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Home-based therapy programmes for upper limb functional recovery following stroke (Review)

Coupar F, Pollock A, Legg LA, Sackley C, van Vliet P

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[Intervention Review]

Home-based therapy programmes for upper limb functional recovery following stroke

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ABSTRACT

Background

With an increased focus on home-based stroke services and the undertaking of programmes, targeted at upper limb recovery within clinical practice, a systematic review of home-based therapy programmes for individuals with upper limb impairment following stroke was required.

Objectives

To determine the effects of home-based therapy programmes for upper limb recovery in patients with upper limb impairment following stroke.

Search methods

We searched the Cochrane Stroke Group's Specialised Trials Register (May 2011), the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library* 2011, Issue 2), MEDLINE (1950 to May 2011), EMBASE (1980 to May 2011), AMED (1985 to May 2011) and six additional databases. We also searched reference lists and trials registers.

Selection criteria

Randomised controlled trials (RCTs) in adults after stroke, where the intervention was a home-based therapy programme targeted at the upper limb, compared with placebo, or no intervention or usual care. Primary outcomes were performance in activities of daily living (ADL) and functional movement of the upper limb. Secondary outcomes were performance in extended ADL and motor impairment of the arm.

Data collection and analysis

Two review authors independently screened abstracts, extracted data and appraised trials. We undertook assessment of risk of bias in terms of method of randomisation and allocation concealment (selection bias), blinding of outcome assessment (detection bias), whether all the randomised patients were accounted for in the analysis (attrition bias) and the presence of selective outcome reporting.

Main results

We included four studies with 166 participants. No studies compared the effects of home-based upper limb therapy programmes with placebo or no intervention. Three studies compared the effects of home-based upper limb therapy programmes with usual care. Primary outcomes: we found no statistically significant result for performance of ADL (mean difference (MD) 2.85; 95% confidence interval (CI) -1.43 to 7.14) or functional movement of the upper limb (MD 2.25; 95% CI -0.24 to 4.73)). Secondary outcomes: no statistically significant results for extended ADL (MD 0.83; 95% CI -0.51 to 2.17)) or upper limb motor impairment (MD 1.46; 95% CI -0.58 to 3.51). One study compared the effects of a home-based upper limb programme with the same upper limb programme based in hospital, measuring upper limb motor impairment only; we found no statistically significant difference between groups (MD 0.60; 95% CI -8.94 to 10.14).

Authors' conclusions

There is insufficient good quality evidence to make recommendations about the relative effect of home-based therapy programmes compared with placebo, no intervention or usual care.

PLAIN LANGUAGE SUMMARY

Home-based therapy programmes for upper limb functional recovery after stroke

After a stroke, upper limb (arm) problems are common and recovery is often limited. This review of four studies with 166 relevant participants, looked at whether participating in home-based therapy programmes, targeted at the upper limb, could improve performance in activities of daily living (ADL), functional movement of the upper limb, performance in extended ADL and arm motor impairment. In comparison with usual care, home-based upper limb programmes had no difference in effect on any of the outcomes. In comparison with an upper limb programme based in hospital, we found home-based upper limb programmes to be no more or no less effective for arm motor impairment outcomes. The evidence in this area is limited. Further research is needed to determine the effects of home-based therapy programmes.

BACKGROUND

Description of the condition

Stroke is a major cause of death and disability throughout the world, consuming significant resources (Isard 1992). It is therefore imperative that stroke services are effective and efficient. Problems affecting the upper limb following stroke are often persistent and disabling, with only 20% (Parker 1986) to 56% (Nakayama 1994) of patients regaining useful upper limb function after three months. In addition, motor impairment has been shown to be the most influential factor in determining well-being, one year after stroke (Wyller 1998). Improving upper limb function is therefore often a core element of rehabilitation after stroke, in order to maximise patient outcomes and reduce disability (Langhorne 2003).

Description of the intervention

Increasingly the trend within health service delivery (including stroke care) is toward decreasing lengths of stay for inpatient care and moving care into the community, which has led to the development of home-based stroke services (ESDT 2005). A Cochrane review of therapy-based rehabilitation services for stroke patients at home (OPT 2006) found such services reduce the odds of a poor outcome in terms of ability to perform activities of daily living (ADL), and have a beneficial effect on a patient's ability to perform personal ADL and extended ADL, compared with conventional or no care. This review specifically investigated therapy service interventions primarily aiming to improve task-orientated behaviour (not upper limb interventions or outcomes) and was based on a review of heterogeneous interventions. Our review, in contrast, exclusively investigated the effects of home-based therapy programmes targeted at upper limb recovery.

Why it is important to do this review

The effectiveness of specific upper limb interventions has been reviewed within other Cochrane systematic reviews: constraint-induced movement therapy (Sirtori 2009), electromechanical and robotic-assisted training (Mehrholz 2009), electrostimulation (Pomeroy 2009), EMG biofeedback (Woodford 2007), hands-on therapy interventions (Winter 2011), mental practice (Stevenson 2011), repetitive task training (French 2007), simultaneous bilateral training (Coupar 2007) and virtual reality training (Laver 2011). This review does not intend to replicate or overlap these other reviews, as the focus will be on a range of programmes of interventions completed at home rather than on a specific intervention.

With an increased focus on home-based stroke services, and the undertaking of programmes of interventions targeted at upper limb recovery within clinical practice, we deemed a systematic review of home-based therapy programmes for individuals with upper limb impairment following stroke, to be appropriate.

OBJECTIVES

To determine the effects of home-based therapy programmes for upper limb recovery in patients with upper limb impairment following stroke, compared with:

1. placebo or no intervention; and
2. usual care.

METHODS

Criteria for considering studies for this review

Types of studies

We included RCTs where participants had been randomly assigned (that is, each participant had an equal chance of being allocated a particular treatment as another participant). Random allocation could have been completed by, for example, using computer-generated random numbers or random number tables. We only included the first phase of cross-over studies to exclude any carry-over or learning effects. We included RCTs with or without blinding of participants, treating therapist(s) and assessor(s). One of the intervention groups must have included an intervention group of a home-based therapy programme (see definition in Types of interventions) and a comparison group of placebo or usual care ('conventional' or 'traditional'). We also included studies that included a home-based therapy programme in addition to usual care, compared with usual care alone. We determined usual care as defined by the original trial authors when it was considered to be a normal or usual component of stroke rehabilitation. Where appropriate, we documented the description of usual care. We only included studies if the therapist visited the patient in their own home (at least once) to prescribe treatment.

Types of participants

We included trials of participants with a clinical diagnosis of stroke - "a syndrome of rapidly developing symptoms and signs of focal, and at times, global, loss of cerebral function lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin" (WHO 1989) - regardless of time since onset, initial upper limb impairment, ability to follow instructions, co-morbidities, previous strokes or location of stroke. We included studies that recruited participants with other neurological disorders if more than 50% of participants were stroke patients. We only included participants living in their own homes (that is, at their permanent address). This included care homes and other forms of supported or sheltered accommodation.

Types of interventions

The included RCTs had to include one group which received a home-based therapy programme, targeted at upper limb recovery following stroke. For the purposes of this review we defined home-based therapy programmes as those:

1. carried out in the patient's home (that is, at their permanent address; this may include care homes and other forms of supported or sheltered accommodation);
2. prescribed by healthcare professionals or individuals under the supervision of healthcare professionals; and
3. including more than one specific intervention targeted at upper limb recovery.

The rationale for including only these RCTs with more than one specific intervention was to avoid studies of single upper limb interventions. The focus of this review is a 'programme' of therapy. A programme of therapy will always include several different treatment interventions. The effectiveness of single interventions for the upper limb is assessed in other reviews. Excluding RCTs that assess only one specific intervention effectively limited this review to RCTs of 'programmes' of interventions to reduce or avoid overlap with other reviews, and reflect clinical reality.

We included studies of complex packages of rehabilitation if the administered package included interventions targeted at upper limb recovery, and included the three elements outlined above.

We included any duration or intensity of programme and completed subgroup analyses as appropriate. Where possible we documented the professional background, training and experience of the person(s) delivering the intervention.

Types of outcome measures

The primary or initial aim of upper limb interventions is usually to improve functional movement and reduce impairment. However, arguably the most important goal for patients is to improve their ability to participate in and independently achieve independence with ADL. Additionally, this is the over-arching aim of all rehabilitation interventions. Therefore, we identified two primary outcomes of interest: performance in ADL and functional movement of the upper limb.

We anticipated that the studies would use and report a large variety of different outcome measures relevant to the primary and secondary outcomes of this review. Therefore, for each outcome of interest (primary and secondary) we attempted to identify and list all the common, specific measurement tools or scales that could be included. If we identified a study that reported more than one measurement tool or scale which addressed the same outcome, we used the scale listed earliest in our lists. If a study did not use any of the measures in a list, but measured the outcome using a different measurement tool or scale, we included and documented this. These hierarchical lists are outlined below.

Primary outcomes

1. Performance in ADL (including feeding, toileting, dressing, bathing, grooming, continence, simple mobility and transfers). Common outcome measures were global measures of ADL such as: Barthel ADL Index (Mahoney 1965), Rivermead ADL Assessment (Whiting 1980), Rivermead Motor Ability Scale (Collen 1991), Rankin Scale (Bonita 1988), Functional Independence Measure (FIM) (Keith 1987), Katz Index of ADL (Katz 1970) and Rehabilitation Activities Profile (Van Bennekom 1995).
2. Functional movement of the upper limb (such as measures of active movement, co-ordination, dexterity, manipulation and grasp/grip/pinch). Common outcome measures:Action Research Arm Test (Lyle 1981), Motor Assessment Scale - upper arm function or combined arm score (Carr 1985), Frenchay Arm Test (Heller 1987), Wolf Motor Function Test (Wolf 2001), Upper Extremity Function Test (Carroll 1967), Functional Test of the Hemiparetic Upper Extremity (Wilson 1984), Box and Block Test (Mathiowetz 1985), Upper Extremity Performance Test for the Elderly (TEMPA) (Desrosiers 1993), Chedoke Arm and Hand Activity Inventory (Barreca 2005), Sodring Motor Evaluation of Stroke Patients - arm section (Sodring 1995), University of Maryland Arm Questionnaire for Stroke (Whitall 2000), Motor Activity Log (Taub 1993), Motor Assessment Scale - hand movement or advanced hand movement scales (Carr 1985), Jebsen Hand Function Test (Jebsen 1969), Nine Hole Peg Test (Kellor 1971) and Purdue Peg Test (Tiffin 1948).

