td>
<td>Team responsible for advising on patient care</td>
<td>Residence, Dependency</td>
<td>12 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unclear to what extent the team was responsible for care</td>
<td></td>
<td></td>
<td>Activity index, Length of stay</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RCT = randomised controlled trial; CCT = controlled clinical trial; OT = occupational therapy; SALT = speech and language therapy; ADL = activities of daily living; NEADL = Nottingham extended ADL score; HADS = hospital anxiety and depression scale.
Table 2. Comparison of process measures: stroke team versus general ward

<table>
<thead>
<tr>
<th>Measure</th>
<th>Trials with data</th>
<th>Stroke team</th>
<th>General ward</th>
<th>Risk difference (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT scan done(^c)</td>
<td>4</td>
<td>259/340 (76%)</td>
<td>265/359 (74%)</td>
<td>0 (−12–12)</td>
<td>0.9</td>
</tr>
<tr>
<td>Anti-thrombotic therapy prescribed(^b)</td>
<td>2</td>
<td>122/222 (55%)</td>
<td>118/216 (53%)</td>
<td>0 (−8–8)</td>
<td>1.0</td>
</tr>
<tr>
<td>Swallowing assessment recorded(^d)</td>
<td>3</td>
<td>131/280 (47%)</td>
<td>113/307 (37%)</td>
<td>12 (−1–25)</td>
<td>0.07</td>
</tr>
<tr>
<td>Physiotherapy assessment recorded</td>
<td>3</td>
<td>229/280 (82%)</td>
<td>214/307 (70%)</td>
<td>13 (4–30)</td>
<td>0.14</td>
</tr>
<tr>
<td>Occupational therapy assessment recorded</td>
<td>2</td>
<td>95/123 (77%)</td>
<td>40/156 (26%)</td>
<td>54 (6–100)</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Results are expressed as raw data with the number and proportion (%) of patients for whom a process measure was recorded. The absolute risk difference (95% CI) shows the estimated difference for every 100 patients treated. The risk difference results take into account between-trial variation.

\(^a\)Uppsala data inferred from diagnostic classifications.

\(^b\)Antiplatelet therapy except for Montreal (6), which recorded anticoagulant therapy.

\(^c\)Defined as early speech and language therapy assessment in two trials [6, 8].

Table 3. Comparison of process measures: stroke team versus comprehensive stroke unit

<table>
<thead>
<tr>
<th>Measure</th>
<th>Stroke team</th>
<th>Comprehensive stroke unit</th>
<th>Risk difference (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT scan done(^e)</td>
<td>146/152 (96%)</td>
<td>151/152 (99%)</td>
<td>−3 (−7–0)</td>
<td>0.05</td>
</tr>
<tr>
<td>Antiplatelet therapy prescribed(^f)</td>
<td>102/119 (86%)</td>
<td>98/106 (93%)</td>
<td>−7 (−15–1)</td>
<td>0.10</td>
</tr>
<tr>
<td>Swallowing assessment recorded</td>
<td>78/152 (51%)</td>
<td>118/152 (70%)</td>
<td>−26 (−37 to −16)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Physiotherapy assessment recorded(^g)</td>
<td>149/152 (98%)</td>
<td>151/152 (99%)</td>
<td>−1 (−4–1)</td>
<td>0.3</td>
</tr>
<tr>
<td>Occupational therapy assessment recorded(^h)</td>
<td>132/152 (87%)</td>
<td>151/152 (99%)</td>
<td>−12 (−18 to −7)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Results are expressed as in Table 2, but include only one trial [7, 12].

\(^e\)Difference was more marked for CT scans done within 48 hours (48% versus 80%, P < 0.0001).

\(^f\)Results expressed only for those in whom haemorrhage was excluded.

\(^g\)Difference was more marked for physiotherapy assessment within 72 hours (80% versus 86%, P = 0.16).

\(^h\)Difference was more marked for occupational therapy assessment within 7 days (21% versus 39%, P = 0.0008).

