

A randomised controlled trial of the Home Independence Program, an Australian restorative home-care programme for older adults

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What is known about this topic

- Restorative approaches to home care are gaining increasing acceptance around the world.
- Evidence regarding their effectiveness is limited, but positive.
- Observational studies conducted on the effectiveness of HIP, an Australian restorative home-care programme, have shown improvements in individuals' functioning and reductions in service need.

What this paper adds

- This study, the first RCT of a restorative home-care programme in Australia, tested a new paradigm where older people received a restorative service prior to consideration for ongoing home care.
- The reduced service use over time by the older people who received restorative home care rather than 'usual' care, provides support for the adoption of this new paradigm for home care across Australia.

Abstract

A randomised controlled trial was conducted to test the effectiveness of the Home Independence Program (HIP), a restorative home-care programme for older adults, in reducing the need for ongoing services. Between June 2005 and August 2007, 750 older adults referred to a home-care service for assistance with their personal care participated in the study and received HIP or 'usual' home-care services. Service outcomes were compared at 3 and 12 months. Subgroups of 150 from each group were also compared on functional and quality of life measures. Data were analysed by 'intention-to-treat' and 'as-treated'. The intention-to-treat analysis showed at 3 and 12 months that the HIP group was significantly less likely to need ongoing personal care [Odds ratio (OR) = 0.18, 95% CI = 0.13–0.26, $P < 0.001$; OR = 0.22, 95% CI = 0.15–0.32, $P < 0.001$]. Both subgroups showed improvements on the individual outcome measures over time with the only significant differences being found at 12 months for Instrumental Activities of Daily Living (IADL) in the as-treated analysis. Contamination of the control group by an increased emphasis on independence across the home-care agency involved, together with other methodological problems encountered, is thought to account for the few differences between groups in individual outcomes. Despite no difference between the groups over time in their overall ADL scores, a significantly smaller proportion of the HIP group required assistance with bathing/showering, the most common reason for referral, at 3 and 12 months. The results support earlier findings that participating in a short-term restorative programme appears to reduce the need for ongoing home care. The implementation of such programmes more broadly throughout Australia could substantially offset the projected increase in demand for home care associated with the five-fold projected increase in numbers of the oldest old expected over the next 40 years.

Keywords: home care, randomised controlled trial, restorative

Introduction

Worldwide, the past decade has shown a shift in ageing policy from a paradigm that sees ageing as a dependent stage of life to one that embraces the concept of active ageing and increased self-management. Active ageing is defined as 'the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age' (World Health

Organization, 2002). In the UK and Australia, prompted by the demand for home-care services exceeding supply, this focus on active ageing has been translated into the development of restorative home-care services that aim to assist older individuals who are experiencing difficulties in everyday living to optimise their functioning and reduce their need for ongoing care (Dale & Letchfield 2000, Lewis & Milne 2000, Lewin *et al.* 2008, Lewin & Vandermeulen 2010). They thus serve the dual purpose of reducing the demand for services whilst at the same time helping people to retain or regain their independence and enhance their quality of life. Although prompted by different circumstances, there have been similar developments in the US and New Zealand (Baker *et al.* 2001, Parsons *et al.* 2007) and a restorative approach now forms the foundation of home-care policy direction and funding models in the UK and New Zealand (Health Workforce Advisory Committee, 2006, Care Services Efficiency Delivery Programme, 2007).

Evidence of the effectiveness of restorative home-care programmes is limited by the small number of randomised controlled trials (RCTs). In the US, restorative home care compared with usual care was shown by Tinetti *et al.* (2002) to significantly improve the ability of older individuals to self-care following hospital discharge, increase the likelihood of remaining at home and reduce the likelihood of visiting an emergency department. Also, in the US, Gitlin *et al.* (2006) showed that a multicomponent restorative programme significantly improved the functioning of older people living in the community who were experiencing difficulties with activities of everyday living. A small RCT of Community FIRST, a New Zealand restorative home support service for older people with high and complex needs, showed that the restorative intervention reduced the risks of mortality and admission to residential care, and improved activities of daily living compared with usual care (Parsons *et al.* 2007). UK evaluations of re-ablement interventions have shown marked reductions in the numbers of individuals needing ongoing home care and improvements in self-rated health, quality of life and social care outcomes (Kent *et al.* 2000, Newbronner *et al.* 2007, Jones *et al.* 2009).

