

Home versus day rehabilitation: a randomised controlled trial

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Abstract

Objective: to assess the effect of home versus day rehabilitation on patient outcomes.

Design: randomised controlled trial.

Setting: post-hospital rehabilitation.

Participants: two hundred and twenty-nine hospitalised patients referred for ambulatory rehabilitation.

Interventions: hospital-based day rehabilitation programme versus home-based rehabilitation programme.

Main Outcome Measures: at 3 months, information was collected on hospital readmission, transfer to residential care, functional level, quality of life, carer stress and carer quality of life. At 6 months, place of residence, hospital re-admissions and mortality status were collected.

Results: there were significant improvements in the functional outcomes from baseline to 3 months for all participants. At discharge, carers of patients in day hospital reported higher Caregiver Strain Index (CSI) scores in comparison to home rehabilitation carers (4.95 versus 3.56, $P = 0.047$). Patients in day hospital had double the risk of readmission compared to those in home rehabilitation (RR = 2.1; 95% CI 1.2–3.9). This effect persisted at 6 months.

Conclusions: day hospital patients are more likely to be readmitted to hospital possibly due to increased access to admitting medical staff. This small trial favours the home as a better site for post-hospital rehabilitation.

Keywords: ambulatory rehabilitation, day rehabilitation, home rehabilitation, randomised controlled trial, elderly

Introduction

Shorter hospital stays can leave insufficient time for functional recovery and as a result programmes such as home rehabilitation and day hospital care which support early discharge are now commonly offered to stroke [1], cardiac [2], respiratory [3], hip fracture [4] and older patients [5].

A systematic review of 12 randomised controlled trials comparing day hospitals with a variety of alternative services found that subjects who received day hospital care had a 28% lower chance of death or poor outcome than those who received no care [6]. However, when results from day rehabilitation programmes were compared with outpatient or home rehabilitation services, the outcomes were largely similar.

The merits of day hospitals have been debated, but with rapidly rising demands for rehabilitation services,

day hospitals remain an attractive proposition because they allow high numbers of patients to be seen in surroundings which facilitate the delivery of rehabilitation (e.g. gyms, hydrotherapy pools) [7]. They offer the prospect of easy access to on-site medical staff, a higher dose of therapy which is increasingly thought to be associated with better functional outcomes [7] and opportunities for social interaction which may be important. Against this, strong evidence supporting home rehabilitation programmes continues to emerge [8].

Following the allocation of funds for a day rehabilitation service for our region, we elected compare approaches for patients discharged from hospital and referred for ambulatory rehabilitation. We compared a hospital-based day rehabilitation centre based on hospital grounds with a home rehabilitation programme

on patient instrumental activities of daily living, re-hospitalisation rates and transfer to residential care facility rates.

Methods

Setting and participants

This study took place in three public hospitals in southern Adelaide, Australia. Between 22 June 2005 and 19 June 2006, patients referred for ambulatory rehabilitation at the end of a hospital stay were approached to participate. Very limited outpatient or community therapy is available in southern Adelaide and so high rates of consent were anticipated. Patients were eligible if they were medically stable, ready for hospital discharge and there were rehabilitation goals that required at least 12 therapy sessions as determined by the rehabilitation triage nurse. They were ineligible if they lived out of the health region or if the referring clinician felt they were unsuitable to receive one of the two programmes.

Recruitment and randomisation

Once baseline assessments were complete, participants were randomly allocated within 24 h to receive their rehabilitation either at home or day hospital. Allocations were computer-generated, stratified by condition at presentation (orthopaedic, stroke, or other) and randomised in blocks of 12. The allocation ratio was 1:1 (intervention:control). Discharge into the programme occurred within 48 h.

A statistician external to the study generated the randomisation sequence using the random number generator in Microsoft Excel and created sequentially numbered, opaque, sealed envelopes containing group allocation for participants. The trial nurse enrolled the participants, and a pharmacist who managed the randomisation allocation assigned participants to the groups. Block size remained unknown to staff.

The ethics committees at Repatriation General Hospital, Flinders Medical Centre and Noarlunga Health Services approved the study.

Day hospital (intervention)

A day rehabilitation programme where patients were transported three to five times per week to the hospital was established. Transport costs to and from hospital were covered by the programme. Patients entered an interdisciplinary programme, providing 4–6 weeks of high-intensity rehabilitation in either individual or group sessions with the option of extending the programme. Each visit lasted 3 h and carers did not usually accompany patients. An education session was available for carers.

Home rehabilitation (control)

A home-based one-on-one rehabilitation programme was delivered by a separate interdisciplinary team with three to five sessions per week.