Secondary outcomes

1. Performance in extended ADL (including shopping and household tasks). Common outcome measures: Nottingham Extended ADL (Nouri 1987), Rivermead Extended ADL (Rossier 2001) and Frenchay Activites Index (Holbrook 1983).
2. Motor impairment of the upper limb (measures of general upper limb impairment, muscle strength and muscle tone). Common outcome measures: Fugl-Meyer Assessment of Sensorimotor Recovery after Stroke (upper limb section) (Fugl-Meyer 1975), Motricity Index (Demeurisse 1980), Rivermead Motor Assessment (arm section) (Lincoln 1979), Motor Club Assessment (Ashburn 1982), Ashworth Scale (Ashworth 1964)/Modified Ashworth Scale (Bohannon 1987), Medical Research Council (MRC) scale (MRC 1975), dynamometer scores (including Jamar) (Bohannon 1987) and Kinematic Measures (e.g. movement time, movement efficiency, movement speed, spatial accuracy and velocity).

Additional outcomes

1. Adverse events, such as death and pain.

We planned to do analyses using data from the end of the intervention period and the end of scheduled follow-up.

Search methods for identification of studies

See the 'Specialized register' section in the Cochrane Stroke Group module. We searched for trials in all languages and planned to arrange translation of relevant articles published in languages other than English.

Electronic searches

We searched the Cochrane Stroke Group's Specialised Trials Register, which was last searched by the Managing Editor in May 2011. In addition, we searched the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library 2011*, Issue 2, searched May 2011), MEDLINE (1950 to May 2011) (Appendix 1), EMBASE (1980 to May 2011) (Appendix 2), AMED (1985 to May 2011) (Appendix 3) and CINAHL (1982 to May 2010) (Appendix 4). We also searched the following occupational therapy and physiotherapy databases: OTseeker (http://www.otseeker.com/) (May 2010), Physiotherapy Evidence database (PEDro, http://www.pedro.org.au) (May 2010), Chartered Society of Physiotherapy Research Database (May 2010) and REHABDATA (http://www.naric.com/research/rehab/default.cfm) (May 2010). We also searched ClinicalTrials.gov (http://www.clinicaltrials.gov/) and the National Research Register (http://www.nihr.ac.uk/Pages/NRRArchiveSearch.aspx) (May 2010) and dissertation abstracts (http://wwwlib.umi.com/dissertations/search) (May 2010).

We developed the search strategies, using a combination of controlled vocabulary and free text terms, in consultation with the Cochrane Stroke Group's Trials Search Co-ordinator.

Searching other resources

In an effort to identify further published, unpublished and ongoing RCTs we checked reference lists of all included studies.

Data collection and analysis

Selection of studies

One of two review authors (FC or PvV) read the titles of the identified references and eliminated any obviously irrelevant studies. We obtained the abstracts for the remaining studies and then, based on the inclusion criteria (types of studies, types of participants, aims of interventions, outcome measures), two review authors (FC, PVV or AP) independently ranked these as 'possibly relevant' or 'definitely irrelevant'. If both review authors identified a trial as 'definitely irrelevant' we excluded it at this point, but included all other trials at this stage. Where disagreement between review authors occurred we sought consensus through discussion or the opinion of a third reviewer (FC, AP or PvV). Following this process we retrieved the full text of those trials still categorised as 'possibly relevant'. The full text of the remaining studies were then retrieved and independently reviewed by two review authors (FC, PvV or AP) who classified each study as 'include' or 'exclude'. We excluded trials classified as 'exclude' by both review authors. Where disagreement occurred between review authors, or a decision could not be made, we reached consensus through discussion or the opinion of a third review author (PvV, AP or CS).

Data extraction and management

Two review authors (FC and PvV) independently extracted the data from the studies using a standard data extraction form. Where possible, we documented:

1. participant details (including age, gender, place of residence, type of stroke, time since stroke, initial upper limb impairment);
2. the inclusion and exclusion criteria;
3. the duration/intensity/frequency of intervention;
4. a brief description of the home-based therapy programme (including details of administered therapy programme (including if part of early supported discharge or standard discharge protocol), involvement of treating therapist and qualifications and experience of treating therapist(s));
5. the comparison intervention; and
6. the outcomes.

Assessment of risk of bias in included studies

Two review authors (FC and PvV) independently assessed the methodological quality of the included studies using a standard critical appraisal assessment form. Assessment of the quality of studies focused on potential areas of bias within the studies as this has been shown to affect the estimation of effectiveness of interventions (Higgins 2011). For each included trial two review authors (FC and PvW) independently extracted information about the method of randomisation and allocation concealment, blinding of outcome assessment, whether all the randomised patients were accounted for in the analysis and the presence of selective outcome reporting. Consideration of blinding of participants and therapists led to the conclusion that blinding would not be possible in these types of trials; consequently we did not document this information. Any disagreements between the two review authors were resolved through discussion, involving a third review author (AP), if necessary.

Measures of treatment effect

For each comparison we used the study results for performance in ADL, measures of upper limb functional movement, measures of motor impairment and adverse effects, if documented. We presented all outcome measures analysed as continuous data and thus we entered, where available, means and standard deviations (SDs). If the studies used the same outcome measures, we calculated a pooled estimate of the mean differences (MDs) with 95% confidence intervals (CIs). If different outcome measures were used within the same outcome category (for example, one study used Action Research Arm Test and another study used the Frenchay Arm Test to measure functional movement of the upper limb), we used standardised mean difference (SMD) instead of MD. We used The Cochrane Collaboration's Review Manager software, RevMan 5 (RevMan 2011), for all analyses.

Dealing with missing data

The primary aim of this review was to obtain standardised data from published studies. Where data were missing, we imputed data where we felt it was appropriate. This was completed by using data from another study or calculating SDs from reported standard error.

Assessment of heterogeneity

We determined heterogeneity using the I^2 statistic: I^2 greater than 50% is considered substantial heterogeneity (Higgins 2011)). If $I^2 \leq 50\%$ we used a fixed-effect meta-analysis (Mantel 1959). If $I^2 > 50\%$, we explored the individual trial characteristics to identify potential sources of heterogeneity. We then performed meta-analysis using both fixed-effect and random-effects (DerSimonian 1986) modelling to assess sensitivity to the choice of modelling approach.

We described and tabulated the variability in participants, interventions and the outcomes studied (clinical diversity).

Assessment of reporting biases

We did not test for funnel plot asymmetry as there were fewer than 10 studies included in the meta-analysis (Higgins 2011).

Data synthesis

We pooled results to present an overall estimate of the treatment effect. We used fixed-effect or random effects meta-analysis depending on the degree of heterogeneity (see above).

Subgroup analysis and investigation of heterogeneity

We planned to undertake subgroup analysis using the Deeks method (Deeks 2001) (a simple approach for a significance test to investigate differences between two or more subgroups and is the standard method in RevMan) (RevMan 2011) on:

1. initial upper limb severity;
2. place of residence (own home, residential or nursing care);
3. self practice versus no self practice; and
4. duration, intensity and frequency of intervention

(intervention less than four weeks and intervention more than four weeks, intervention less than three times a week and intervention more than three times a week).

We planned to undertake these subgroup analyses, where data permitted (we considered sufficient data as more than five trials reporting the information) and on the primary outcome only. As we only included four studies in the analysis we were unable to complete any of the planned subgroup or sensitivity analyses.

The studies included in this review are clinically diverse. In Table 1 and in the Characteristics of included studies table we described and tabulated the variability in participants, interventions and outcomes studied (clinical diversity).

Sensitivity analysis

We planned to conduct sensitivity analyses based on the risk of bias criteria (selction bias, detection bias, attrition bias and selective reporting). However, we did not deem such analyses appropriate due to the limited number of studies included in this review. In future updates of the review, if there are more than five trials in the comparison of home-based upper limb therapy programmes versus the same therapy programmes in hospital, then we will perform sensitivity analyses.

RESULTS

Description of studies

Results of the search

Our searches of the electronic bibliographic databases identified 1773 records after removal of duplicates (107 from the Cochrane Trials Register, 1247 from MEDLINE, EMBASE, AMED and CINAHL, 52 from CENTRAL, 121 from OT seeker, 78 from PEDro and 168 from REHABADATA database). After elimination of obviously irrelevant studies and further duplicates we were left with 446 potential papers. Two independent review authors (FC and PvV or AP) obtained the abstracts for these papers and assessed them for inclusion. We then assessed these abstracts for further review at full paper. Where disagreement arose, the review authors reached consensus through discussion and/or sought the opinion of a third review author (PvV or AP). From this process we obtained full papers of 57 studies. Of these 57 full papers (relating to 56 studies), we excluded 49 papers (see Excluded studies and Characteristics of excluded studies for further details). Two studies still require classification (see Studies awaiting classification and Characteristics of studies awaiting classification for further details) and one study is ongoing (see Ongoing studies and Characteristics of ongoing studies) leaving four studies (five papers included: one study with two associated papers) for inclusion.

Included studies

We included four trials (166 randomised participants) in this review (Duncan 1998; Duncan 2003; Piron 2008; Piron 2009). Full descriptions of the included studies can be found in Characteristics of included studies, and in Table 1 (Demographics of included participants). The four trials were completed by two different research groups.

Duncan 1998 and Duncan 2003 were completed by one research group. Both of these studies were RCTs, which compared a home therapy programme with usual care, and recruited individuals from the Kansas City Stroke Study registry. It is assumed that Duncan 1998 (20 participants) was a pilot study, undertaken prior to the larger Duncan 2003 study (100 participants). Both studies included an exercise programme that was designed to improve strength, balance and endurance, and to encourage more use of the affected extremity. This intervention met the inclusion criteria as it was explicitly stated that the programme was targeted at upper limb recovery after stroke, the intervention was carried out in the patients' homes, was prescribed and supervised by a physiotherapist or occupational therapist and clearly involved more than one specific intervention targeted at upper limb recovery.