In Australia, restorative services have not yet been accepted as an essential component of home-care provision at a national level, but individual states such as Western Australia and Victoria are moving in this direction. The majority of current Australian research has examined the effectiveness of the Home Independence Program (HIP). Since developing HIP 10 years ago, Silver Chain, a large health and home-care provider in Western Australia, has conducted progressively more rigorous tests on it. This has included a pilot study, a 2-year operational trial, a non-randomised controlled

trial, and the RCT reported here. HIP was developed to target older individuals referred for home care, regardless of their referral source, and has been shown to significantly reduce the need for ongoing services and to be effective in improving people's functioning on a range of outcome measures, including measures of functional dependency, confidence and morale (Lewin *et al.* 2008, Lewin & Vandermeulen 2010). Prior to the present study, individuals have either been referred to HIP directly or invited to participate at initial assessment for home-care services. Current findings are therefore restricted to the effectiveness of the programme with individuals who choose this approach.

The present study was designed to examine the effectiveness of a new paradigm for home care in which older individuals referred for home-care services, including personal care, first participated in a restorative programme prior to any receipt of ongoing home care. The primary measure of effectiveness was the need for ongoing personal care services. The hypothesis was that individuals who received restorative home care were less likely to need ongoing personal care support than individuals who received 'usual' care.

Methods

Study setting

Silver Chain provides a broad range of nursing and home-care services throughout most of Western Australia. Many of these home-care services are provided through the Home and Community Care (HACC) programme, which is jointly funded by the Commonwealth and State Governments. Since 2003, Silver Chain has also been funded to provide HIP throughout the Perth metropolitan area. Prior to this study, which commenced in 2005, a specific referral to HIP was required.

Study design

An RCT in which the outcomes for older clients referred for home care who received HIP (the intervention group) were compared with the outcomes of similar individuals who received usual HACC home-care services (the control group).

Outcomes

For all participants, service outcome, as the primary measure of effectiveness, was ascertained from routinely collected service data and investigated as a binary variable (yes/no) that represented the need for an ongoing personal care service. The secondary outcomes of functional status and quality of life were examined for a subgroup recruited from the main RCT group. As the intervention

was time-limited, with a maximum of 12 weeks, the RCT was designed to examine client outcomes at this point in time and again 9 months later (a year after service commencement).

Study participants

The study participants comprised older persons living in Perth suburbs who were referred for home-care services, were found on assessment to be eligible to receive HACC-funded home care, and met the RCT inclusion criteria. Eligibility for the HACC programme is defined (by the funder) as needing assistance with one or more tasks of daily living because of an ongoing disability, rather than needing acute or post-acute care. The RCT inclusion criteria were over 65 years of age; referred for personal care; not having a diagnosis of dementia or other progressive neurological disorders, or receiving palliative care; and, able to communicate in English. Individuals may have been referred for a range of services in addition to personal care (e.g. domestic assistance, respite, nursing, or meals on wheels). The personal care criterion was used to reduce the potential for variation in the level of dependency between the two groups, a difficulty that was encountered in a previous non-randomised controlled trial (Lewin & Vandermeulen 2010).

The initial intention was to include 1250 randomly assigned clients to obtain 519 in each group with baseline and follow-up data, after drop out, in each of the intervention and control arms of the main RCT and recruit 500 of these (to achieve 191 per group with baseline and follow-up data) into the substudy that examined functional outcomes. This sample size was calculated as having 90% statistical power to detect a difference (at the 5% level of significance) between the two groups of 10% (i.e. 40% vs. 50%) in the proportion of clients still requiring ongoing home care at 3 months and 1 year. For the substudy, with a total of 382 (191 in each group), it was calculated that there would be 90% statistical power to detect differences of $\frac{1}{3}$ SD in mean general health and functional scores between groups. The average rate of admission to Silver Chain HACC-funded metropolitan personal care services during the year preceding the study proposal being written was 26 per week. It was determined that, on average, 20 of these individuals would have met the study criteria. A study sample of 1250 could therefore have been expected to be achieved within 15 months (20 per week * 65 weeks = 1300). With an average of eight per week (four in each group) being recruited to the substudy, the required total of 500 would have been achieved within the same period (eight per week * 62.5 weeks = 500).

