
Evaluation of home-based
rehabilitation in Victoria

Draft Literature Review

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Literature Review

Parameters of the review

This literature review includes both Australian and internationally published (peer reviewed) research into home-based rehabilitation within the following parameters. Firstly, only those articles published in or after 1990 are included. The present study is concerned with the recent development of home-based rehabilitation (post 1995 in Victoria) and although international research into this area predates the Australian development, there is little published research prior to 1990. Secondly, studies about paediatric and psychiatric rehabilitation are excluded. Home-based rehabilitation models that apply to these groups are not being investigated in this study. Thirdly, the review is concerned with home-based rehabilitation interventions that include a multi-disciplinary team approach rather than a single discipline one. It is expected that the home-based rehabilitation programs investigated in this study will take a multi or inter disciplinary approach. Finally, the review is restricted to research that includes stroke and/or orthopaedic conditions as these are the client groups included in this study.

The following data bases were searched from 1989 to the present for peer reviewed, English language papers containing the key words "home rehabilitation", "stroke rehabilitation", "rehabilitation in the home", and "hospital in the home": Academic Search Elite Australia/New Zealand Reference Centre; CINAHL, EBSCO Online Citations; ERIC; Health Business Fulltext Elite Health Source – Consumer Edition Health Source; Nursing/Academic Edition Professional Development Collection; Psychology and Behavioural Sciences Collection, PsychINFO, and Pubmed. In addition, papers located for previous reviews by the authors and previous research at NARI were included, as were papers cited in the reference list of these papers. The Cochrane Library was also searched using the key words "home rehabilitation". The authors will continue to search for relevant literature during the course of the research project.

The topics of particular interest in the present study are the evaluations of home-based rehabilitation that focused on client and carer and the papers that described home-based rehabilitation practice models. A section on cost effectiveness has also been included as cost was often discussed in the literature, but this is not the focus of the current study.

Section One of this review outlines the models described in the literature. Section Two summarises the evaluative literature on home-based rehabilitation including those studies that meet the criteria for levels of evidence one and two (NHMRC, 1999¹) and

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Level One - evidence obtained from a systematic review of all relevant randomised controlled trials.

those that meet the criteria for level three and below (NHMRC, 1999). Finally, Section Three provides a summary and critique of the literature reviewed.

Section One: Models of home based rehabilitation

The current study aims to describe home-based rehabilitation models in Victoria, utilising data derived from focus groups investigating the current models of home-based rehabilitation that are in existence across Victoria. This section of the review will examine models of home-based rehabilitation as described in the literature. This will provide a basis for comparison of Victorian practice with that of other Australian states and with international practice in this field. The findings of these studies will be discussed in sections two and three.

Thirteen studies described some aspects of their models of home based rehabilitation. This section outlines some of consistent features across the home rehabilitation programs described, as well as some of the features that are unique to particular services. However, it is limited to what was actually reported in the literature. It may be that many more programs share the features described by one or two, but if these features have not been reported in the published article, they have not been included in this description.

Diagnostic group

The majority of the home rehabilitation teams described in the literature focussed on clients from a particular diagnostic group. Seven of the thirteen programs only admitted stroke clients (Anderson, Rubenach, Ni Mhurchu, & Clark, 2000a; Indredavik, Fjætoft, Ekeberg, Loge, & Morch, 2000; Mayo, Wood-Dauphinee, Cote, & Gayton, 2000; Rodgers et al., 1997; Rudd, Wolfe, Tilling, & Beech, 1997; Widen Holmqvist, de Pedro-Cuesta, Holm, & Kostulas, 1995) and three only admitted clients with a fractured hip (Crotty, Whitehead, Gray, & Finucane, 2002; Farnworth, Kenny, & Shiell, 1994; Meeds & Pryor, 1990). Two programs included all diagnostic groups (Bairstow, Ashe, Heavens, & Lithgo, 1997; Portnow et al., 1991) and one included hip and knee replacement; hysterectomy; general medical; and Chronic Obstructive Airways Disease (COAD) (Shepperd, Harwood, Jenkinson et al., 1998).

Level Two -	evidence from at least one well-designed randomised controlled trial (where participants are randomised to the intervention/non intervention groups; or to different interventions).
Level Three -	evidence from well designed controlled trials without randomisation, or from well designed case controlled analytic studies preferably from more than one centre or research group, or from multiple time series.
Level Four -	opinion of respected authorities, based on clinical experience, descriptive studies, case series (either post-test or pre-test and post-test) or reports of expert committees.

Staffing

All of the home-based rehabilitation models described used a multi-disciplinary approach with two also using an interdisciplinary approach (Portnow et al., 1991; Rodgers et al., 1997). A multi-disciplinary approach refers to a team approach in which staff from a range of rehabilitation disciplines provide a discipline based assessment to the client and then work together in a co-ordinated way to achieve each discipline's (and/or the client's) rehabilitation goals. An inter-disciplinary approach starts with the collective identification of client goals (Merck, 2003). These goals are then achieved through cooperation and joint intervention between the disciplines, the client and his or her family. Interdisciplinary teamwork focuses on the client's handicaps (or participation restrictions) rather than disability (activity limitations) or impairments (McGrath, Marks, & Davis, 1995). Transdisciplinary teamwork is where each team member becomes so familiar with the roles and responsibilities of other team members that the tasks and functions become to some extent interchangeable (Merck, 2003).