Piron 2008 and Piron 2009 were completed by one research group. Both of these studies were RCTs, which compared virtual reality plus telerehabilitation at home with either virtual reality training in hospital with a therapist present (Piron 2008), or conventional

therapy in the local health district (Piron 2009). Both studies aimed to improve motor impairment in the upper limb.

Disagreement occurred between review authors as to whether virtual reality telerehabilitation training should be considered as a single intervention or a therapy programme. The intervention described in the studies of virtual reality and telerehabilitation training (Piron 2008; Piron 2009) consisted of different virtual tasks, comprising a number of arm movements, plus knowledge of results feedback and therapist instructions via teleconferencing (Piron 2009). The intervention combined virtual reality training and telemedicine. In Piron 2008 the intervention designed to be tested within the RCT was the teleconferencing itself; however, the consequence of this design was a study which compared virtual reality arm training at home versus virtual reality arm training in hospital. In Piron 2009 virtual reality arm training delivered at home using teleconferencing was compared with conventional or 'standard' care. As the review authors could not reach consensus on whether the virtual reality intervention was a single intervention or a therapy programme, we took a majority decision and included virtual reality training as a therapy programme. We would welcome feedback on this decision, and will reconsider it for future updates of this review.

Design

All four of the included studies were RCTs (Duncan 1998; Duncan 2003; Piron 2008; Piron 2009).

Comparison groups

Three of the studies compared the effects of home therapy programmes for the upper limb with usual care (Duncan 1998; Duncan 2003; Piron 2009). One study (Piron 2008) compared a home therapy programme with the same therapy programme in hospital (which was not considered usual care). We felt this was a relevant study to include, despite not fitting into one of our predetermined comparison groups. Therefore, we added a further comparison group: upper limb home therapy versus same upper limb therapy in hospital.

Follow-up

All four included studies completed outcomes at the end of the intervention period. Piron 2009 also completed outcomes after one month follow-up. Duncan 2003 also reported follow-up data at six months post-treatment.

Sample sizes

Sample sizes were 10 (Piron 2008), 20 (Duncan 1998), 36 (Piron 2009) and 100 (Duncan 2003).

Setting

Of the four included studies, all were carried out in two settings: one group at home; and the other either at hospital or in the local health district.

Participants

We have provided demographics of included participants in Table 1. Of the randomised participants 64 were female and 82 were male. One study did not report gender (Duncan 1998). The lowest reported mean age was 53 years (SD = 15) and the highest mean age was 70.2 years (SD = 11.4). Across the studies, time since stroke varied from a mean of 56 to a mean of 412 days.

Interventions

Two of the included studies (Duncan 1998; Duncan 2003) delivered an exercise programme designed to increase strength, endurance and encourage use of the affected arm, which included functional exercises, assistive/resistive exercise with proprioceptive neuromuscular facilitation and resistive exercise with a theraband. This exercise programme was compared with usual care as prescribed by their physicians. The remaining two studies delivered a virtual reality intervention with telerehabilitation. This was compared with usual care (Piron 2009) or the same therapy delivered with a therapist present (Piron 2008). Therapists delivered or supervised interventions in all four studies.

Outcome measures

ADL was measured using the Barthel Index (Duncan 1998; Duncan 2003). Functional movements of the upper limb were measured using the Jebsen Test of Hand Function (Duncan 1998) and the Wolf Motor Function Test (Duncan 2003). Extended ADL were measured using the Lawton Instrumental ADL (Duncan 1998; Duncan 2003). Upper limb motor impairment was measured using the Fugl-Meyer Upper Extremity Scale in all four studies.

Excluded studies

We excluded a total of 49 papers following consideration of the full articles. The principal reasons for exclusion were: intervention not specifically targeted at the upper limb (18 papers), intervention not completed at home (17 papers), single, not a programme of interventions (6 papers), non-RCT (5 papers), no appropriate comparison (2 papers) and participants not visited by health professional at home (1 paper). Details can be found in Characteristics of excluded studies.

Several studies aimed to compare modes of service delivery, such as domiciliary versus hospital-based care (Andersen 2002; BCST 1991; Bjorkdhal 2006; Domino 1993; Gilbertson 2000; Roderick

2001; Rudd 1997; Wolfe 2000). These studies delivered general rehabilitation rather than being specifically targeted to the upper limb. If we could not find a specific aim to target upper limb, we excluded these studies.

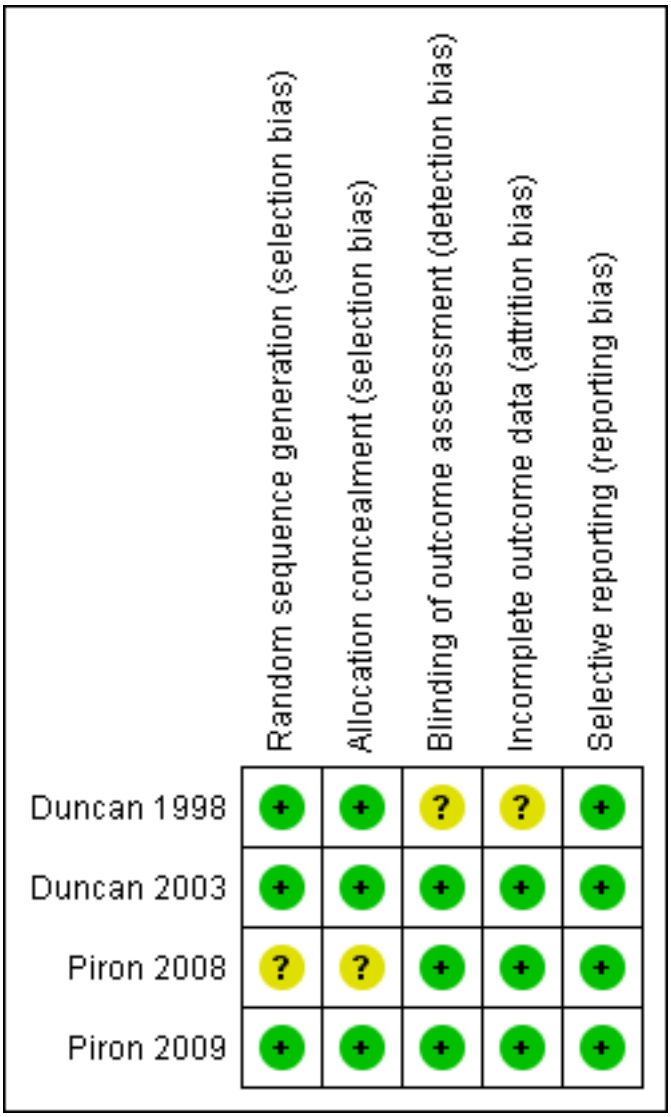
We considered the full paper of one excluded study (Baskett 1999) in detail. There was initially disagreement between review authors regarding whether or not the intervention in this study met the inclusion criteria. This study investigated a home-based programme of individually prescribed exercises and activities. We have had no response from our attempts to contact the authors of this study. Discussion between three review authors (FC, PvV and AP) led to consensus that there was insufficient information available within the published paper to definitively conclude that the programme did meet the criteria of including "more than one specific intervention targeted at upper limb recovery". However, all review authors did acknowledge that this assessment was based on a lack of information, rather than on definitive information, suggesting that the programme did not meet the review criteria. This study has been excluded and is detailed in Characteristics of excluded studies. If we obtain further information relating to the home-based programme evaluated in this trial, we will reconsider including the study in future updates of this review.

Where the comparison intervention was also conducted at home (Byl 2003; Gabr 2005; Thielman 2004; TOTAL 2001), these studies did not meet the criteria of the home intervention being compared with either placebo, no treatment or usual care. These studies help to determine whether home-based intervention of one type improved upper limb function and impairment compared to home intervention of another type. This was not the purpose of this particular review and, therefore, we excluded this type of study. These studies are recorded in Characteristics of excluded studies.

Risk of bias in included studies

Review authors' judgements about each risk of bias item for each included study are outlined in Characteristics of included studies and summarised in Figure 1. The inclusion criteria for this review required a study to be randomised. Three of the studies (Duncan 1998; Duncan 2003; Piron 2009) reported an adequately generated allocation sequence. The same three studies reported adequately concealed allocation. The other study (Piron 2008) did not report how randomisation sequence was generated or details of any allocation concealment. Blinding of outcome assessor was reported in three of the studies (Duncan 2003; Piron 2008; Piron 2009). Three of the studies (Duncan 1998; Piron 2008; Piron 2009) did not report any drop-outs from their studies and therefore were felt to be at low risk of attrition bias. The other study was also considered to be of low risk as the reasons for the drop-outs were provided and were similar across both groups. Additionally an intention-to-treat analysis was used to account for missing data.

Figure 1. Risk of bias summary: review authors' judgements about each risk of bias item for each included study.



Effects of interventions

Within the four included trials, 166 stroke participants were randomised.

One study (Piron 2008) did not include SDs in the paper. In order to include this study in the meta-analysis, we used the SD reported by Piron 2009, which included participants with similar levels of initial upper limb motor impairment. We used the largest SD reported by Piron 2009 in order to be conservative.

Home therapy programmes versus placebo or no intervention

No studies compared the effects of a programme of home therapy (targeted at the upper limb) with placebo or no intervention.

Home therapy programmes versus usual care

Three studies compared the effects of a home therapy programme for upper limb with usual care (Duncan 1998; Duncan 2003; Piron 2009).

Primary outcomes

Performance in ADL

Two studies (113 participants) reported performance of ADL (Barthel Index) (Duncan 1998; Duncan 2003): (MD 2.85; 95% CI -1.43 to 7.14) (Analysis 1.1). We used a random-effects model for analysis as I^2 > 50% (55%). Fixed-effect analysis produced a statistically significant result: (MD 3.16 Barthel points; 95% CI 0.37 to 5.95) in favour of the home therapy programme (experimental group). Duncan 2003 reported follow-up data (80 participants) at six months post-treatment: (MD -1.70; 95% CI -5.51 to 2.11) (Analysis 1.1).