However, achievement of this sample size became impossible due to the restricted availability of HACC ser-

vices in many parts of the metropolitan area for a significant duration within the study period. Sample size was therefore recalculated and it was determined that a sample size of 375 in each of the main RCT groups would, nevertheless, be sufficient to detect a difference of 12% (i.e. 38% vs. 50%) in service outcomes with 90% power and a 5% level of significance, while a sample of 150 in each of the subgroups would be sufficient to detect a difference of 0.4 SD in the functional measures with 90% power and a 5% level of significance. These sample sizes, which did not explicitly allow for dropouts, became our target and were achieved.

Randomisation process

Referral to Silver Chain for home-care services is followed by a telephone assessment to determine eligibility for HACC-funded services. This assessment has been incorporated into ComCare, Silver Chain's client information management system; the Customer Centre Operator is prompted via a questionnaire on the screen and data are entered in real time. On completion of the assessment, ComCare provides the Operator with details about what services the individual is eligible for, which is determined by the business rules within the assessment software. A modified process was developed for this RCT. Specifically, once the Operator was informed that an individual was eligible for HACC-funded personal care services, ComCare then provided prompts to complete another short questionnaire that determined RCT eligibility. If eligible, and having determined that both HACC and HIP services were available, the system allocated the individual to either the intervention or control group based on alternating tenths of a second. The Operator then followed the normal process for onward referral to the appropriate service. The Operators could not therefore be blind to group allocation. The randomisation process was in place from June 2005 to August 2007 when the final sample size was achieved.

All Operators received training to apply the group assignment protocol. Training was repeated when, following achievement of approximately half of the sample, an imbalance in numbers between the two groups had not righted itself and it was thought that Operators may somehow have been purposefully influencing the randomisation process, despite an assurance by the designer of the process that this was not possible.

Recruitment into subgroups

The process for subgroup recruitment was designed, in accordance with our sample size calculations and to ensure that substudy subjects were representative of the whole study sample, to restrict recruitment to a maximum of four intervention and four control subjects per

week. A weekly report of the randomised eligible individuals, their contact details, group assignment and service commencement date was sent to the Project Officer. After removal of the details indicating group assignment, she then forwarded it to a Research Assistant who telephoned subjects and invited them to participate in a study to investigate the outcomes of different models of community care. Following the first round of calls, the Research Assistant would advise the Project Officer of the subgroup participants. Having ascertained how many intervention vs. control subjects had so far been recruited to a subgroup, the Project Officer would then inform the Research Assistant who, of those remaining on the list, they should try ringing again. Recruitment into the subgroups was continued until the strength of 150 in each subgroup was achieved. Subjects recruited to a subgroup were sent an information statement, a consent form and a reminder of the date and time of the visit arranged. When visited, prior to initial data collection, the Research Assistant obtained written consent from each participant.

Intervention – HIP

Home Independence Program was developed as an early intervention programme directed at optimising functioning, preventing or delaying further functional decline, promoting healthy ageing and encouraging the self-management of chronic diseases. It is designed to target individuals when they are first referred for home-care services, or existing home-care clients who request an increase in service. The intention is to remove or minimise the need for ongoing support services.

The key components of the service model have been described elsewhere in detail (Silver Chain Nursing Association, 2007). In brief, the areas of functioning and types of interventions that are incorporated into HIP include the promotion of active engagement in a range of daily living activities using task analysis and redesign, work simplification and assistive technology where appropriate; strength, balance and endurance programmes for improving or maintaining mobility; chronic disease self-management; falls prevention strategies; medication, continence and nutrition management; and the improvement or maintenance of skin integrity. Individuals participate in HIP until they achieve their goals or for up to 12 weeks, whichever occurs first. If HIP individuals need continued assistance from a home-care service at discharge from HIP, this is arranged.

'Standard' HACC home care

No changes were made to the usual model of delivering HACC home-care services. Following determination of eligibility, individuals randomised to the control group (standard HACC services) were visited by a HACC Care

Co-ordinator. This involved further assessment of individual needs, completion of a care plan and the commencement of direct care. The most common care plan included three personal care visits a week to assist with bathing/showering and a fortnightly housecleaning visit that included heavy laundry.