Table 2 (on the following page) outlines the different disciplines included in each of the 10 home rehabilitation teams. Rehabilitation teams ranged from three to eight disciplines. All teams had a physiotherapist and occupational therapist. Most teams also had nursing staff (8), speech pathology (9), and medical input (9). Medical input varied across teams and included liaison with general medical practitioners (GPs) and rehabilitation consultants. Five programs had social workers. Few programs reported having allied health assistants, dietitians or podiatrists.

Care planning

All except one (Gladman et al., 1993) of the programs included early discharge from a hospital as a goal of the home rehabilitation team. This was achieved through close liaison with hospital staff and timely contact with the client and carer. Four programs liaised with staff and clients of acute wards while the client was still in hospital (Farnworth et al., 1994; Meeds & Pryor, 1990; Rodgers et al., 1997; Shepperd, Harwood, Jenkinson et al., 1998); one liaised with the inpatient rehabilitation team (Bairstow et al., 1997) and two liaised with both acute and rehabilitation ward staff (Anderson et al., 2000a; Indredavik et al., 2000). Five programs completed a home visit prior to the client being discharged from the inpatient setting (Crotty et al., 2002; Indredavik et al., 2000; Meeds & Pryor, 1990; Rodgers et al., 1997; Shepperd, Harwood, Jenkinson et al., 1998).

Seven models included development of individualised client goals (Anderson et al., 2000a; Bairstow et al., 1997; Crotty et al., 2002; Indredavik et al., 2000; Portnow et al., 1991; Rodgers et al., 1997; Widen Holmqvist et al., 1995) with Portnow et al's (1991) model describing the client as a member of the care team. Five of these studies

also included the carer in the case planning. Five programs also provided carer education and support (Bairstow et al., 1997; Indredavik et al., 2000; Portnow et al., 1991; Rodgers et al., 1997; Widen Holmqvist et al., 1995).

Case management was a feature of six of the programs (Anderson et al, 2000a; Bairstow et al., 1997; Indredavik et al., 2000; Portnow et al., 1991; Widen Holmqvist et al., 1995; & Rodgers et al., 1997). These programs identified a team member who was responsible for coordination of the client's care and/or acting as the key contact person for the client and his or her family.

Table 2 - Composition of Home rehabilitation teams

	Medical input	PT	OT	SP	Nurs	SW	AHA	Diet	Path	Pod
(Anderson et al., 2000a)	Rehab consultant	✓	✓	✓	✓	✓				
(Bairstow et al., 1997)	Liase with GP	✓	✓	✓		✓				
(Crotty et al., 2002)	Rehab Specialist or Geriatrician Liase with GP	✓	✓	✓	✓	✓	✓			✓
(Farnworth et al., 1994)	Consultant orthopaedic surgeon	✓	✓		✓	✓				
(J. Gladman, Lincoln, & Barer, 1993)		✓	✓							
(Indredavik et al., 2000)	✓	✓	✓		✓					
(Mayo et al., 2000)		✓	✓	✓	✓			✓		
(Meeds & Pryor, 1990)		✓	✓		✓					
(Portnow et al., 1991)	Medical practitioner	✓	✓	✓	✓	✓				
Rodgers et al., 1997	GP with support from consultant	✓	✓	✓		✓	✓			
Rudd et al., 1997	Consultant physician as team coordinator	✓	✓	✓			✓			
Shepperd et al., 1998	GPs had clinical responsibility and paid by program	✓	✓	✓	✓				✓	
Widen Holmqvist et al., 1995		✓	✓	✓		✓				
Total - 13	9	13	13	9	8	6	3	1	1	1

PT = Physiotherapist; Nurs = Nurse; OT = Occupational Therapist; SW = Social Worker; SP = Speech Pathologist; AHA = Allied Health Assistant; Diet = Dietitian; Path = Pathologist; Pod = Podiatrist.

Three models had an emphasis on self-learning and adjustment to disability (Anderson et al., 2000a; Meeds & Pryor, 1990; Portnow et al., 1991) and four encouraged practice between sessions (Anderson et al., 2000a; Crotty et al., 2002; Portnow et al., 1991;

Widen Holmqvist et al., 1995). Portnow et al (1991) described an emphasis on community reintegration.

Six programs had weekly team meetings to discuss client progress (Anderson et al., 2000a; Bairstow et al., 1997; Crotty et al., 2002; Rodgers et al., 1997; Widen Holmqvist et al., 1995). The Stroke Discharge Team described by Rodgers et al. (1997) held their weekly team meeting at the client's home and the client and carer were encouraged to participate. Furthermore, in this program, the medical record was kept at the client's home and the client and carer were invited to contribute. The client-directed approach of this service extended to discharge, which was determined by the client and carer when they felt that they were ready. Despite this approach, the authors reported that there were no difficulties associated with withdrawal of the service. However, length of stay in this program was not reported.

Service brokerage and referral to community services

Three of the teams reported brokering services for their clients (Rodgers et al., 1997; Shepperd et al., 1998b; & (Crotty et al., 2002). The Shepperd et al. program provided medical care through the client's general practitioner (GP) and the Crotty et al. program brokered home care. The Stroke Discharge Team described by Rodgers et al. (1997) provided nursing care through the district nursing service and medical care through the client's GP. Although seven teams assessed for home aids and modifications, only three reported that they supplied what was required (Anderson et al., 2000a; Portnow et al., 1991; Rodgers et al., 1997). Six models made referrals to community services on discharge from the home rehabilitation program (Anderson et al., 2000a; Crotty et al., 2002; Indredavik et al., 2000; Rodgers et al., 1997; Rudd et al., 1997; Widen Holmqvist et al., 1995)).