Both programmes were based on a medical rehabilitation model that included goal setting, early multidisciplinary assessment and weekly case conferences. Length of stay in rehabilitation was not standardised but was dictated by the clinicians based on the achievement of agreed goals, separate from the researchers, and was usually 4 to 6 weeks. Therapy sessions involved physiotherapy, occupational therapy, speech therapy, social work, psychology, dietetics, nursing and access to a rehabilitation medicine physician. The same doctor provided medical services to both groups. Referrals from both groups were made to community services for equipment, self care and domestic supports, as required.

Sample size

The primary outcome was the change in the Assessment of Motor and Process Skills (AMPS) [9] instrument from randomisation to 3 month follow-up measured for each individual. The AMPS is an observational measure of functional competence in activities of daily living allowing simultaneous assessment of motor and process skills necessary for competent performance [10]. The AMPS is assessed by an occupational therapist trained in AMPS assessment and activities of daily livings (ADLs) are selected for each individual that pose some degree of difficulty. A logit score is given for the motor and the process component of the assessment (range from -3 to 4). Using previous AMPS data for persons aged 60 years or more with stroke [11], 60 participants per group were required to detect a clinically significant change of 0.5 on the AMPS logit scale (power 80%, α 0.05). We increased the sample size to allow for the stratification and for 25% attrition.

Baseline assessment

The information collected included socio-demographic variables, co-morbid conditions, medications, admission diagnosis, duration of hospital stay, level of cognition (Mini-Mental State Examination [12]), functional status (Modified Barthel Index [13]), timed up and go (TUG) [14], maximal quadriceps strength, AMPS, depression (Geriatric Depression Scale [15]) and quality of life [Short-Form-36 (SF-36)] [16].

Programme information including number and type of services received during the programme was collected. Information was also collected from carers including quality of life (SF-36) and carer stress (Caregiver Strain Index (CSI) [17]) on discharge from the programme.

Follow-up

Three months after randomisation, a research occupational therapist blinded to allocation visited participants at home. The follow-up data collection included AMPS, TUG, SF-36, maximal quadriceps strength, place of residence and mortality. Data collected from carers at 3 months included the CSI and SF-36.

The functional independence measure (FIM [18]) at baseline and discharge from both programmes was

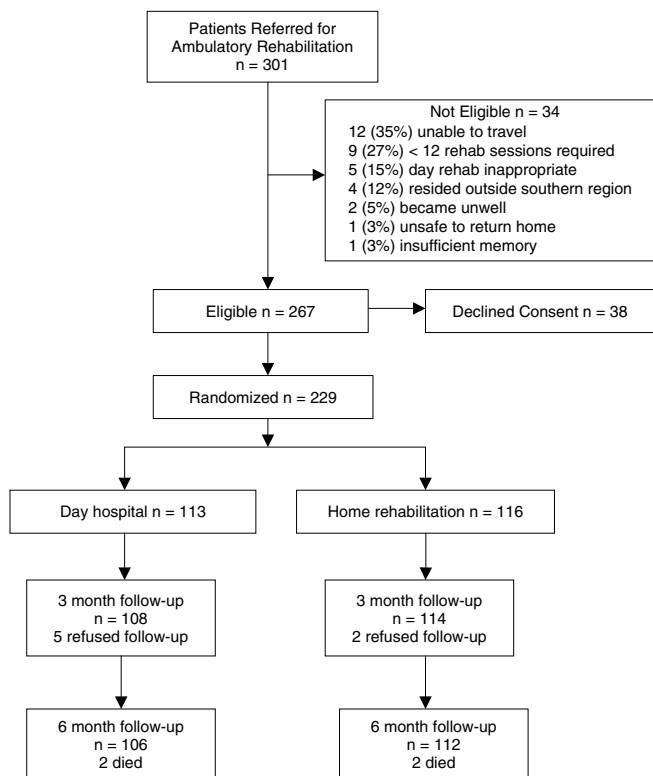


Figure 1. Recruitment flow of participants.

performed by the clinical team which was not blinded to the allocation of participants.

Readmissions to hospital within 6 months of the baseline admission were collected over the phone from the participant or their proxy. Public hospital admissions and length of stay were confirmed by searches of the public hospitals' database matching patient's name, date of birth and admission date for each patient. Place of admission and mortality were also collected. An independent geriatrician reviewed the readmissions.