Premature reassignment of participants

Prior to commencement of the trial, it was agreed that clients randomised to receive HIP, who after 2 weeks were not participating in the programme for any reason, would be reassigned to receive 'usual' HACC home care.

Data collection

There were two data sources and three data collection points for this RCT. ComCare, Silver Chain's client database, was the source of demographic, assessment and service data. Demographic and HACC eligibility assessment data are collected at the time of referral and then updated annually. Eligibility is determined using the HACC Needs Identification (HNI), the standard HACC eligibility assessment used throughout Western Australia. Service data are collected at intervals throughout an individual's episode of care. These latter data, in particular whether an individual was receiving ongoing personal care at 3 months and 1 year (the service outcome), formed the primary outcome measures for this RCT.

Functional and quality of life outcome data were collected for individuals in the subgroups by visiting their homes on three occasions: service commencement, 3 months and 1 year. Measures were chosen on the basis that they were key outcomes of interest in this RCT (i.e. functional independence, confidence and quality of life) and because they had established validity and reliability with older people. The measures used were the Primary Assessment Form, a tool developed for use by community care providers in Western Australia, which includes Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) scales based on the Modified Barthel Index (Colin *et al.* 1988) and the Lawton and Brody Scale (Lawton & Brody 1969) with the scoring modified to increase according to the amount of assistance required on a task (Calver *et al.* 2002); the timed up and go (Podsiadlo & Richardson 1991); the Modified Falls Efficacy Scale (Hill *et al.* 1996) and the Assessment of Quality of Life Scale (Hawthorne *et al.* 1997).

A data collection manual was developed for the RCT, which included a detailed protocol and copies of all forms to be used. Research Assistants were trained to collect the data in a standardised format and their ability to collect consistently reliable data was established before they were permitted to complete visits independently. When commencing the first interview, Research Assis-