Level of intervention

Only four studies reported on the level of intervention provided by their services. Mayo et al. (2000) reported that clients did not receive more than one visit per day and that they received an average of 3.6 visits per week. The level of care provided to the stroke clients in the Widen Holmqvist et al. (1996) study was an average of 1 hour and 54 minutes of therapy per week. Two studies reported that they could provide 24-hour care. Shepperd et al. (1998) provided the client with a mobile phone for emergency contact and could provide 24-hour nursing care if required. The home care component of the Stroke Discharge Team was also available 24 hours a day and seven days a week if required (Rodgers et al., 1997).

Summary

The review of the models indicates that all the home rehabilitation teams were similar in their multi-disciplinary approach. All had a physiotherapist and an occupational therapist as part of the team. All (except one) of the home-based rehabilitation programs had early discharge from an inpatient setting as an aim of their service. They varied according to the diagnostic group they targeted with some focussing on one diagnosis (hip fracture or stroke) while others had a broader range of diagnostic groups. Numerous care planning and therapy management practices were described, for example, developing individualised goals, involving the carer in case planning and providing carer education and support, and emphasising self-learning, adjustment to disability and community reintegration. Although each of these practices was reported by only half or fewer services, there was consistency in the aim of these practices. All aimed to encourage client and carer participation in the care planning process.

Most of the models of rehabilitation described in the literature are linked with early discharge from acute or rehabilitation wards and act as a substitute for inpatient care. However, few describe a level of care or therapy that is comparable to inpatient care. Only one study described an ambulatory model of care (Gladman et al., 1994).

Section Two: Evaluations of home-based rehabilitation

This section considers the evaluative research on home-based rehabilitation. It includes a discussion of two Cochrane reviews and one other study that met the criteria for level of evidence one, eighteen studies that met the criteria for level two and ten that meet the criteria for level three and below (NHMRC, 1999). Outcomes for clients and carers and cost effectiveness are the major foci of the literature included in this review. The International Classification of Functioning, Disability and Health (ICF), described in the Introduction, is used to classify and critique the outcome measures used in these evaluations.

Level One Reviews

There have been two Cochrane reviews that include literature on multi-disciplinary rehabilitation interventions for stroke clients. (Langhorne et al., 2000) reviewed the literature on stroke interventions that aimed to help stroke clients avoid hospital admission and Outpatient Service Trialists (Outpatient Service Trialists, 2003) reviewed the literature on outpatient care for stroke clients that did not aim to reduce or avoid hospital admissions.

The Langhorne et al review concluded that there were no statistically significant differences in either patient or carer outcomes between the intervention and control groups, either individually or when the data from the four trials reviewed was pooled. The two trials reviewed by Langhorne et al that met the criteria for this review have been included below.

The review by Outpatient Service Trialists examined 14 trials. Only three of those trials included a multi-disciplinary home-based rehabilitation service, one of which is included below, one of which was published in 1981, and one conference paper that has not been located yet.

There was one other systematic review located (Anderson et al., 2002). This paper reported on seven studies of cost effectiveness.

Randomised controlled trials

There were eighteen level two research papers reviewed in this study (see Appendix A). These reported on a total of eleven randomised controlled trials comparing home-based rehabilitation with inpatient or outpatient alternatives.

Descriptive and quasi-experimental research

There were 10 additional published papers that did not meet the criteria for the NHMRC levels of evidence one and two. These studies used a variety of research designs. Three were purely descriptive (Portnow et al., 1991; Tamm, 1999; von Koch, Holmqvist, Wottrich, Tham, & de Pedro-Cuesta, 2000); three used a before and after design to investigate the outcomes for a group of clients treated before the establishment of a home rehabilitation program compared with a group discharged early to home rehabilitation (Bairstow et al., 1997; Brown, 1990; Farnworth et al., 1994); and one was a non-randomised comparison of outcomes for home and hospital-based rehabilitation clients (O'Cathain, 1994). There was also one study conducted by (Currie, Tierney, Closs, & Fairtlough, 1994) that aimed to determine the feasibility of early home rehabilitation for orthopaedic clients. All studies except one (Tamm, 1999) reported on programs that combined rehabilitation in the home with early discharge from hospital.

Diagnostic groups and study locations

Nine of the eleven randomised controlled trials (RCTs) reported in the literature included only stroke clients. One trial examined outcomes for clients with hip fracture; and one reported on outcomes for clients after hip and knee replacement, hysterectomy, elderly

medical clients, and clients with COAD. Two of the trials were conducted in Australia, five in England, two in Norway, one in Canada and one in Sweden. Most (nine) of the trials investigated the outcomes of early supported discharge rather than ambulatory care (two trials).

Four of the non-randomised studies considered stroke or neurological clients (Andersson, Levin, Oberg, & Mansson, 2002; Bairstow et al., 1997; L. von Koch et al., 2000; Widén Holmqvist, de Pedro Cuesta, Möller, Holm, & Sidén, 1996); five investigated outcomes for orthopaedic clients (Brown, 1990; Currie et al., 1994; Farnworth et al., 1994; Möller, Goldie, & Jonsson, 1992; O'Cathain, 1994); and two considered all rehabilitation conditions (Portnow et al., 1991; Tamm, 1999).