Functional movement of the upper limb

Two studies (Duncan 1998; Duncan 2003) reported outcomes relevant to functional movement of the upper limb (Jebsen Test of Hand Function and Wolf Motor Function Test respectively). We were unable to use the data in Duncan 1998 for use in the analysis as total scores and SDs were not reported. The authors reported no trends in changes in speed of upper extremity movements, as measured by the Jebsen Test of Hand Function, between the experimental and control groups. Duncan 2003 (100 participants) reported data according to initial scores (above and below medians). Therefore, this study has been entered as two subgroups (above median group presented first in the forest plot). There was no significant difference between the intervention and control groups: (MD 2.25; 95% CI -0.24 to 4.73) (Analysis 1.2).

Secondary outcomes

Performance in extended ADL

Two studies (113 participants) reported the effects of home-based therapy programmes (targeted at the upper limb) on performance of extended ADL (Lawton Instrumental ADL Scale) (Duncan 1998; Duncan 2003). No significant difference was found between groups: (MD 0.83 Lawton Instrumental ADL Scale points; 95% CI -0.51 to 2.17) (Analysis 1.3) . Duncan 2003 reported follow-up data (80 participants) at six months post-treatment: (SMD 0.80; 95% CI -0.96 to 2.56) (Analysis 1.3). We used a fixed-effect model as we found no substantial heterogeneity.

Motor impairment of the upper limb

Three studies (Duncan 1998, Duncan 2003, Piron 2009) (156 participants) reported outcomes of motor impairment.
All three studies reported a motor impairment score (Fugl-Meyer Upper Extremity Scale). Duncan 1998 and Piron 2009 presented the mean of final outcome scores. Duncan 2003 presented means of change scores. There was no significant difference between groups: (MD 1.46 Fugl-Meyer Upper Extremity Scale points; 95% CI -0.58 to 3.51) (Analysis 1.4). We used a fixed-effect model as we found no substantial heterogeneity. Piron 2009 reported follow-up data (one month after treatment ceased). We found a statistically significant difference: MD 4.30; 95% CI 0.19 to 8.41) (Analysis 1.4).

Home therapy programmes versus same therapy programme in hospital

One study (Piron 2008) compared the effects of a home therapy programme for upper limb with the same therapy programme in hospital.

Secondary outcomes:

Motor impairment of the upper limb

The one study included in this comparison (Piron 2008) (10 participants) reported a motor impairment score (Fugl-Meyer Upper Extremity Scale). There was no significant difference between groups: MD 0.60; 95% CI -8.94 to 10.14) (Analysis 2.1).

Other outcomes

None of the studies reported any adverse events.

DISCUSSION

There was insufficient evidence to determine if home therapy programmes were more or less effective than usual care (visits to hospital or local health centre or hospital inpatient care), no intervention or a placebo intervention. Only four studies met the inclusion criteria for this review. These four studies included essentially two different programmes of therapy and so are not representative of all the therapies available.

The initial level of impairment of participants in the included studies was mild to moderate as measured by the Fugl-Meyer Upper Extremity Scale. We found no studies on the effectiveness of home therapy programmes for participants with more severely affected upper limbs.

The primary outcome of interest was the effect of the programme on ADL, as the most important goal for patients is to improve their ability to participate in and independently achieve independence with ADL. However, the initial aim of upper limb interventions is to improve functional movement and reduce impairment, which is expected to lead to more independence in ADL. Therefore, we also included improvement in functional movement as a

primary outcome of interest, and we included upper limb motor impairment as a secondary outcome. All studies used the Fugl-Meyer Upper Extremity Scale as a measure of motor impairment and so it was possible to combine results for this outcome in a meta-analysis. Piron 2008 and Piron 2009 however, did not include measures of ADL, functional movement of the upper limb or extended ADL, so the findings for these measures are based on the Duncan 1998 and Duncan 2003 studies. Overall there was a lack of evidence concerning primary outcomes.

Summary of main results

This review found no studies that compared home therapy programmes with placebo or no intervention, three studies which compared home therapy programmes with usual care, and one study which compared the same therapy programme delivered in either the home or hospital.

In summary, this review has identified:

- insufficient evidence to determine if home therapy programmes are more (or less) effective than usual care; and
- insufficient evidence to determine if home therapy programmes are more (or less) effective than the same therapy delivered in hospital.

Overall completeness and applicability of evidence

The evidence is currently insufficient to answer the review questions: the effects of home therapy programmes compared with placebo, no intervention, usual care or the same therapy in hospital in terms of performance in ADL, functional movement of the upper limb, performance in extended ADL, motor impairment of the upper limb and adverse events. We only included four studies in the review and two of these had a small number of participants. This limits the completeness of the evidence relevant to this review.

All of the studies focused on individuals with mild to moderate stroke deficits and included other inclusion criteria relating to exclusion of other serious medical conditions or cognitive impairment interfering with comprehension. Therefore, the results of this review may not be generalised to the wider population of stroke patients.

It should be noted that disagreement occurred between review authors as to whether virtual reality telerehabilitation training should be considered as a single intervention or a therapy programme. A majority decision was taken to categorise virtual reality telerehabilitation training as a therapy programme, and this decision will be revisited in future updates of this review.

The lack of sufficient high quality evidence makes it inappropriate to draw conclusions from the results regarding the applicability of home therapy programmes within the context of current practice.

Quality of the evidence

The evidence in this review comes from only four studies with a total number of 166 participants. The lack of evidence makes it impossible to draw any robust conclusions. Again it must be highlighted that the evidence in this review also comes only from two research groups. The heterogeneity between the groups in terms of types of home therapy programmes completed also limits the conclusions that can be drawn.

Identification of relevant studies

Within the protocol we attempted to create a clear and unambiguous definition of home-based therapy programmes targeted at the upper limb, in order to select studies relevant to our research question. However, the review authors encountered a number of difficulties in reaching consensus over the inclusion or exclusion of specific studies. There were a limited number of studies reporting on specific home-based therapy programmes targeted at the upper limb. Many of the studies were service evaluations, which may have included elements of upper limb interventions. However, it was unclear what, if any, interventions were targeted at the upper limb. General lack of information about interventions made it difficult to decide on whether to include some studies. Considerations of home-based therapy versus other forms of service delivery have been covered in other reviews (e.g. OPT 2006) and therefore, we did not include them in this review. In addition,we were only interested in studies that clearly had a programme of interventions targeted at the upper limb.

We experienced particular difficulties in reaching a decision about the inclusion of Piron 2008 and Piron 2009. The review authors could not reach consensus, and the majority decision was taken. This difficulty related to disagreement over whether virtual reality training comprised of more than one treatment component or not. We also experienced difficulties reaching consensus on the exclusion of studies in terms of which part of the intervention had been delivered at home (e.g. Byl 2003). These difficulties suggest that the definition was not sufficiently clear and should be reconsidered prior to future updates.

We did not identify any studies comparing the effects of a home therapy programme with placebo or no intervention. Arguably, placebo interventions and no intervention are very different comparison interventions and ought to be considered separately. Therefore, for future versions of this review, if there are studies with either placebo or no intervention comparison groups, we will consider using separate comparisons for home therapy versus placebo and home therapy versus no intervention.

Whilst our research question has clear clinical relevance and focus, it is possible that our attempt to apply rigorous and clearly defined criteria to the interventions studied may have inadvertently restricted the selection of relevant studies. Consequently, it may be that the focus of this review is too narrow, and further updates

may need to consider the remit of the review in order to be of clinical benefit.

Potential biases in the review process

Through a thorough searching process we are confident that we should have identified all relevant published studies. However, it must be acknowledged that there is a small possibility that there are additional studies (published and unpublished) that we did not identify, particularly as we did not complete handsearching of relevant journals and conference proceedings that had not been searched on behalf of The Cochrane Collaboration. By missing relevant studies, this potentially could have introduced bias into the review.

The diversity of the training carried out at home, and the variations in reporting between studies, led to the review team making some subjective decisions, particularly about the trials to include (see sections above) which may have introduced bias. The studies within this area are heterogenous in terms of what can be classified as home therapy programmes targeted at the upper limb and there were a number of complex strands which required discussion among the review authors and consensus decisions being made. We appreciate that this could be perceived as a limitation of our review.

We used hierarchical lists (see Types of outcome measures) to select which outcome measure should be included (if a study reported a number of different relevant outcome measures). There could potentially be biases in the hierarchical order developed for each outcome. However, we carefully considered the order of the hierarchy and reached consensus. Despite the potential limitations and biases of this approach, we believe that because of the large number of different outcome measures used to assess similar domains, the pre-stating of a hierarchical list provides substantial advantages in comparison to the alternative option of having to make subjective decisions about the selection of outcome measures after data collection has been completed.

For one study (Piron 2008) SDs were not reported and we imputed the SD from another paper (Piron 2009) (by the same research group which included similar patients). Further, we calculated SDs from reported standard error (SE) (SD = SE $\sqrt{n}$) with regard to another study (Duncan 2003). This may have introduced some bias into the review process. However, we believe that including imputed and estimated data from these studies is preferable to excluding the data.

AUTHORS' CONCLUSIONS

Implications for practice

There is insufficient evidence in this review to provide implications for practice. As no negative effect was demonstrated, it is reasonable to suggest that given the lack of evidence found in this review, there is no reason to currently change clinical practice if home-based therapy programmes for the upper limb are being provided.

Implications for research

Implications for primary research

In order to be able to achieve the objective of this review- to determine the effects of home-based therapy programmes for upper limb recovery in patients with upper limb impairment following stroke, compared with (1) placebo or no intervention; (2) usual care; and (3) same treatment in hospital- further research is required. High quality RCTs are needed which aim to test a therapy programme specifically targeted at the upper limb, in the home, and where participants are visited by health professionals at home. It is also desirable that future studies are explicit about the types of home therapy programmes provided, and that an increased number of types of home therapy programmes are investigated. Trials of adequate size and quality are required, not only to assess the clinical effectiveness of home-based therapy programmes for upper limb recovery but also to assess the cost benefit of undertaking such interventions.