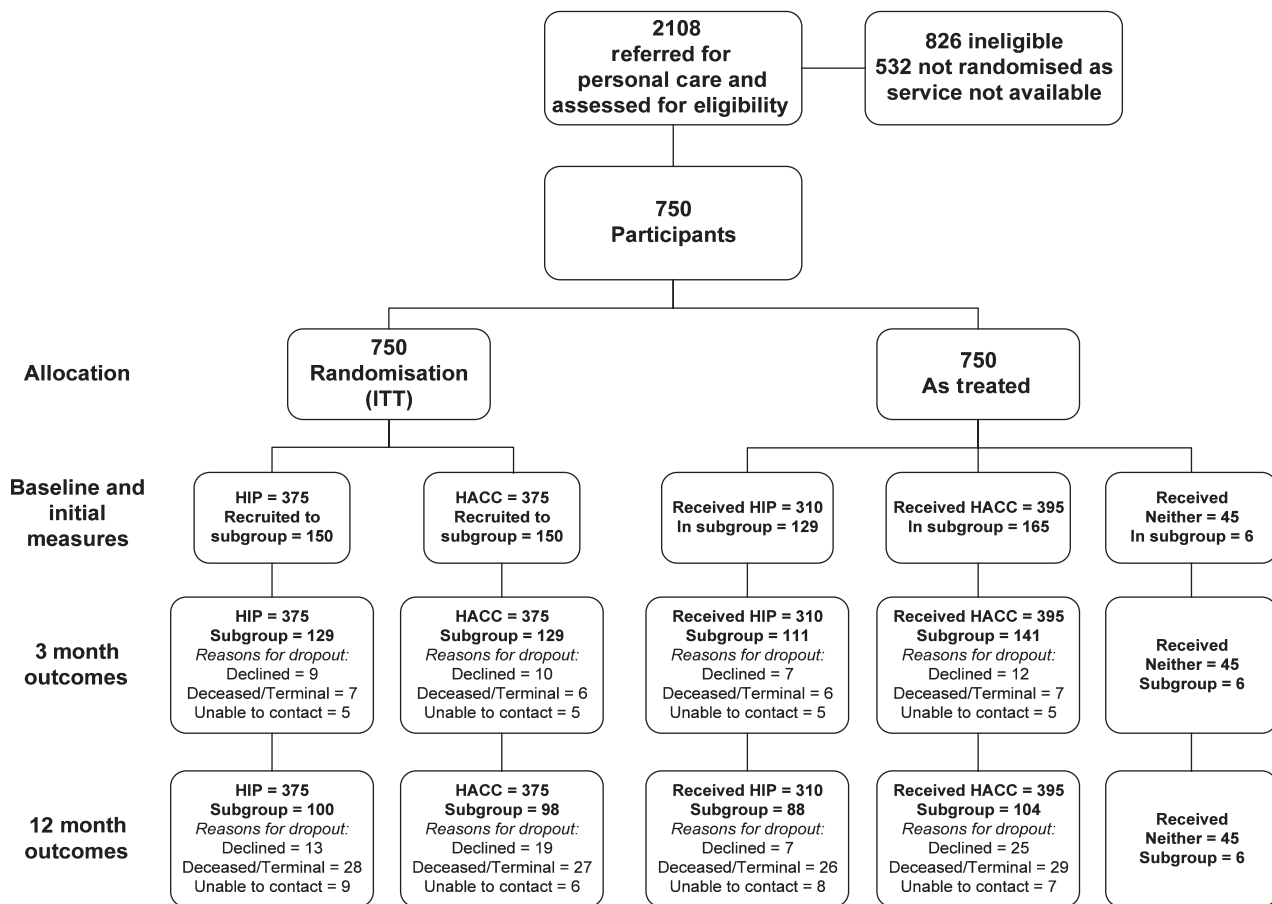


Figure 1 Participant flow through study.

tants were blind to whether the individual was in the intervention or the control group. However, participants would often talk about the type of assistance they were receiving from Silver Chain, so it was impossible to prevent Research Assistants from deducing over the course of the RCT whether the participant was in the intervention or in the control group.

Data analysis

Data were analysed using Stata version 10.1 (Stata Corporation 2005, College Station, Texas, USA). Both *intention-to-treat* (ITT) and *as-treated* analyses were performed. Differences in demographics and functional dependency between the intervention and control subjects in the total sample and in the subgroups were examined at the start of care using chi-square tests for categorical variables and *t*-tests for age and dependency; these latter data were normally distributed. Using logistic regression, service outcome (yes/no) was compared for the control and intervention groups separately at 3 months and 1 year. These analyses were adjusted for basic demographics and dependency (age, gender, living arrangements, carer availability, HNI, IADL and ADL scores).

Linear regression models, adjusted for basic demographics and baseline dependency, were used to identify any differences between the subgroups' functioning at initial data collection, 3 months and 1 year, and to examine differences between the groups in terms of change in measures over the follow-up period.

Ethics

Approval to conduct this study was given by the Silver Chain Human Research Ethics Committee. It was not possible to obtain consent from the participants at randomisation, but they were asked for consent by the Research Assistant at the first interview.

Results

Figure 1 shows the participant flow diagram for this RCT. A total of 2108 individuals were referred to Silver Chain for assistance with personal care during the study period, nearly two-fifths (39%) of whom were ineligible to participate because they did not live in the metropolitan area, were too young (<65), were receiving palliative care, had a progressive neurodegenerative condition or a