Statistical Analysis

Intention-to-treat analyses were performed by a statistician blinded to allocation group. Means and 95% confidence intervals (CIs) were calculated for normally distributed continuous variables, and medians and 95% CIs were calculated for continuous variables with a skewed distribution. Independent sample *t* tests or Mann–Whitney U-tests were used to assess continuous variables. For categorical variables, chi-square tests of association or Fisher's exact test were used to test for differences between groups. Poisson regression models were fitted to the number of readmissions. A Cox proportional hazards model was fitted, taking time-to-first readmission as the response variable. The time to first readmission was censored at 91 days for the 165 participants who were not readmitted.

Analyses were carried out using SPSS for Windows 12.0 and Stata version 9.0.

Declaration of Sources of Funding

This study was funded by the South Australian Department of Health. The trial sponsor played no role in the design, execution, analysis, interpretation of the data or writing of the study.

Results

Baseline

A total of 301 patients were referred for ambulatory rehabilitation: 267 patients were assessed as eligible with 34 ineligible (Figure 1). Of the eligible patients, a further 38 were not randomised as they declined participation or were not approached at the request of the referring clinician. Two hundred and twenty-nine provided consent and were randomised to day hospital ($n = 113$) or home rehabilitation ($n = 116$).

The demographic, functional and quality of life characteristics of both groups were similar at baseline (Table 1). There were 120 females (52%) and 109 males (48%). While the group had a mean age of 71.7 (SD = 14.1) years, there were five participants aged less than 30 years and four participants aged 90 years or more. The group as a whole had a mean Modified Barthel Index of 92.4 (SD = 6.5). Reasons for initial admission included stroke ($n = 83$; 36%), other neurological injury ($n = 17$; 8%), total knee replacement ($n = 44$; 19%), fractured neck of femur

Table 1. Baseline comparisons between groups of patients by treatment allocation

	Day hospital $n = 113$	Home $n = 116$
Age (years); mean (SD)	71.2 (13.4)	72.2 (14.8)
Lives alone (n (%))	46 (40.7)	45 (38.8)
No home services (n (%))	90 (79.6)	96 (82.8)
Reason for acute admission n (%)		
Total knee replacement	21 (18.6)	23 (19.8)
Stroke, n (%)	49 (43.3)	51 (44.0)
Total anterior circulation	3 (6.1)	1 (2.0)
Partial anterior circulation	18 (36.7)	18 (35.3)
Lacunar	16 (32.7)	16 (31.4)
Posterior circulation	5 (10.2)	6 (11.8)
Other neurological injury	7 (14.3)	10 (19.6)
General rehabilitation n (%)	43 (38.1)	42 (36.2)
Hip fracture	7 (16.3)	5 (11.9)
Other orthopaedic injury	10 (23.3)	10 (23.8)
Functional decline	20 (46.5)	19 (45.2)
Others	6 (14.0)	8 (19.1)
Acute length of stay [days (SD)]	15.3 (16.5)	13.9 (10.6)
Rehabilitation admission [yes (%)]	60 (53.1)	56 (48.3)
Rehabilitation length of stay [days (SD)]	23.9 (20.4)	20.4 (19.9)
Pre-admission use of a mobility aid, n (%)	48 (42.5)	50 (43.1)
MMSE mean (SD)	27.0 (3.0)	26.9 (3.1)
Modified Barthel Index mean (SD)	92.2 (6.4)	92.5 (6.5)
Geriatric depression score 15 mean (SD)	3.5 (2.6)	3.2 (2.4)

(*n* = 12; 5%), other orthopaedic injury (*n* = 20; 9%), non-specific functional decline (*n* = 39; 17%) and other diagnoses (*n* = 14) including falls and pneumonia.

Patients randomised to day hospital had a median length of stay in rehabilitation of 78 (95% CI: 71.6–83) days compared with a median of 28 (95% CI: 26–30) days (*P* < 0.001) in home rehabilitation.

Day hospital patients attended, on average, 67.8 (SD = 38.6) sessions composed of both individual and group sessions. In comparison, home rehabilitation patients received 23.5 (SD = 14.7) individual home visits.

Follow-up

Two hundred and twenty-two participants completed the 3-month follow-up (Figure 1). At 3 months there were no deaths, and five patients from day hospital and three from home rehabilitation had moved into permanent residential care. At 6 months, four participants had died (two from residential care and two from home); three had received respite care then returned home; five had shifted into residential care permanently and two had received respite care and then moved into residential care permanently. In the group, six patients from day hospital and five patients from home rehabilitation had died or had moved into permanent residential care.