Implications for secondary research

We believe that the question we sought to answer within this review has high clinical relevance. However, we encountered a number of problems during the review process relating to our definitions of home-based therapy programmes. These definitions and the scope of this review should be appropriately considered prior to any further updates.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Duncan 1998

Methods	RCT Participants randomly assigned to control or intervention group using a random list generated by group assignments. Randomisation completed in blocks of 10. Random list generated prior to the beginning of the study. Only a laboratory technician who had no input into participant selection or recruitment was aware of group assignment
Participants	20 participants selected from local participating hospitals and Kansas City Stroke Registry. To be included on this registry participant had to have a stroke defined by WHO definition Inclusion criteria: 1. 30 to 90 days after stroke; 2. minimal or moderately impaired sensorimotor function (Fugl-Meyer 40 to 90, Oprington Prognostic Scale score 2.0 to 5.2); 3. ambulatory with supervision and/or assistive device; 4. living at home; 5. living within 50 miles of the University of Kansas Medical Center; 6. no medical condition that interfered with outcome assessments or limited participation in submaximal exercise programme; 7. MMSE > 18; and 8. no receptive aphasia that interfered with ability to follow a 3-step command
Interventions	Group 1 (10 participants): usual care. Usual care as prescribed by their physicians. Reserach assistant visited every 2 weeks to assess the participants exercise and activity level. Clinicans completed an intervention log to capture type of exercises and frequency and duration of therapy visits during treatment or in a home exercise programme. The therapy programmes received by the control group varied in intensity, frequency and duration Group 2 (10 participants): home therapy programme. This involved an exercise programme designed to improve strength, balance and endurance and to encourage more use of the affected extremity. No other physical or occupational therapy was provided. The programme was a home-based exercise programme provided by a physical therapist. The study principal investigator (physiotherapist) and co-investigator (occupational therapist) observed at least 1 therapy session for each participant to ensure standard application of interventions. Exercise sessions were divided into the following 4 blocks (preceded by a 10-minute warm-up session of stretching and flexibility exercises) 1. Assistive and resistive exercises using PNF patterns or theraband exercises to the major muscle groups of the upper and lower extremities 2. Balance exercises 3. Encouraged to use the affected upper extremity in functional activities 4. Progressive walking programme or progressive exercise on a bicycle ergometer The programme included 3 visits per week for 8 weeks, and the patients were instructed to continue the exercise programme for an additional 4 weeks. Each session lasted approximately 1.5 hours

Duncan 1998 (*Continued*)

Outcomes	• Primary outcome 1: performance in ADL: Barthel Index (0 to 100) • Primary outcome 2: functional movement: Jebsen Test of Hand Function (dexterity measure). We could not include data for this outcome in the data analysis as total scores and SD were not reported • Secondary outcome 1: performance in extended ADL: Lawton Instrumental ADL • Secondary outcome 2: (motor impairment) Fugl-Meyer Upper Extremity Scale (0 to 66) Oprington Prognositc Scale, Fugl-Meyer Lower Extremity Scale (0 to 34), Medical Outcomes study- 36 Health Status Measurement, 10 metre walk, 6 minute walk and Berg Balance Scale were also reported, but are not relevant to this review Outcome measures completed at the end of intervention period only
Notes	SDs are not included in the paper. However, we were able to calculate the SDs from data gained from the study authors. Data gained from study authors was also used to enter mean values for Barthel Index. This data gained from personal communication with the author differs from those presented in the published paper

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"A random list was generated by group assignments"
Allocation concealment (selection bias)	Low risk	"Only a laboratory technician who had no input into subject selection or recruitment was aware of group assignment"
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Comment: no information provided
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Comment: no dropouts for any of the reported outcomes
Selective reporting (reporting bias)	Low risk	One outcome not reported (10 metre walk test), however all other pre-specified outcomes were reported

Duncan 2003

Methods	Prospective RCT Participants were randomly assigned to intervention or control group using a random-number generator with a block size of 6. Allocation concealment ensured through the use of sealed envelopes

Participants	100 participants selected from Kansas City Stroke Registry. To be included on this registry participant had to have a stroke defined by WHO definition, diagnosis confirmed by positive CT/MRI scan, > 50 years, stroke onset within 3 to 28 days and residence within 50 miles radius. Excluded from registry if they had subarachnoid haemorrhage, lethargic, obtunded or comatose, uncontrolled blood pressure, hepatic or renal failure, NYHA III/IV heart failure, known limited life expectancy or pre-stroke disability in self-care, or lived in a nursing home prior to stroke Inclusion criteria: 1. stroke within 30 to 150 days; 2. ability to ambulate 25 feet independently; 3. mild to moderate stroke deficits (Fugl-Meyer Upper and Lower Extremity Scales 27 to 90, Orpington Prognositc Score 2 to 5.2, palpable wrist extension on involved side); 4. MMSE $\geq$16; 5. no serious cardiac conditions; 6. not oxygen dependent; 7. no severe weight-bearing pain; 8. no other serious organ system disease; and 9. life expectancy > 1 year
Interventions	Group 1 (50 participants): usual care. This involved services as prescribed by their physicians. Reserach staff visited every 2 weeks for health education, vital signs and a test of oxygen saturation. 46% of participants in this group did not receive any postacute rehabilitation services. Two-thirds were provided with an unsupervised exercise programme. Those who did receive therapy received an average of 8.7 ± 5.3 physical therapy visits and 10.4 ± 7 occupational therapy visits. Physical and occupational therapy were received separately, as prescribed by participants' physicians. Duration of combined physical therapy and occupational therapy visits comparable to those in intervention group (approximately 90 minutes). There was much variation in the types of exercises received Group 2 (50 participants): home therapy programme. This involved an exercise programme designed to improve strength, balance and endurance and to encourage more use of the affected extremity. Exercise sessions were divided into the following 4 blocks 1. Assistive and resistive exercises using PNF patterns or theraband exercise (elastic bands of varying elasticity used as a means to provide resistance) and functional exercises in which body weight was used for resistance, all directed at both upper and lower extremity 2. 15 minutes of balance exercises, which were progressively ordered by difficulty 3. Use of the affected upper extremity in functional activities 4. Progressive walking programme, progressive exercise on a bicycle ergometer Physical and occupational therapists supervised the programme, at participants home and included 36 sessions of 90-minute duration over 12 to 14 weeks. No other therapy was provided unless participants required speech therapy, provided by usual care providers. There were structured protocols for the exercise tasks, criteria for progression and guidelines for reintroducing therapy after intercurrent illness Each participant received an average of 33.4 ± 2.3 visits, and the average duration of a visit was 91 ± 4.5 minutes For both groups, treating therapists completed a treatment log to capture type of exercises and frequency and duration of therapy visits

Outcomes	• Primary outcome 1: performance in ADL: Barthel Index. Data for this outcome were extracted from the associated paper (Studenski 2005) (93 participants post-treatment); 6 month follow-up (80 participants) • Primary outcome 2: functional movement: Wolf Motor Function Test. The data for this outcome were presented for patients above and below median at baseline. We therefore assumed 25 participants in each group • Secondary outcome 1: performance in extended ADL: Lawton Instrumental ADL. Data for this outcome were extracted from associated paper (Studenski 2005); 93 participants post-treatment and 80 participants at follow-up • Secondary outcome 2: motor impairment: Fugl-Meyer Upper Extremity Scale (0 to 66) and grip strength (Jamar dynamometer) Orpington Prognositc Scale, Fugl-Meyer Lower Extremity Scale (0 to 34), isometric strength testing for ankle dorsiflexion and knee extension, 10-metre walk test, 6 minute walk and Berg Balance Scale were also reported but are not relevant to this review. Studenski 2005 further reported Medical Outcomes Study short-form 36-item questionnaire (SF-36) and Stroke Impact Scale (SIS) which are also not relevant Outcome measures completed at end of intervention period for all outcomes. Performance in ADL and extended ADL outcomes also reported at 6 month follow-up
Notes	Change scores only reported and therefore used in the analysis For performance in ADL and extended ADL outcomes, data from Studenski 2005 used. These data had been adjusted for age, pre-stroke physical function, stroke severity and baseline measurement of outcome. Studenski 2005 only completed on treatment analysis therefore data only available for 93 participants. Follow-up data (6 months post-treatment) only available for 80 participants For other outcomes 8 drop-outs reported. 6 participants from intervention arm (significant renal insufficiency detected after randomisation, subclavian steal syndrome diagnosed after randomisation, 1 withdrew after 18 visits, 3 experienced a second stroke) and 2 from usual care group (1 withdrew after randomisation, 1 did not return for 3-month assessment). ITT analysis was completed and therefore analysis based on 100 participants Wolf Motor Function Test time for completion was used in the analysis. We inverted the data for use in the analysis (multiplied x-1). To increase availability of included data we converted presented SEs into SDs ($SD = SE\sqrt{n}$)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	"Subjects were randomly assigned...through the use of a random-number generator...."
Allocation concealment (selection bias)	Low risk	"... with a block size of six and sealed envelopes"
Blinding of outcome assessment (detection bias)	Low risk	"Outcome assessment was performed by research staff blinded to treatment assign-

Duncan 2003 (*Continued*)

All outcomes		ment. Participants were instructed to avoid mentioning anything regarding their study experience to the assessors"
Incomplete outcome data (attrition bias) All outcomes	Low risk	6/50 (12%) participants in the experimental group and 2/50 (4%) in the comparator group were lost to follow-up Reasons for drop-out: 3 re-stroke, 3 withdrew consent, 1 withdrawal, 1 re-hospitalised Statistical methods used to deal with missing data: "All analyses were performed on an intention-to-treat basis. Any missing values at 3 months were imputed using baseline values, a conservative estimation" For 2 of the outcomes (Extended ADL and ADL) another paper (Studenski 2005) was used. For the primary analysis (end of intervention) drop-outs were n = 6/50 and 2/50 for the intervention and control groups respectively. To account for possible missing value bias, multiple imputation was performed. This was judged to be at low risk of bias. For ADL and extended ADL outcomes at follow-up drop-outs n = 10 for both groups, which raises the possible risk of bias for these outcomes
Selective reporting (reporting bias)	Low risk	All pre-specified outcomes were reported