Three of the latter studies were conducted in Australia; (two in NSW (Brown, 1990; Farnworth et al., 1994) and one in WA (Bairstow et al., 1997); one in Scandinavia (Andersson et al., 2002); two in Sweden (Tamm, 1999; L. von Koch et al., 2000; Widén Holmqvist et al., 1996); two in the United Kingdom (Currie et al., 1994; O'Cathain, 1994); and one in the United States (Portnow et al., 1991).

Measurement of outcomes

The main outcomes measured in the RCTs have been tabulated below according to the World Health Organisation (WHO) ICF, described in the Introduction.

As Table 3 (page 19) illustrates, measures of disability and social and environmental factors, such as carer stress, were predominantly used to evaluate the outcomes of these services. The Barthel Index (BI) or modified BI was used in ten of the eleven trials. Measures of handicap, or participation restriction, were used in only four trials.

Although four of the non-randomised studies investigated health and disability outcomes for clients (Bairstow et al., 1997; Farnworth et al., 1994; O'Cathain, 1994; Widén Holmqvist et al., 1996), there was greater emphasis on goal attainment, client satisfaction, and process outcomes than in the studies reviewed in the randomised controlled trials.

Table 3 – Outcome measures according to ICF

ICF element	Disease	Impairment	Disability/ Activity Limitation	Handicap/ Participation restriction	Personal and environmental factors
Outcomes	Mortality (8) Respiratory disease (1)	Aphasia (1) Hip and knee function (1)	Dependence in activities of daily living (11) Balance/falls (3) Walking (1)	Handicap (3) Social and community engagement (2)	Client or carer satisfaction (5) Client mental health (3) Carer stress (8) Length of stay (8) General health (5) Place of residence (5) Quality of life (3)
Total number of trials measuring each element	9	2	11	4	10

Client outcomes

With the exception of the study by Ronning et al. (1998), discussed below, all the RCTs found that the outcomes (outlined in Table 3, above) for home-based rehabilitation clients were better than or no different to clients treated in hospital. Most studies found no significant differences in client outcomes between the two groups. However, four studies found that home-based rehabilitation was associated with improved outcomes for some clients. The study by Indredavik et al., (2000) found that clients treated in the extended stroke unit service (ESUS) had better outcomes in ADL (BI) and global independence (Rankin Scale) at 6 and 26 weeks. Furthermore, ESUS clients had lower average lengths of stay in institutions. Some caution must be exercised in interpreting these findings however, as the intervention group in this study did not necessarily receive rehabilitation in the home. The ESUS team provided direct treatment to some clients, some attended a day clinic and some received further inpatient care if required. The ESUS team co-ordinated the care received by all clients in conjunction with the primary health system. In another study, Mayo et al. (2000) found that home rehabilitation clients had significantly better Instrumental ADL scores and Reintegration to Normal Living Index scores compared with clients treated in hospital but no difference in Barthel Index, Timed Up and Go or mental health. Similarly, Rodgers et al. (1997) had mixed results, with improved outcomes in the Barthel Index and Extended Activities of Daily Living (ADL) measures but no difference in the global health status of clients. Finally, Shepperd et al. (1998) found that clients with hip replacement had significantly greater improvement in quality of life but found no significant differences between groups on any other of the outcomes measured.

The only study that found reduced outcomes for home rehabilitation clients (Ronning et al., 1998) found that clients in the sub-acute stroke unit in hospital had better outcomes in death and dependency, BI and Scandinavian Stroke Scale than those receiving health services in the municipality. However 30% of clients treated in the municipality received no rehabilitation treatment and 59% received outpatient care. Only 29% of the home-based treatment group received in-home rehabilitation and the outcomes for this sub-group were not subject to separate statistical analysis. The studies of ambulatory care conducted by Gladman and his colleagues (Gladman et al., 1994; Gladman et al., 1995) also found that some frail older clients were better off receiving day hospital care than home care in terms of mortality and admission to residential care.

Table 4 – Summary of findings of RCTs on client outcomes

Client outcomes	Study
No difference between groups	Anderson et al., 2002; Anderson et al., 2000(a); Gladman et al., 1994; Gladman et al., 1995; Rudd et al., 1997; von Koch et al., 2000.
Improved outcomes for home rehabilitation group	Indredavik et al., 2000; Mayo et al., 2000; Rodgers et al., 1997; Shepperd et al. 1998
Better outcomes for hospital/outpatient group	Ronning et al., 1998.

Similarly, the non-randomised research reported benefits for home rehabilitation clients. (Bairstow et al., 1997) reported high levels of goal attainment and client and carer satisfaction and low rates of hospital readmission. (O’Cathain, 1994) found that both groups (hospital and home care) were satisfied with care, and that the general health status of both groups was similar except that the home group had better emotional health. (Widén Holmqvist et al., 1996) also reported high levels of client satisfaction in the home rehabilitation group. (Farnworth et al., 1994) reported no difference in outcomes for hip fracture clients between a group of clients treated conventionally in hospital before the home rehabilitation program was established and those who were discharged with home rehabilitation.