Table 1 Baseline demographics for whole study sample

Whole sample Minimum Data Set (MDS)	Intention-to-treat (N = 750)		As-treated (N = 705)	
	HACC	HIP	HACC	HIP
Gender				
Male	133 (35.5%)	112 (29.9%)	141 (35.7%)	86 (27.7%)
Female	242 (64.5%)	263 (70.1%)	254 (64.3%)	224 (72.3%)
		<i>P</i> = 0.102		<i>P</i> = 0.025*
Country of birth				
Australia	183 (48.8%)	204 (54.4%)	195 (49.4%)	173 (55.8%)
England	69 (18.4%)	64 (17.1%)	72 (18.2%)	56 (18.1%)
Italy	18 (4.8%)	19 (5.1%)	19 (4.8%)	16 (5.2%)
Other	105 (28.0%)	88 (23.4%)	109 (27.6%)	65 (20.9%)
		<i>P</i> = 0.415		<i>P</i> = 0.211
Carer availability				
Has a carer	254 (67.7%)	216 (57.6%)	266 (67.3%)	176 (56.8%)
Has no carer	121 (32.3%)	159 (42.4%)	129 (32.7%)	134 (43.2%)
		<i>P</i> = 0.004**		<i>P</i> = 0.004**
Language				
English	351 (93.6%)	362 (96.5%)	369 (93.4%)	301 (97.1%)
Non-English	24 (6.4%)	13 (3.5%)	26 (6.6%)	9 (2.9%)
		<i>P</i> = 0.064		<i>P</i> = 0.026
Living arrangement				
Lives alone	159 (42.4%)	192 (51.2%)	167 (42.3%)	164 (52.9%)
Lives with family/others	216 (57.6%)	183 (48.8%)	228 (57.7%)	146 (47.1%)
		<i>P</i> = 0.016*		<i>P</i> = 0.005**
Carer status				
Co-resident carer	185 (72.8%)	141 (65.6%)	195 (73.3%)	109 (62.3%)
Non-resident carer	69 (27.2%)	74 (34.4%)	71 (26.7%)	66 (37.7%)
		<i>P</i> = 0.089		<i>P</i> = 0.014*
Pension				
Aged pension	318 (85.5%)	307 (81.9%)	334 (85.2%)	253 (81.6%)
No government pension	25 (6.7%)	42 (11.2%)	28 (7.1%)	34 (11.0%)
Other government pension	29 (7.8%)	26 (6.9%)	30 (7.7%)	23 (7.4%)
		<i>P</i> = 0.097		<i>P</i> = 0.207
Age				
Number	375	375	395	310
Mean	82.73	81.84	82.68	81.89
Standard deviation	7.70	7.19	7.55	7.36
		<i>P</i> = 0.105		<i>P</i> = 0.164

HACC, Home and Community Care – control; HIP, Home Independence Program – intervention; ITT, Intention-to-treat.

P values are shown for ITT analyses at baseline to indicate potential purposeful influencing of the randomisation process.

**P* value <0.05 level for HIP vs. HACC.

***P* value <0.01 level for HIP vs. HACC.

diagnosis of dementia. Of those who were found eligible for the study, 532 (41.5%) could not be included in the study as services were not available in their areas at the time of referral or because the target sample size for that group (375) had already been achieved. All 750 clients randomised to the study were included in the ITT analysis, whereas 45 were not included in the *as-treated* analysis because they did not receive sufficient service (defined as three HIP visits for the intervention group or 3 hours of personal care for the control group). Assessment at referral (baseline) and service data (including outcomes at 3 and 12 months) were available for all participants, while functional and quality of life outcomes

data were available only for the individuals recruited into subgroups. Within the subgroups, 42 participants were lost to follow-up at 3 months, and a further 60, at 1 year.

Baseline

The baseline demographics for the groups overall can be seen in Table 1. This Table shows that the groups were somewhat different in terms of their characteristics, namely that the HIP group was less likely to have a carer and more likely to live alone.

There was also a statistically significant, but clinically insignificant, difference in terms of their dependency as

Table 2 IADL and ADL scores at baseline for whole sample using HNI[‡] data

Group	Intention-to-treat (N = 750)				As-treated (N = 705)			
	Number	Mean	Standard deviation	P value	Number	Mean	Standard deviation	P value
IADL total								
HACC	375	7.19	3.61	<0.001***	395	7.15	3.67	<0.001***
HIP	375	8.14	3.23		309	8.22	3.11	
ADL total								
HACC	349	12.21	3.18	0.013*	367	12.20	3.13	0.005**
HIP	354	12.76	2.75		294	12.85	2.72	

ADL, Activities of Daily Living; HACC, Home and Community Care – control; HNI, HACC Needs Identification; HIP, Home Independence Program – intervention; IADL, Instrumental Activities of Daily Living.

[‡]HNI items derived from modified Barthel (Colin *et al.* 1988) and Lawton and Brody (Lawton & Brody 1969). The lower the score, the higher the dependency.

*P value <0.05 level for HIP vs. HACC.