Figure 1. Stroke team versus alternative service. The figure shows the number of patients who had a clinical outcome event (n) of the total number allocated to that service option (N). Also shown is the odds ratio (OR) and 95% CI for that event occurring in a stroke team patient versus those receiving an alternative service. Results are stratified by the service comparison and take into account between-trial variation. Early death was recorded at a median of 6 weeks (range 1–12 weeks). All other outcomes were recorded at a median of 12 months (range 5 weeks to 12 months).

Sensitivity analyses were carried out focusing on only randomised trials with blinded follow-up [5–7] and on trials carried out in the last 10 years [5, 7, 8]. There were no substantial differences in any of the conclusions.
Discussion

The current systematic review has not identified any clear evidence that peripatetic systems of care provided by mobile stroke teams can improve patient outcomes compared with conventional care in general wards. We found no individual trials or groups of trials where survival, discharge home or recovery of independence was significantly improved by stroke team care. In addition, the one trial [7] that compared mobile stroke team care with admission to a comprehensive stroke unit found that these outcomes were better in the stroke unit group.

There are several potential limitations to this analysis. First, we have combined a number of somewhat differing approaches to providing peripatetic stroke care. However, our conclusions are largely unchanged if we focus on a core group of trials [5–7] that evaluated a well-described, discrete mobile team looking after only stroke patients across several wards. Secondly, these trials have been carried out over more than two decades and hence show varying baseline rates of CT scanning, swallowing assessments and drug use. However, analyses that include only trials conducted in the last 10 years produced very similar conclusions. Finally, we are limited to using data from only six clinical trials and 1,085 patients. However, the CI around the main clinical outcomes consistently indicate that outcomes in the mobile stroke teams were similar to conventional care in general wards.

These findings raise the question of why mobile stroke teams are not apparently achieving the results of a geographically discrete stroke unit. Basing a team within a discrete unit could provide a more efficient system of care and allow staff to devote a greater proportion of their time to stroke patient care and developing the necessary knowledge and skills. Indeed, in the Orpington trial [12] it appeared that stroke unit patients were able to access a greater amount of rehabilitation input than those being cared for by the mobile team. Secondly, a mobile team may find it difficult to modify the behaviour of other professionals who are providing direct patient care. The third possible reason is that mobile stroke teams usually do not allow for specialist nursing care to be provided throughout a 24-hour period. Although currently unproven, it is very possible that skilled nursing care is crucial in the early stages of stroke to ensure a therapeutic environment and to prevent early complications. Studies that have explored the care provided within stroke units [13] indicate that a wide range of specific nursing (e.g. continence management, pressure area care) and more general patient care (e.g. swallowing management, early mobilisation) interventions may be important for patient recovery.

Should we conclude that mobile stroke teams do not have any role in a modern stroke service? Mobile stroke teams may influence the coordination of care, and at least one trial [14] reported a beneficial effect of a mobile stroke team on the attitudes of nursing staff. One could argue that peripatetic systems of care may be used to provide outreach services from a stroke unit before patients are admitted to the unit, or when transfers into the unit have to be prioritised because of insufficient bed numbers. However, we have found no evidence that such peripatetic care will provide a substantial therapeutic benefit in its own right. An adequately resourced geographically discrete stroke unit should be the mainstay of any hospital stroke service.

Key points

- Although organised (stroke unit) care can increase the chances of stroke patients surviving, returning home and regaining independence, the role of peripatetic mobile stroke teams has been unclear.
- Compared with care in general wards, stroke team care improved some aspects of the process of care.
- Stroke team outcomes were worse than those of a comprehensive stroke unit.
- Care from a mobile stroke team had no major impact on death, dependency or the need for institutional care.

Acknowledgements

This review was conducted as part of the Cochrane Review of organised in-patient (stroke unit) care, and updated versions will be available in the Cochrane Library. We are grateful to the Cochrane Stroke Group for help with literature searching and Chest, Heart and Stroke Scotland for support of the Stroke Unit Trialists Collaboration.

Conflicts of interest

No conflict of interest was identified.

References

9. Feldman DJ, Lee PR, Unterecker J, Lloyd K, Rusk HA, Toole A. A comparison of functionally orientated medical care and formal rehabilitation in the management of patients with


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