Client satisfaction and control

Client and/or carer satisfaction was measured in only four RCTs. These studies consistently found that clients and carers in both groups were satisfied with the care that they received. In one study clients in the home therapy group were more satisfied with the hospital component of their care than those in the hospital care group (Rudd et al., 1997). Another study found that lower satisfaction was associated with poorer understanding and lack of information about stroke, in both groups (Anderson et al. 2000a). Shepperd et al. (1998) examined which location of care was preferred by clients and carers and most clients preferred to be at home. The only exception to this was clients with COAD. In the same study, carers of clients with hysterectomy preferred

hospital care, but there was little difference in carer preferences for the other clinical conditions.

All of the descriptive studies discussed the extent to which clients have control over the rehabilitation process. There is anecdotal evidence that clients feel more in control in their home environment than they do in hospital. This is reflected in clients' increased role flexibility (L. von Koch et al., 2000), in increased client confidence, and in increased motivation for clients to set and attain their rehabilitation goals (Portnow et al., 1991). In contrast, however, (Tamm, 1999) concluded that when the home becomes a location for therapy it ceases to be a private place for the client and family and this constitutes a loss of control for the older client over an important part of their life.

One study investigated the impact of the establishment of home rehabilitation on continuity of care and throughput. (Brown, 1990) identified increased throughput due to early discharge without any adverse outcomes for clients. Staff perceptions were investigated in only one study. The study by (Portnow et al., 1991) was written by various members of the home rehabilitation team and they were clearly positive about their experience as clinicians working in the program.

Carer outcomes

Carer stress was one of the most frequently measured outcomes in the RCTs. Most of the studies did not report any differences in carer stress between the carers of the group treated in hospital and the home-based carers. However, there were two studies that reported adverse outcomes for carers. Anderson et al. (2000a) found lower (poorer) mental health scores on the SF36 for carers of home based rehabilitation clients. (Widén Holmqvist et al., 1996)) reported that the Carer Sickness Impact Profile (SIP) reflected modest dysfunction but this was not compared with an inpatient group. In contrast, Crotty et al. (2000) found that carers in home rehabilitation achieved significantly greater improvement on the SF36 mental health scores than carers of the group treated in hospital. Further investigation of the models of care adopted in these three studies, described in Section One above, did not reveal any major differences between the programs that would explain these differences in carer outcomes.

Table 5 – Summary of findings of RCTs on carer outcomes

Carer outcomes	Study
No difference in carer outcomes	Gladman et al., 1994; Rodgers et al., 1997; Rudd et al., 1997; Young & Forster, 1992; Shepperd et al., (1998).
Poorer outcomes for carers in home-based rehabilitation	Anderson et al., 2000; (Widén Holmqvist, von Koch, & de Pedro Cuesta, 2000)
Better outcomes for carers in home-based rehabilitation.	Crotty et al., 2002

Cost effectiveness

Most studies of cost effectiveness found home rehabilitation combined with early discharge to be cost effective compared with hospital care but their reasons for this finding differed. The main reason for reduction in cost was reduced length of stay in hospital or other institution. All studies found that there was a reduction in hospital length of stay and that this was achieved without any adverse effects on health outcomes for clients. The meta-analysis conducted by Anderson et al. (2002) calculated that the overall costs were approximately 15% lower for the early discharge interventions compared with conventional care. However, this calculation did not take carer costs into account and was based on the potentially incomplete accounts of service use and therapy sessions reported in the literature. An examination of the literature included in Table 6 below, revealed that two out of three studies that included carer's time found that home-based care was not cost effective compared with hospital care (Anderson, Rubenach, Ni Mhurchu, & Clark, 2000b; Shepperd, Harwood, Gray, Vessey, & Morgan, 1998). In the Shepperd et al. study, carer expenditure, and loss of earnings were included as well as a costing of the time spent caring for the patient. They concluded that carer and patient costs accounted for a very small proportion of the total cost of providing the service. Anderson et al. (2000b) and Widen Holmqvist et al. (1996) calculated only the carer time spent with the patient at the hourly rate of a paid home carer in their cost analyses.

Table 6 – Studies of cost effectiveness

Study	Hospital costs	Home costs	Study findings
(Anderson et al., 2000b)	Direct & indirect staff costs Community services % of overheads	Direct & indirect staff costs Aids and adaptations Community services Residential care costs Carer time	Reduced LOS. Increased informal care costs. Home-based rehabilitation no less costly.
Andersson et al., 2002	Hospital costs of acute and rehabilitation stays. Nursing home and home help services.	Hospital costs of acute and rehabilitation stays. Nursing home and home help services	Reduced LOS in acute care for home rehab. group. Rehab costs significantly lower in home-based group but cost of home-help was higher in the home-based group. Total costs for the care episode did not differ significantly for the 2 groups.
(Beech, Rudd, Tilling, & Wolfe, 1999)	Units of therapy Direct and indirect client attributable time Contacts with GPs and other medical practitioners Service use	Units of therapy Direct and indirect client attributable time Contacts with GPs and other medical practitioners Service use	Reduced inpatient costs but higher non-inpatient costs. Early discharge is unlikely to lead to financial savings but can increase throughput.
(Farnworth et al., 1994)	Average bed day costs on orthopaedic ward adjusted for client dependency.	Hospital costs. Staff time, use of medical goods, office space and travel time, excluding those services that would have been supplied in the absence of the program.	Reduced LOS.
(J. R. F. Gladman, Whynes, & Lincoln, 1994)	Direct costs for day hospital and outpatient rehabilitation –plus a share of the hospital overhead costs and ambulance travel costs.	Gross employment costs of therapists plus vehicle running costs.	Overall hospital-based services cheaper but day hospital care cost 25% more than domiciliary care and domiciliary care cost 2.6 times more than outpatient care.
(Indredavik et al., 2000)	LOS	LOS in hospital	Reduced LOS No overall cost analysis
(Mayo et al., 2000)	Bed days Number of therapy sessions Service use Outpatient usage	Bed days Number of therapy sessions Service use Outpatient usage Cost of home rehabilitation service	Reduced LOS No overall cost analysis
(Rodgers et al., 1997) (McNamee et	Per day inpatient costs adjusted for dependency	Per day inpatient costs adjusted for dependency Staff costs per hour	Reduced LOS. Additional costs of home supports countered by