Participants in both programmes demonstrated significant improvements from baseline to 3 months follow-up in the functional outcomes (Table 2). There were however no statistically significant differences between the two rehabilitation programmes in the 3-month changes to either the motor or process scores of the AMPS. Similarly, there was no difference between the intervention and control groups for the physical and mental components of SF-36, TUG and quadriceps strength. While the FIM scores at both the 3 months follow-up (*P* = 0.01) and the change scores from baseline to 3 months (*P* = 0.03) were higher for the day hospital group; this measure was undertaken by therapists who were unblinded to treatment allocation.

Amongst the participating carers (*n* = 98), there were no differences between groups for the SF-36 scores of the carers either at baseline or the change in scores from baseline to 3 months (Table 2). However, while carers of day hospital patients reported statistically significantly higher CSI scores at discharge from the programme (4.95 versus 3.56, *P* < 0.05), by 3 months follow-up there were no differences.

Number of readmissions

Ninety five patients were readmitted to hospital at least once during the follow-up period with 64 participants (day hospital, *n* = 40; home rehabilitation *n* = 24) readmitted during the first 3 months and an additional 31 participants (day hospital, *n* = 15; home rehabilitation, *n* = 16) from 3 to 6 months. The relative risk of readmission in day hospital compared with home rehabilitation was 2.1 (95% CI 1.2–3.9; *P* = 0.012). In relation to the index hospitalisation, 53 (82.9%) of the readmissions in the day hospital group and

Table 2. Outcome measures at baseline and 3 months follow-up for patients and carers from both rehabilitation groups

Variable	Day hospital (<i>n</i> = 113)	Home (<i>n</i> = 116)
Mass		
Baseline	72.3 (16.9)	75.5 (19.4)
3-month	74.0 (14.5)	75.1 (18.6)
Change	-0.2 (3.7)	-0.7 (4.1)
SF-36		
Mental component score		
Baseline	47.1 (10.9)	47.9 (10.6)
3-month	47.3 (12.2)	46.7 (12.4)
Change	-0.02 (12.3)	-1.4 (11.4)
SF-36		
Physical component score		
Baseline	36.8 (10.5)	36.2 (9.8)
3 months	42.6 (10.2)	42.7 (10.0)
Change	5.9 (9.5)	6.9 (8.9)
AMPs		
Motor score		
Baseline	0.40 (0.8)	0.29 (0.8)
3 months	0.97 (0.8)	0.91 (0.8)
Change	0.57 (0.8)	0.62 (0.8)
AMPS		
Process score		
Baseline	0.54 (0.6)	0.46 (0.6)
3 months	1.05 (0.5)	1.00 (0.5)
Change	0.51 (0.5)	0.54 (0.5)
FIM		
Baseline	108.5 (12.4)	108.1 (8.4)
Discharge from programme	118.1 (8.1)*	115.5 (6.8)*
Change	9.6 (9.0)**	7.4 (5.8)**
Max quad strength		
Baseline	6.2 (3.0)	6.5 (3.5)
3 months	10.9 (5.8)	11.3 (5.4)
Change	4.7 (5.0)	4.8 (4.5)
TUG		
Baseline	35.9 (43.8)	32.4 (23.0)
3 months	18.7 (13.2)	23.2 (28.1)
Change	-17.2 (39.9)	-11.4 (23.0)
Carer Strain Index (SD)		
Discharge	4.95 (4.1)*	3.56 (2.76)*
3 months	4.92 (3.86)	4.25 (3.10)
Change scores not applicable		
Carer SF-36 physical		
Baseline	52.67 (10.36)	52.42 (9.31)
3 months	52.16 (9.36)	50.94 (9.40)
Change	-0.052 (9.07)	-1.48 (5.29)
Carer SF-36 mental		
Baseline	44.65 (11.81)	45.59 (10.47)
3 months	44.47 (10.09)	44.69 (11.08)
Change	-0.18 (8.86)	-0.90 (8.71)

All results are mean (SD).

* *P* = 0.01;

** *P* = 0.03.

23 (67.7%) of the readmission in the home rehabilitation group were considered to be either probably related or possibly related to the index admission. No information concerning the necessity of the readmission was available as part of the trial.

Time to first readmission

The median time to first readmission among readmitted participants in day hospital was 25 days (95% CI 17.3–34.0) and home rehabilitation was 49 days (95% CI 25.3–54.3) and this was significantly different ($P = 0.050$). There was no significant interaction between the groups and age group, gender, marital status or carer status with respect to time to first readmission.

Discussion

Patients in home rehabilitation and day hospital programmes achieved functional gains and few transfers to residential care. A systematic review [19] including trials which compared day hospital rehabilitation with domiciliary care reported that the outcomes achieved were similar for both groups in terms of death or institutional care, or deterioration in activities of daily living. The major difference in our trial was in the utilisation of health services. Participants allocated to day hospital recorded a length of stay some 50 days longer (78 versus 28 days) and received on average 44 more therapy sessions (68 versus 24) than patients who received home rehabilitation. Furthermore, we showed that when patients entered day hospital they were twice as likely to be readmitted to hospital as those patients who received their rehabilitation at home.