Piron 2008

Methods	RCT Participants were randomly assigned using simple randomisation to 1 of 2 treatment groups of 5 patients. Details of any allocation concealment were not reported
Participants	10 participants Inclusion criteria: 1. mild to intermediate arm motor impairment; 2. ischaemic stroke in the area of the middle cerebral artery; and 3. no cognitive problems that could interfere with comprehension
Interventions	Group 1: virtual reality training with therapist. A 3D motion tracking system recorded participants' arm movements and a virtual environment created in which the participants' movements were represented. A sequence of virtual tasks was performed whilst participants watched their movement trajectory on screen compared with an ideal trajectory. The virtual reality system thus provided visual feedback, i.e. knowledge of performance and knowledge of results. Treatment occurred in hospital with a therapist present Group 2: virtual reality with telerehabilitation at home. The same practice as group 1

Piron 2008 (*Continued*)

	was performed but via a computer in the participants' homes, with a videoconferencing system and a remote link to the therapist in the hospital Both groups received 1 hour of daily training for 1 month. Same physical therapist managed the rehabilitation sessions for both groups
Outcomes	• Secondary outcome 2: motor impairment: Fugl-Meyer Upper Extremity Scale Multidimensional disease and treatment specific satisfaction questionnaire was also reported as an outcome but this was not relevant to this review Outcome measures were completed at the end of the intervention period only
Notes	No details given as to the training or experience of the therapist delivering the intervention No SDs were included in the paper. In order to include this study in the meta-analysis, we used the SD reported by Piron 2009, which included participants with similar levels of initial upper limb motor impairment. The largest SD reported by Piron 2009 (7.7) was used in order to be conservative

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	"Using simple randomization, the subjects were assigned to two different groups..." Judgement: unable to make decision about adequate random sequence generation
Allocation concealment (selection bias)	Unclear risk	Comment: No reported details of allocation concealment
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"... the examining physician was blind to the type of treatment given and evaluated arm motor performance in all patients ..."
Incomplete outcome data (attrition bias) All outcomes	Low risk	Comment: No drop outs reported for any of the reported outcomes
Selective reporting (reporting bias)	Low risk	All pre-specified outcomes were reported

Piron 2009

Methods	RCT Simple randomisation using sequentially numbered, opaque, sealed envelopes. Allocation to 1 of 2 treatment groups was performed by the therapist co-ordinator of the hospital who was not involved in the participants rehabilitation programme
Participants	36 participants Inclusion criteria: 1. mild to intermediate arm motor impairment on Fugl-Meyer Upper Extremity Scale;

	2. single ischaemic stroke in the area of middle cerebral artery; 3. no apraxia (< 62 points on the de Renzi Test); and 4. no clinical evidence of cognitive impairment that could interfere with verbal comprehension, such as neglect and language disturbances (more than 40 errors in the Token Test)
Interventions	Group 1: conventional physiotherapy in the local health district. Participants performed specific exercises for the upper limb with a strategy of progressive complexity. First, they were requested to control isolated motions without postural control, then postural control was included, and finally complex motions with postural control were practiced. Examples of tasks were to touch different targets arranged in front, manipulate different objects, follow trajectories displayed on a plane and to recognise different arm positions Group 2: telerehabilitation system at home. This consisted of 2 dedicated personal computer-based workstations; 1 at the participants home; and 1 at the hospital. This generated a virtual environment in which participants executed motor tasks. This was combined with video-conferencing which permitted the remote control of the participants video camera mobility in order to observe the participants movements during the rehabilitation tasks. The virtual reality system incorporated a 3D motion tracking system to record arm movements. 5 virtual tasks comprising simple arm movements were practised whilst participants watched their movement trajectory on screen compared to an ideal trajectory. Participants received verbal feedback from the therapist about the exactness of the movements Both groups received 1 hour of daily training, 5 days per week for 1 month
Outcomes	• Primary outcome 2: functional movement: ABILHAND Scale • Secondary outcome 2: motor impairment scale: Fugl-Meyer Upper Extremity Subscore and Ashworth Scale. Fugl-Meyer selected for analysis Outcome measures performed 1 month before treatment began, at baseline, immediately after 1 month treatment and at 1 month after treatment ceased (follow-up)
Notes	No details given as to the training or experience of the therapist delivering the intervention

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	"... selected patients were assigned to 2 groups according to simple randomisation technique using sequentially numbered, opaque sealed envelopes"
Allocation concealment (selection bias)	Low risk	"Allocation was performed by the therapist coordinator of the hospital ... the coordinator was not involved, as care provider, in the patients rehabilitation programme"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	"The examining neurologist was blind to the treatments administered to the participants"

Piron 2009 (*Continued*)

Incomplete outcome data (attrition bias) All outcomes	Low risk	"All patients completed the study ..."
Selective reporting (reporting bias)	Low risk	All pre-specified outcomes were reported

ADL: activities of daily living
CT: computerised tomography
MMSE: Mini mental state examination
MRI: magnetic resonance imaging
NYHA: New York Heart Association
PNF: proprioceptive neuromuscular facilitation
RCT: randomised controlled trial
SD: standard deviation
SE: standard error
WHO: World Health Organization

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Alon 2003	Not RCT. Unclear if intervention completed at home
Andersen 2002	Intervention not targeted at upper limb. Patients randomised to (1) follow-up home visits by a physician, (2) physiotherapist instruction at home or (3) standard aftercare
Barker 2008	Intervention was not completed at home
Baskett 1999	Interventions not clearly targeted at upper limb. Patients randomised to home therapy or day hospital therapy
Basmajian 1982	Neither intervention completed at home
BCST 1991	Interventions not targeted at upper limb. Patients randomised to home physiotherapy or day hospital intervention
Bjorkdhal 2006	Interventions not targeted at upper limb. Patients randomised to receive rehabilitation at home, based on individual needs with a focus on activities in natural context or a day clinic group, aimed mainly at improving functions (related to service delivery)
Brogardh 2006	Single intervention (constraint induced movement therapy), not a programme of interventions
Byl 2003	Only part of the intervention completed at home. Alternate treatment could not be considered placebo or usual care - comparison of 2 upper limb interventions
Byl 2008	Intervention not delivered by a therapist within patients' home

(*Continued*)

Calis 2004	Intervention not delivered by a therapist within patients' home
Cauraugh 2003	No information provided on setting of intervention. Not a programme of interventions
Chaiyawat 2009	Intervention not targeted at upper limb. Patients were evaluated on a range of functions related to indoor and outdoor mobility as well as some basic ADL before a home rehabilitation programme was provided
Chen 2006a	Not clear if intervention completed at participants place of residence
Delden 2009	2 of the interventions were not delivered at home. The third intervention was constraint-induced therapy which is defined as a single intervention for the purpose of this review, and was therefore excluded as not a programme of therapy
Djkerman 2004	Not RCT. A single intervention (motor imagery)
Domino 1993	Intervention not targeted at upper limb. Patients randomised to receive domiciliary or hospital-based care after discharge (related to service delivery)
Donaldson 2009	Intervention not delivered at home
Gabr 2005	Both upper limb interventions completed at home. Health care professional did not visit patients' home
Gilbertson 2000	Interventions not targeted at upper limb. Patients randomised to domiciliary occupational therapy or routine follow-up after discharge
Hara 2008	Only 1 intervention of interest, not a programme of upper limb targeted interventions
Hesse 2008	Intervention not delivered at home
Higgins 2006	Home exercises included but most of the intervention did not take place within patients' home (rehabilitation setting)
Kimberley 2004	Single intervention (electrical stimulation) not a programme of interventions targeted at the upper limb
Lin 2004	Interventions not targeted at upper limb. Patients randomised to home-based physical therapy, comprising motor facilitation, postural control, functional ambulation and ADL training or no treatment
Liu 2009	Intervention not delivered at home
Lo 2009	Intervention not delivered at home
Lo 2010	Intervention not completed at home
Noad 1998	Not RCT
Ozdemir 2001	Intervention not targeted at upper limb. Investigating service delivery (related to service delivery)

(*Continued*)

Page 2009	Intervention not delivered at home
Pang 2006	Interventions not completed at home
Platz 2009	Intervention not delivered at home
Ploughman 2008	Not an upper limb intervention
Ring 2005	Not RCT
Roderick 2001	Intervention not targeted at upper limb. Patients randomised to receive domiciliary care or day hospital (related to service delivery)
Rudd 1997	Intervention not targeted at upper limb. Patients randomised to early discharge scheme or conventional care (related to service delivery)
Ryan 2006	Intervention not targeted at upper limb
Sackley 2006	Intervention not targeted at upper limb. Care homes were randomised to receive occupational therapy or usual care
Sun 2010	Intervention not delivered at home
Thielman 2004	Both upper limb interventions completed at home
Thrasher 2008	Intervention not delivered at home
TOTAL 2001	Interventions not targeted at upper limb. Both interventions completed at home
Tseng 2006	Both interventions completed in long term care facilities. ROM exercises only - not a programme of interventions
Turton 1990	Home programme, but not RCT
Volpe 2008	Intervention not delivered at home
Walker 1999	Interventions not targeted at upper limb. Patients randomised to receive occupational therapy at home or no intervention (control group)
Wolfe 2000	Interventions not targeted at upper limb. Patients randomised to rehabilitation at home by rehabilitation team or usual care (related to service delivery)
Yu 2009	Interventions not targeted at upper limb

ADL: activities of daily living
RCT: randomised controlled trial
ROM: range of motion

Characteristics of studies awaiting assessment *[ordered by study ID]*

Crosbie 2009

Methods	RCT
Participants	Stroke patients
Interventions	Virtual reality mediated therapy group or a standard therapy group
Outcomes	Upper Limb Motricity Index and Action Research Arm Test
Notes	Unclear where intervention was completed

De Paula Oliveira 2007

Methods	RCT
Participants	Stroke patients
Interventions	Home exercise group, supervised care group or control group
Outcomes	Barthel index
Notes	Unclear if intervention targeted at the upper limb