Study	Hospital costs	Home costs	Study findings
al., 1998)	Staff costs per hour (including % of overheads) Community services	(including % of overheads) Community services	reduced LOS
(Ronning & Guldvog, 1998)	LOS	Hospital LOS and community services	Reduced LOS No overall cost analysis
(Shepperd, Harwood, Gray et al., 1998)	Direct and indirect staffing costs, non-staffing costs, including equipment and pharmaceuticals, and capital costs, adjusted for client dependency. GP costs Carer costs	Staffing and non-staffing running costs – including direct client contact, non-contact time. Administration, travel, medication, and equipment. GP costs Carer expenditure, loss of earnings and time caring for client.	No difference for hip or knee replacement or elderly medical clients. H@H increased cost for hysterectomy and COAD clients. Increased GP costs for hysterectomy and COAD clients.
(Widén Holmqvist et al., 1996)	Bed days	Staffing costs, medication, technical aids, home adaptations, transport, home help, and cost of carer time.	Reduced LOS. Home-based rehabilitation less expensive.

LOS = Length of stay in hospital for intervention group.

Shepperd et al. (1998) conducted a very comprehensive cost analysis. As well as both direct and indirect costs associated with provision of the health service, they included GP costs and the costs to the client and carer (including time off work and a calculation of the cost of carer time spent caring for the client). This study found that there were no cost advantages in home-based care and that home care for clients recovering from hysterectomy and COAD was more costly than hospital-based care. They concluded that there had been some cost shifting from hospital to the primary care system (GPs) in the provision of home-based care. Similarly Andersson et al. (2002) found that there was some cost-shifting associated with home-based rehabilitation. Andersson et al. (2002) reviewed resource use over a twelve-month period and included service use post-discharge in their cost analysis. They were interested in whether there had been a transfer of cost from health care to social welfare providers. They found that when they looked at the total episode of care over a twelve-month period, there was little difference in cost between the two groups and that there had been a redistribution of costs as anticipated. However, the study by Widen Holmqvist et al. (1996) found home-based rehabilitation to be less expensive even when carers' time was included in the analysis.

The only study to examine the costs of ambulatory care, where a reduction in hospital LOS was not expected or achieved, found that overall hospital-based treatment was 27% cheaper than home-based care (Gladman et al., 1994). However, this trial considered three types of care, home-based rehabilitation, day hospital attendance and outpatient care. When each type of care was compared individually, home rehabilitation was found

to be less expensive than day hospital attendance – including transport by ambulance to and from the day hospital - but more expensive than outpatient treatment.

More information about the level of service provided at home would be required to draw any further conclusions from these findings. Careful calculation of the service cost as well as the cost of carer time and carer loss of earnings should be included in any future cost analysis.

Summary of evaluative research

Most of the RCTs focused on stroke rehabilitation and measures of disability, carer stress and cost. Although the non-randomised studies were somewhat broader in their focus including five orthopaedic and three that included all rehabilitation clients, and a wider range of outcomes, the lack of randomised controls weakened the strength and generalisability of their findings. Despite these shortcomings, the majority of the literature reviewed found home-based rehabilitation to be as effective if not more effective than inpatient rehabilitation in terms of achieving client outcomes. They also found home-based rehabilitation to be cost effective when compared with hospital-based care. One study found that home rehabilitation was not cost effective for all client groups and two reported adverse outcomes for carers.

The next section will analyse and critique the literature in more detail and link the literature reviewed with the aims and focus of the current study.

Section Three: Summary and critique

Description of interventions

The description of the interventions trialled in the literature was very limited. The descriptions of conventional (inpatient) care were generally limited to their location (on a stroke unit or other ward) and the outpatient services available. The one exception to this is the ordinary stroke unit service (OSUS) described by Indredavik et al. (2000). This unit had been the subject of a previous trial that compared outcomes for stroke clients treated on a specialised stroke ward compared with treatment in conventional wards and was described in some detail in that study (Indredavik, Bakke, Slordahl, Rokseth, & Haheim, 1999). Mayo et al (2000) also reported on the number of interventions received by the control group as well as the intervention group.

The home-based interventions were generally more fully described with care planning processes, team composition and the number of visits regularly included. However, there was little consistency in the features described so one can only assume that where program features were not described, they were not included as part of the service. This makes it difficult to compare the outcomes of one study with another and to make any overall conclusions about the outcomes, as the type and level of care may vary considerably from one program to another.

Methodological shortcomings

It is generally accepted that randomised controlled trials are the preferred methodology when comparing one intervention with another. However, the bulk of the randomised controlled trials in this field have focused solely on stroke rehabilitation. They have also focused on bed substitution rather than on ambulatory care. The non-randomised studies investigated a broader range of outcomes and included participants from a range of diagnostic groups. However the methodological short-comings of these studies make it difficult to draw any firm conclusions about the efficacy of home-based rehabilitation.