It was expected that the easy access to medical staff associated with the day hospital would prevent readmission rather than promote it. However, it may be that the on-site medical staff and the proximity to the Emergency Department facilitated readmission and promoted a focus on medical issues. While these may be local effects, the entry criteria for this trial allowed the assessment of a population comparable to that treated by many clinical services. It is possible that the delivery of rehabilitation in a home environment is protective and addresses important but poorly understood issues such as mastery and self-management.

In this trial, the programmes (therapy dose, length of stay or therapy mix) were not prescribed but left to the clinicians' assessment. Day hospital rehabilitation was a new programme and while the provision of patient transport allowed higher levels of direct patient contact time with staff, it also appears to have encouraged longer patient programmes and more frequent therapy sessions. There was no evidence that the increased levels of therapy in day hospital or the better access to gyms, specialist equipment and hydrotherapy produced better outcomes at 3 or 6 months. Although there is work suggesting that increased doses of therapy produce improved clinical outcomes [7], our results imply that in a real-life environment with a group of reasonably unselected post-hospital patients, the functional effects of an ambulatory programme can be achieved with smaller doses of treatment.

A number of limitations should be considered in interpreting the results of this study. The population was heterogeneous with a wide range of conditions and ages and the sample was small. Both groups received active care and there was no non-treatment control group that limits our ability to comment on the significance of the improvements

in functional outcomes. A non-treatment control group may also have revealed a high background readmission rate among these patients who are often on the cusp of frailty. The study did not include information on costs, which limits comparisons. The patients of the day hospital group received more therapy during their programme, and were readmitted to hospital earlier, suggesting a higher cost; however, no information was collected on issues such as drug adjustments which may have offset these costs. Day rehabilitation programmes can be important in communities where primary care is difficult for older people to access and can offer more than physical rehabilitation, addressing medication management as well as providing social support. Finally, identifying appropriate outcomes for ambulatory rehabilitation trials remains a challenge. Limited qualitative measures were included in this study and there is some evidence suggesting that questionnaires do not adequately measure outcomes of individuals with chronic disease [20]. Programmes that include a component of self-reflection such as rehabilitation may lead individuals to re-evaluate their health status prior to the programme as better or worse. This response shift is poorly understood in rehabilitation studies but could confound assessments of quality of life [21].

Implications of results

Despite providing less therapy, the home rehabilitation programme achieved similar functional gains with a lower risk of readmission. With shorter hospital admissions and the increasing reliance on hospital substitution programmes to address functional recovery in older people, prevention of readmission is an important service goal. Day hospital programmes that involve increased therapy time and easy access to medical staff may increase the rate of readmission to hospital during the programme in comparison to home-based rehabilitation. Although this is a small trial, our results suggest that health services should prioritise providing patients with access to home rehabilitation ahead of day hospital programmes.

Key points

- As acute demand for hospital beds increases, rehabilitation is increasingly offered in ambulatory settings—either day programmes or home programmes without information on the relative merits of each.
 - At 3 months, similar outcomes were achieved for recently hospitalised patients in both programmes in terms of function and quality of life; however, the day hospital rehabilitation programme required more resources in terms of length of stay in the programme and the number of therapy sessions.
 - Patients in the day hospital programme were more likely to be readmitted to hospital and their carers reported higher levels of strain at the end of the programme.
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Conflict of Interest

All authors declare that there are no conflicts of interest to declare.

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This study was funded by a grant from the South Australian Department of Health.

Details of informed consent

Patients deemed suitable for ambulatory rehabilitation by their treating clinician were referred to the ambulatory rehabilitation triage nurse. Those deemed eligible according to the inclusion/exclusion criteria listed below were approached to participate in the study by the usual triage nurse. The triage nurse provided all potential participants (and their caregiver if appropriate) with an information sheet detailing the study design and procedures. To ensure the validity of the consent, all participants were required to complete a test of cognition—Mini Mental State Examination, and for participants who scored <24/30 informed consent processes utilised a proxy.

Details of ethics approval

Ethics approval for the study was granted by the Repatriation General Hospital's Research and Ethics Committee, Flinders Medical Centre's Clinical Research Ethics Committee and Noarlunga Health Services' Ethics Committee.

This trial is registered on the Australian Clinical Trials Registry #12 605 000 638 639.

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