RCT: randomised controlled trial

Characteristics of ongoing studies *[ordered by study ID]*

Alberts ongoing

Trial name or title	Rehabilitation of the stroke hand at home
Methods	RCT
Participants	Stroke patients
Interventions	Robotic-based home therapy or a self-administered home therapy programme
Outcomes	Action Research Arm Test, Wolf Motor Function Test, Fugl-Meyer Upper Extremity Test and Stroke Impact Scale
Starting date	June 2010
Contact information	James B Koeneman, email: jkoeneman@kineticmuscles.com

Alberts ongoing (*Continued*)

Notes	Estimated study completion date: May 2013

RCT: randomised controlled trial

DATA AND ANALYSES

Comparison 1. Home therapy programme versus usual care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Performance of activities of daily living	2		Mean Difference (IV, Random, 95% CI)	Subtotals only
1.1 Analysis immediately following intervention	2	113	Mean Difference (IV, Random, 95% CI)	2.85 [-1.43, 7.14]
1.2 Analysis at follow-up	1	80	Mean Difference (IV, Random, 95% CI)	-1.70 [-5.51, 2.11]
2 Functional movement of upper limb	1	100	Mean Difference (IV, Fixed, 95% CI)	2.24 [-0.24, 4.73]
3 Performance of extended activities of daily living	2		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
3.1 Analysis immediately following intervention	2	113	Mean Difference (IV, Fixed, 95% CI)	0.83 [-0.51, 2.17]
3.2 Analysis at follow-up	1	80	Mean Difference (IV, Fixed, 95% CI)	0.80 [-0.96, 2.56]
4 Upper limb motor impairment	3		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
4.1 Analysis immediately following intervention	3	156	Mean Difference (IV, Fixed, 95% CI)	1.46 [-0.58, 3.51]
4.2 Analysis at follow-up	1	36	Mean Difference (IV, Fixed, 95% CI)	4.30 [0.19, 8.41]

Comparison 2. Home therapy programme versus same therapy programme in hospital

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Upper limb motor impairment	1	10	Mean Difference (IV, Fixed, 95% CI)	0.60 [-8.94, 10.14]

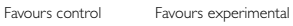
Analysis 1.1. Comparison 1 Home therapy programme versus usual care, Outcome 1 Performance of activities of daily living.

Review: Home-based therapy programmes for upper limb functional recovery following stroke

Comparison: 1 Home therapy programme versus usual care

Outcome: 1 Performance of activities of daily living

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
1 Analysis immediately following intervention							
Duncan 1998	10	96 (5.16)	10	95.6 (5.27)		44.3 %	0.40 [-4.17, 4.97]
Duncan 2003	44	94.4 (6.7)	49	89.6 (10.4)		55.7 %	4.80 [1.28, 8.32]
Subtotal (95% CI)	**54**		**59**			**100.0 %**	**2.85 [-1.43, 7.14]**
Heterogeneity: Tau^2 = 5.35; Chi^2 = 2.23, df = 1 (P = 0.14); I^2 =55%							
Test for overall effect: Z = 1.30 (P = 0.19)							
2 Analysis at follow-up							
Duncan 2003	40	92.6 (9.5)	40	94.3 (7.8)		100.0 %	-1.70 [-5.51, 2.11]
Subtotal (95% CI)	**40**		**40**			**100.0 %**	**-1.70 [-5.51, 2.11]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.87 (P = 0.38)							
Test for subgroup differences: Chi^2 = 2.42, df = 1 (P = 0.12), I^2 =59%							



Analysis 1.2. Comparison 1 Home therapy programme versus usual care, Outcome 2 Functional movement of upper limb.

Review: Home-based therapy programmes for upper limb functional recovery following stroke

Comparison: 1 Home therapy programme versus usual care

Outcome: 2 Functional movement of upper limb

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Duncan 2003	25	0.36 (0.5)	25	-1.42 (6.7)		89.2 %	1.78 [-0.85, 4.41]
Duncan 2003	25	10.87 (15.65)	25	4.78 (11.35)		10.8 %	6.09 [-1.49, 13.67]
Total (95% CI)	**50**		**50**			**100.0 %**	**2.24 [-0.24, 4.73]**

Heterogeneity: Chi² = 1.11, df = 1 (P = 0.29); I² =10%

Test for overall effect: Z = 1.77 (P = 0.077)

Test for subgroup differences: Not applicable

Analysis 1.3. Comparison 1 Home therapy programme versus usual care, Outcome 3 Performance of extended activities of daily living.

Review: Home-based therapy programmes for upper limb functional recovery following stroke

Comparison: 1 Home therapy programme versus usual care

Outcome: 3 Performance of extended activities of daily living

Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Analysis immediately following intervention							
Duncan 1998	10	22 (4.24)	10	22.2 (3.82)		14.3 %	-0.20 [-3.74, 3.34]
Duncan 2003	44	22.8 (3.2)	49	21.8 (3.9)		85.7 %	1.00 [-0.44, 2.44]
Subtotal (95% CI)	**54**		**59**			**100.0 %**	**0.83 [-0.51, 2.17]**
Heterogeneity: Chi^2 = 0.38, df = 1 (P = 0.54); I^2 =0.0%							
Test for overall effect: Z = 1.21 (P = 0.22)							
2 Analysis at follow-up							
Duncan 2003	40	23.2 (3.7)	40	22.4 (4.3)		100.0 %	0.80 [-0.96, 2.56]
Subtotal (95% CI)	**40**		**40**			**100.0 %**	**0.80 [-0.96, 2.56]**
Heterogeneity: not applicable							
Test for overall effect: Z = 0.89 (P = 0.37)							
Test for subgroup differences: Chi^2 = 0.00, df = 1 (P = 0.98), I^2 =0.0%							

Analysis 1.4. Comparison 1 Home therapy programme versus usual care, Outcome 4 Upper limb motor impairment.

Review: Home-based therapy programmes for upper limb functional recovery following stroke

Comparison: 1 Home therapy programme versus usual care

Outcome: 4 Upper limb motor impairment

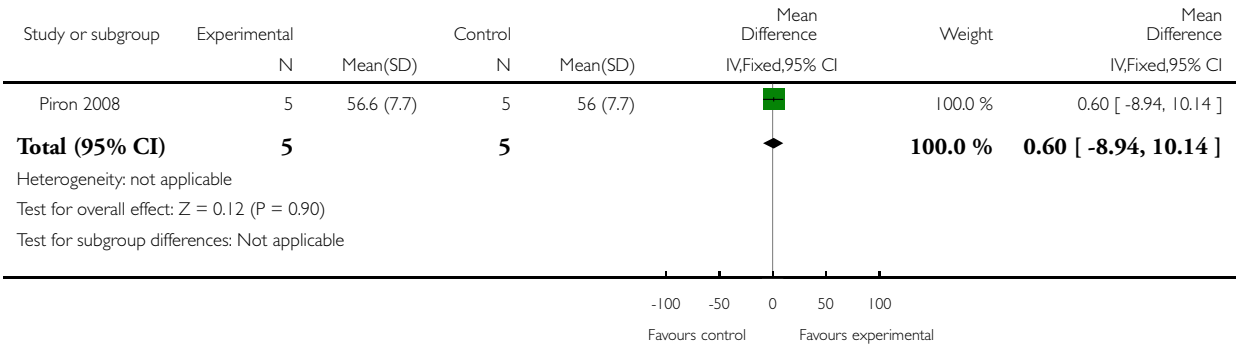
Study or subgroup	Experimental N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
1 Analysis immediately following intervention							
Duncan 1998	10	47.6 (17.35)	10	38.6 (17.73)		1.8 %	9.00 [-6.38, 24.38]
Duncan 2003	50	4.48 (5.73)	50	4.04 (6.36)		74.4 %	0.44 [-1.93, 2.81]
Piron 2009	18	53.6 (7.7)	18	49.5 (4.8)		23.8 %	4.10 [-0.09, 8.29]
Subtotal (95% CI)	**78**		**78**			**100.0 %**	**1.46 [-0.58, 3.51]**
Heterogeneity: Chi^2 = 3.16, df = 2 (P = 0.21); I^2 =37%							
Test for overall effect: Z = 1.40 (P = 0.16)							
2 Analysis at follow-up							
Piron 2009	18	53.1 (7.3)	18	48.8 (5.1)		100.0 %	4.30 [0.19, 8.41]
Subtotal (95% CI)	**18**		**18**			**100.0 %**	**4.30 [0.19, 8.41]**
Heterogeneity: not applicable							
Test for overall effect: Z = 2.05 (P = 0.040)							
Test for subgroup differences: Chi^2 = 1.46, df = 1 (P = 0.23), I^2 =32%							

Analysis 2.1. Comparison 2 Home therapy programme versus same therapy programme in hospital, Outcome 1 Upper limb motor impairment.