Measurement issues

Most of the studies reviewed measured disability using measures such as the Barthel Index. According to the WHO ICF, disability is only one aspect of a person's health. Measuring disability alone accounts for only one aspect of the potential gains or losses associated with rehabilitation. Fewer studies examined handicap, goal attainment or QOL. As discussed in the Introduction, rehabilitation aims to facilitate the client's participation in society as well as the ability to undertake life activities. This is particularly the case with home-based rehabilitation where clients and their families can work directly with the rehabilitation team to facilitate their integration into community and social life. This element of the rehabilitation continuum is not measured by the Barthel Index or other disability measures. Future research should consider outcomes related to broader health outcomes, such as a person's ability to participate in life events, their life satisfaction and quality. This study will consider broader health outcomes utilising the ICF to ensure that each area is covered. The rationale for and description of the measures chosen in this study is included in the Methodology. Notwithstanding the methodological shortcomings and the differences in home-based care models applied there was considerable consistency in the study findings, detailed below.

Client outcomes

With the exception of two trials – one by Ronning et al. (1998), where inpatient care was compared with three different interventions, only one of which included in-home treatment; and one by Gladman & Lincoln (1994) and Gladman et al (1995) in which older frail clients were found to be better off attending a day hospital than receiving rehabilitation at home - all studies found that home-based rehabilitation was as effective as hospital rehabilitation in achieving rehabilitation outcomes. However, as mentioned above, some caution needs to be exercised in interpreting the findings from the non-randomised studies and most of the randomised controlled trials examined outcomes for stroke clients only. More research needs to be conducted into outcomes for clients with orthopaedic and other rehabilitation diagnoses.

Staff outcomes

Only one study investigated the perceptions of staff working in home-based rehabilitation. This is an area that should be explored further. There is some evidence of increased client throughput as a result of the implementation of home-based rehabilitation (Brown, 1990; Beech, 1999). This may mean increased staff workloads, particularly in inpatient settings. Working in the client's home may also be a less safe environment for staff. These issues should be explored further through canvassing the experiences of staff working in home-based rehabilitation programs and those in the inpatient wards from which the home-based rehabilitation clients have been drawn.

Carer outcomes

The evaluation of carer outcomes conducted to date indicates that there may be some cause for concern about the impact of home-based rehabilitation. Although a number of studies reported no difference in outcomes between home-based and hospital-based carers, two studies detected some adverse outcomes for carers. A review of the care-giving literature, conducted by one of the project team for an earlier study, uncovered some anecdotal evidence that carers preferred their relative to be at home, despite the demands this entailed, as they found hospital visiting to be more of a burden (Kane, Reinardy, Penrod, & Huck, 1999; Santamaria & McKenzie, 2000). This observation was supported by one of studies reviewed here (Shepperd et al., 1998) that found that most clients and carers preferred home-based care.

The above study was the only one to include both the direct and indirect costs to carers in their analysis of cost effectiveness. There is a need for more research into the outcomes for carers. Furthermore, this research should go further than examining carer stress to examine the costs to carers and the impacts on other areas of their lives.

The effects of being at home

In their discussions about the effectiveness of home-based rehabilitation, many studies refer to the positive effect of being at home on the client's wellbeing, goal attainment, and functional status (J. Gladman et al., 1993); (Indredavik et al., 2000; Mayo et al., 2000; Portnow et al., 1991; Ronning & Guldvog, 1998; von Koch, Wottrich, & Widén Holmqvist, 1998). As Mayo et al. (2000) pointed out, early supported discharge constitutes a multi-modal intervention, comprising shorter hospital stays (potentially reducing the negative effects of hospitalisation); the delivery of services in the client's own home; and the delivery of coordinated care. Although they found it difficult to determine the independent effects of these variables, they argued that delivering services in the client's home environment was at least one of the factors associated with improved outcomes in reintegration and physical health. Indredavik et al. (2000) postulate that the home environment may be a more enriched environment for stroke clients, with more opportunities for social interaction, factors that they point out have been associated with better outcomes in animal studies.

These qualitative factors are difficult to measure and it is difficult to demonstrate a statistical relationship between these factors and enhanced or reduced outcomes for home rehabilitation clients. However, there is a clear theme in the literature that these subjective, personal, and identity factors are important in attaining rehabilitation outcomes. The qualitative component of this study, interviews with clients, carers and staff, will enable these aspects of home (and hospital) – based rehabilitation to be explored.

Summary and implications for this study

In summary, this literature review has revealed the following –

- Home-based rehabilitation is not associated with any adverse effects for clients (particularly stroke clients) – and is therefore worthy of further investigation;

- Home rehabilitation is a cost effective alternative to hospital rehabilitation for stroke clients due to reductions in inpatient LOS;
- The models of home and hospital-based rehabilitation have not to date been clearly defined in the literature;
- Outcomes for carers need further exploration;
- Outcomes for orthopaedic and other rehabilitation conditions need further exploration;
- There is a need for more research that focuses on handicap (participation restriction) and personal factors, such as client goals and quality of life;
- There is a need for more qualitative research to explore the motivational and affective features of being at home and their effect on rehabilitation outcomes;
- Staff perceptions of home-based rehabilitation (for example, the impact on workloads of increased throughput and any safety issues associated with working in the client's home) need to be further explored.