Review: Home-based therapy programmes for upper limb functional recovery following stroke

Comparison: 2 Home therapy programme versus same therapy programme in hospital

Outcome: 1 Upper limb motor impairment



ADDITIONAL TABLES

Table 1. Demographics of included participants

Study	Number of participants	Age: mean (SD)	Gender (M/F)	First stroke	Time since stroke: mean (SD)	Side of stroke (L/R)	Type of stroke	Inital Fugl-Meyer (UE) mean (SD)
Duncan 1998	Usual care: 10 Home therapy: 10	67.8 years (7.2) 67.3 years (9.6)	Not reported	Not reported	56 days 66 days	4/5; Brainstem: 1 4/6	Ischaemic: 8 Haemorrhagic: 2 Brain stem: 1 Ischaemic: 10 Haemorrhagic: 0	36.4 (Not reported) 38.1 (Not reported)
Duncan 2003	Usual care: 48 Home therapy: 44 Drop-outs: 8	70.2 years (11.4) 68.5 years (9.0) 74.6 years (9.8)	27/21 23/21 6/2	Not reported as comorbid condition assume n = 100	73.5 days (27.1) 77.5 days (28.7) 84 days (27.2)	22/22; Brainstem/other: 4 18/2; Brainstem/other: 4 4/3; Brainstem/other: 1	Ischaemic: 44 Ischaemic: 39 Ischaemic: 7	43.3 (11.9) 45.8 (12.8) 50.6 (7.4)

Table 1. Demographics of included participants (*Continued*)

Piron 2008	Virtual reality with therapist: 5 Virtual reality with telerehabilitation: 5	65 years (11) 53 years (15)	3/2 2/3	Not reported Not reported	364 days (56) 280 days (56)	Not reported Not reported	Ischaemic: 5 Ischaemic: 5	49.4 (Not reported) 51.2 (Not reported)
Piron 2009	Conventional: 18 Telerehabilitation with virtual reality: 18	64.4 years (7.9) 66 years (7.9)	10/8 11/7	18 18	333 days (11.9) 412 days (184.8)	8/10 8/10	Ischaemic: 18 Ischaemic: 18	47.3 (4.5) 48.3 (7.2)

F: female
L: left
M: male
R: right
SD: standard deviation

APPENDICES

Appendix 1. MEDLINE search strategy

We used the following search strategy, for MEDLINE and CENTRAL.
1. cerebrovascular disorders/ or exp basal ganglia cerebrovascular disease/ or exp brain ischemia/ or exp carotid artery diseases/ or cerebrovascular accident/ or exp brain infarction/ or exp cerebrovascular trauma/ or exp hypoxia-ischemia, brain/ or exp intracranial arterial diseases/ or intracranial arteriovenous malformations/ or exp "Intracranial Embolism and Thrombosis"/ or exp intracranial hemorrhages/ or vasospasm, intracranial/ or vertebral artery dissection/
2. (stroke or poststroke or post-stroke or cerebrovasc$ or brain vasc$ or cerebral vasc$ or cva$ or apoplex$ or SAH).tw.
3. ((brain$ or cerebr$ or cerebell$ or intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiplegia/ or exp paresis/
6. (hemipleg$ or hemipar$ or paresis or paretic).tw.
7. 1 or 2 or 3 or 4 or 5 or 6
8. exp Upper Extremity/
9. (upper adj3 (limb$ or extremity)).tw.
10. (arm or shoulder or elbow or forearm or hand or wrist or finger or fingers).tw.
11. 8 or 9 or 10
12. 7 and 11
13. community health services/ or community health nursing/ or community networks/ or home care services/ or home care services, hospital-based/ or home nursing/
14. homebound persons/ or home health aides/ or home care agencies/ or house calls/ or primary health care/ or aftercare/

15. residential facilities/ or assisted living facilities/ or group homes/ or halfway houses/ or homes for the aged/ or exp nursing homes/
16. housing for the elderly/ or long-term care/ or institutionalization/
17. (home$ or house$ or domicile or domiciliary or community or institution$ or outreach or sheltered accomm$).tw.
18. ((resident$ or long-term) adj5 (care or facilit$)).tw.
19. or/13-18
20. 12 and 19

Appendix 2. EMBASE search strategy

1. cerbrovascular disease/ or exp basal ganglion hemorrhage/ or exp brain ischemia/ or exp carotid artery disease/ or cerebrovascular accident/ or exp brain infarction/ or exp cerebrovascular accident/ or exp brain ischemia/ or exp cerebral artery disease/ or brain arteriovenous malformations/ or exp thromboembolism/ or exp brain hemorrhage/ or *brain vasospasm/ or artery dissection/ or stroke patients/
2. (stroke or poststroke or post-stroke or cerebrovasc$ or brain vasc$ or cerebral vasc$ or cva$ or apoplex$ or SAH).tw.
3. ((brain$ or cerebr$ or cerebell$ or intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiplegia/ or hemiparesis/ or paresis/
6. (hemipleg$ or hemipar$ or paresis or paretic).tw.
7. 1 or 2 or 3 or 4 or 5 or 6
8. exp arm/
9. (upper adj3 (limb$ or extremity)).tw.
10. (arm or shoulder or elbow or forearm or hand or wrist or finger or fingers).tw.
11. 8 or 9 or 10
12. nursing home/ or residential home/ or home/ or home care/ or home environment/ or home for the elderly/ or home health agency/ or home physiotherapy/ or home rehabilitation/
13. nursing home patient/ or nursing home personnel/ or homebound patient/ or halfway house/ or aftercare/ or assisted living facility/ or professional practice/
14. community/ or community based rehabilitation/ or community living/ or community medicine/ or community program/ or community health nursing/
15. family nursing/ or family service/ or family therapy/ or residential care/ or exp primary health care/ or community care/ or family centered care/ or family health/ or institutional care/ or long term care/ or institutionalization/
16. (home$ or house$ or domicile or domiciliary or community or institution$ or outreach).tw.
17. ((resident$ or long-term) adj5 (care or facilit$)).tw.
18. or/12-17
19. 7 and 11 and 18

Appendix 3. AMED search strategy

1. cerebrovascular disorders/ or cerebral hemorrhage/ or cerebral infarction/ or cerebral ischemia/ or cerebrovascular accident/
2. (stroke or poststroke or post-stroke or cerebrovasc$ or brain vasc$ or cerebral vasc$ or cva$ or apoplex$ or SAH).tw.
3. ((brain$ or cerebr$ or cerebell$ or intracran$ or intracerebral) adj5 (isch?emi$ or infarct$ or thrombo$ or emboli$ or occlus$)).tw.
4. ((brain$ or cerebr$ or cerebell$ or intracerebral or intracranial or subarachnoid) adj5 (haemorrhage$ or hemorrhage$ or haematoma$ or hematoma$ or bleed$)).tw.
5. hemiplegia/
6. (hemipleg$ or hemipar$ or paresis or paretic).tw.
7. 1 or 2 or 3 or 4 or 5 or 6
8. exp arm/
9. (upper adj3 (limb$ or extremity)).tw.
10. (arm or shoulder or elbow or forearm or hand or wrist or finger or fingers).tw.

11. 8 or 9 or 10
12. home care services/ or home nursing/ or community health nursing/ or community health services/ or after care/ or primary health care/ or rehabilitation nursing/ or residential treatment/
13. nursing homes/ or homes for the aged/ or group homes/ or long term care/ or independent living/ or residential facilities/
14. home remedies/ or family/ or family therapy/ or professional practice/ or professional family relations/
15. (home$ or house$ or domicile or domiciliary or community or institution$ or outreach).tw.
16. ((resident$ or long-term) adj5 (care or facilit$)).tw.
17. or/12-16
18. 7 and 11 and 17

Appendix 4. CINAHL search strategy

1. MM "cerebrovascular disorders+" or "cerebral ischemia+" or "basal ganglia cerebrovascular disease" or "carotid artery diseases" or "stroke" or "stroke patients" or "cerebral embolism" or "brain injuries" or "intracranial arterial diseases" or "intracranial arteriosclerosis" or "arteriovenous malformations" or "cerebral embolism" "thrombosis" or "intracranial haemorrhages"or "cerebral vasospasm" or "vertebral artery dissection"
2. stroke or poststroke or post-stroke or cerebrovasc* or brain vasc* or cerebral vasc* or cva* or apoplexy* or SAH
3. brain* or cerebr* or cerebell* or intracran* or intracerebral N5 isch?emi* or infarct* or thrombo* or emboli* or occlus*
4. brain* or cerebr* or cerebell* or intracerebral or intracranial or subarachnoid N5 haemorrhage* or hemorrhage* or haematoma* or bleed*
5. hemiplegia/ or exp paresis/
6. (hemipleg$ or hemipar$ or paresis or paretic).tw.
7. 1 or 2 or 3 or 4 or 5 or 6
8. MM arm+
9. upper N3 (limb* or extremity)
10. arm or shoulder or elbow or forearm or hand or wrist or finger or fingers
11. 8 or 9 or 10
12. "nursing home" or "residential home" or home or "home care" or "home environment" or "home for the elderly" or "home health agency" or "home physiotherapy" or "home rehabilitation"
13. "nursing home patient" or "nursing home personnel" or "homebound patient" or "halfway house" or "aftercare" or "assisted living facility" or "professional practice"
14. community or "community based rehabilitation" or "community living" or "community medicine" or "community program" or "community health nursing"
15. "family nursing" or "family service" or "family therapy" or "residential care" or "primary health care+" or "community care" or "family centered care" or "family health" or "institutional care" or "long term care" institutionalization
16. home* or house* or domicile or domiciliary or community or institution* or outreach
17. (resident* or "long-term") N5 (care or facility*)
18. or/12-17
19. 7 and 11 and 18

HISTORY

Protocol first published: Issue 4, 2007

Review first published: Issue 5, 2012

Date	Event	Description
9 July 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Fiona Coupar (FC) co-ordinated the review process and managed searching and main data extraction input. Fiona Coupar, Paulette van Vliet (PvV) and Alex Pollock (AP) undertook searching for trials, decided upon trial inclusion and exclusion, undertook data extraction and assessment of methodological quality. Catherine Sackley (CS) and Lynn Legg (LL) assisted with drafting of the protocol and read all drafts.

DECLARATIONS OF INTEREST

Catherine Sackley is a collaborator on a Stroke Association project piloting a home therapy intervention.

SOURCES OF SUPPORT

Internal sources

- Greater Glasgow Health Board Managed Clinical Network for Stroke, UK.

External sources

- Chest, Heart and Stroke Scotland, UK.
- Chief Scientist Office, Scottish Government Health Directorate, UK.

Alex Pollock is employed by the Nursing, Midwifery and Allied Health Professions Research Unit, which is funded by the Chief Scientist Office, part of the Scottish Government Health Directorate.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We included as additional comparison, studies that compared home therapy programmes for the upper limb with the same therapy in hospital, as these were relevant to achieving the objective of the review - to assess the effectiveness of home therapy programmes for the upper limb - but did not fit within the category of either placebo or usual care .

The protocol stated that we would search OT Search. Following advice from the Cochrane Stroke Group's Trials Search Co-ordinator, we did not conduct this search as this database now requires subscription.

The protocol stated that we would identify and handsearch relevant journals and conference proceedings that had not been searched on behalf of The Cochrane Collaboration. We did not identify any relevant journals and so carried out no handsearching.

INDEX TERMS

Medical Subject Headings (MeSH)

*Home Care Services; *Recovery of Function; *Stroke Rehabilitation; *Upper Extremity; Activities of Daily Living; Randomized Controlled Trials as Topic

MeSH check words

Adult; Humans