The present study will explore some of these areas in its investigation of current practice in home-based rehabilitation in Victoria. The following section describes a survey of outcomes measures that was distributed to all Victorian home based rehabilitation programs to help inform the use of outcome measures to be used in the project methodology.

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Appendix A – List of randomised controlled trials

Study	NHMRC Level	Article	Focus of study(s)	Major variables	Outcome measures used
1 (review of seven RCTs)	1	(Anderson et al., 2002)	Review of studies of cost effectiveness	Cost effectiveness	Hospital LOS Mortality Institutionalisation Various disability measures Readmission rates Resource use – hospital stay and rehabilitation and community services
2	2	(Anderson et al., 2000a) (Anderson et al., 2000b)	Home-based rehabilitation for stroke in 2 hospitals in Adelaide, South Australia	Quality of life Disability Mental status Activities General health Carer strain Patient and carer satisfaction Cost	36 item short form questionnaire (SF- 36) Nottingham Health Profile Modified Barthel Index (MBI) Mini Mental Status Examination (MMSE) General Health Questionnaire (GHQ) – 28 Adelaide Activities Profile (AAP) McMaster Family Assessment Device (MFAD) Caregiver Strain Index (CSI) Satisfaction surveys Cost – see table 7

Study	NHMRC Level	Article	Focus of study(s)	Major variables	Outcome measures used
3	2	(Rudd et al., 1997)	Home-based rehabilitation for stroke in London, UK	Impairment Disability Anxiety and depression Handicap Carer strain Patient and carer satisfaction	BI Motoricity index MMSE Frenchay aphasia screening test Rivermead ADL HADS 5m walk Nottingham Health Profile CSI Patient and carer satisfaction questionnaires Cost – see table 7
		(Beech et al., 1999)			
4	2	(Crotty et al., 2002)	Home-based rehabilitation for hip fracture in Adelaide, South Australia	Balance and falls Handicap Carer strain Carer satisfaction Service use Readmissions	SF – 36 MMSE MBI Timed up and go Berg Balance Scale Activities-specific Balance Confidence Scale Falls Efficacy Scale London Handicap Scale CSI Patient and carer interviews Use of community services Incidence of readmissions and falls

Study	NHMRC Level	Article	Focus of study(s)	Major variables	Outcome measures used
5	2	(J. R. F. Gladman & Lincoln, 1994) (J. R. F. Gladman et al., 1994)	DOMINO stroke program, UK	Disability Cognitive status Carer life satisfaction and social engagement Mortality Residence Cost	BI AMTS Nottingham Health Profile Carer – Brief Assessment of Social Engagement and the Nottingham Version of the Life Satisfaction Index Mortality Place of residence Cost – see table 7
5 & 6	2	(J. Gladman, Forster, & Young, 1995)	DOMINO stroke program and Bradford Community Stroke Trial (BCST)	As above for DOMINO and as below for BCST.	
6	2	(Young & Forster, 1992)	Bradford Community Stroke Trial, UK	Disability Carer stress Level of treatment and community care provision	BI Motor Club Assessment Frenchay Activities Index Nottingham Health Profile Carer stress – GHQ Level of treatment and community care provision
7	2	(Indredavik et al., 2000)	Extended Stroke Unit Service, Norway	Global independence ADL independence Residence Mortality Cost	BI Rankin Scale LOS in institutions Cost – see table 7

Study	NHMRC Level	Article	Focus of study(s)	Major variables	Outcome measures used
8	2	(Mayo et al., 2000)	Home-based rehabilitation for stroke, Canada	Physical health Mobility Disability Instrumental ADL Mental health Community reintegration Health related QOL	Physical and mental health components of the SF-36 Timed up and go BI Older Americans' Resource Scale for IADL RNL
9	2	(Rodgers et al., 1997)	Home-based rehabilitation for stroke, UK	Hospital LOS ADL Handicap Depression General health Carer stress Mortality Residence Readmissions	Nottingham Extended ADL scale Oxford Handicap Scale Wakefield Depression Inventory Dartmouth COOP Function Charts Carers – GHQ
10	2	(Ronning & Guldvog, 1998)	Hospital rehabilitation compared with municipal health services, Norway	Disability Impairment Mortality Dependence in ADL Quality of life Hospital LOS	BI Scandinavian Stroke Scale

Study	NHMRC Level	Article	Focus of study(s)	Major variables	Outcome measures used
11	2	(Shepperd, Harwood, Jenkinson et al., 1998)	Hospital treatment compared with hospital at home, UK	General health Disability Impairment Hospital readmissions Carer strain Patients and carers preferences Mortality Cost	Dartmouth COOP chart SF – 36 BI Oxford Hip Score Bristol Knee Score CSI Cost – see table 7
		(Shepperd, Harwood, Gray et al., 1998)			
12	2	(von Koch, Widén Holmqvist, Kostulas, Almazan, & de Pedro Cuesta, 2000)	Home-based rehabilitation for stroke, Sweden	Motor capacity ADLs Social activities Perceived dysfunction Mortality Falls Cost	Lindmark Motor Capacity Index Time to walk 10m Nine-hole peg test Scandinavian Stroke Scale MMSE BI Katz ADL Frenchay Activities Index Sickness Impact Profile Sense of Cohesion Questionnaire Cost – see table 7
		(Widen Holmqvist et al., 1998)			
		(von Koch, de Pedro-Cuesta, Kostulas, Almazan, & Widen Holmqvist, 2001)			