**P value <0.01 level for HIP vs. HACC.

***P value <0.0005 level for HIP vs. HACC.

Table 3 Service outcomes at 3 and 12 months

Outcome	3 months		12 months	
	HACC (%)	HIP (%)	HACC (%)	HIP (%)
Intention-to-treat				
Ongoing personal care	238 (63.5)	103 (27.5)	151 (40.3)	67 (17.9)
No care required	63 (16.8)	166 (44.3)	75 (20.3)	177 (47.2)
Died	25 (6.6)	17 (4.5)	72 (19.2)	65 (17.3)
Residential care	21 (5.6)	16 (4.2)	48 (12.8)	44 (11.7)
Other community service	10 (2.7)	10 (2.7)	16 (4.3)	10 (2.7)
Declined/terminated	9 (2.4)	30 (8.0)	4 (1.1)	6 (1.6)
Admitted to hospital	6 (1.6)	24 (6.4)	3 (.8)	1 (0.3)
Moved out of area	3 (0.8)	0 (0.0)	5 (1.3)	1 (0.3)
Hospice care	0 (0.0)	9 (2.4)	1 (0.3)	4 (1.1)
Total	375 (100)	375 (100)	375 (100)	375 (100)
As-treated				
Ongoing personal care	272 (68.9)	66 (21.3)	170 (43.0)	44 (14.2)
No care required	50 (12.6)	163 (52.7)	71 (18.0)	156 (49.3)
Died	26 (6.6)	13 (4.2)	74 (18.7)	56 (18.1)
Residential care	21 (5.3)	14 (4.5)	51 (12.9)	35 (11.3)
Other community service	10 (2.5)	10 (3.2)	15 (3.8)	10 (3.2)
Declined/terminated	9 (2.3)	12 (3.8)	4 (1.0)	4 (1.3)
Admitted to hospital	4 (1.0)	23 (7.4)	3 (0.8)	1 (0.3)
Moved out of area	3 (0.8)	0 (0.0)	5 (1.3)	1 (0.3)
Hospice care	0 (0.0)	9 (2.9)	2 (0.5)	3 (1.0)
Total	395 (100)	310 (100)	395 (100)	310 (100)

HACC, Home and Community Care – control; HIP, Home Independence Program – intervention.

measured using the HNI (i.e. substantially less than 1 where 1 represents the difference between an individual having difficulty vs. no difficulty performing just one IADL or ADL task) (Table 2). The individuals in the subgroups for whom there were complete follow-up data also differed on the same demographic characteristics, although these differences were only significant in the *as-treated* analyses for living arrangements [$\chi^2(1,$

$N = 192) = 4.212, P = 0.04]$ and carer residency [$\chi^2(1,$
 $N = 106) = 4.499, P = 0.03]$.

Service outcomes

It can be seen in Table 3 that substantially fewer of the HIP group compared with the HACC group required ongoing personal care at both follow-up points, when analysed either by ITT or *as-treated*.

Table 4 Logistic regression – need for ongoing personal care at 3 and 12 months

	Odds ratio	P value	95% Confidence interval	
Intention-to-treat 3 months (<i>N</i> = 592)				
HIP vs. HACC	0.18	<0.001	0.13	0.26
Carer availability	1.68	0.008	0.95	1.09
ADL score	1.02	0.529	0.95	1.09
As-treated 3 months (<i>N</i> = 558)				
HIP vs. HACC	0.10	<0.001	0.07	0.15
Carer availability	1.8	0.006	1.19	2.84
ADL score	1.04	0.297	0.96	1.12
Intention-to-treat 12 months (<i>N</i> = 473)				
HIP vs. HACC	0.22	<0.001	0.15	0.32
Carer availability	2.32	<0.001	1.51	3.58
ADL score	1.08	0.048	1.00	1.17
As-treated 12 months (<i>N</i> = 444)				
HIP vs. HACC	0.15	<0.001	0.10	0.24
Carer availability	2.55	<0.001	1.60	4.07
ADL score	1.01	0.020	1.01	1.19

ADL, Activities of Daily Living; HACC, Home and Community Care – control; HIP, Home Independence Program – intervention.

Other covariates used in the regression analysis included: living arrangements, Instrumental Activities of Daily Living, age and gender. This analysis did not include those who died, were terminally ill, moved to residential care or out of the area, or who had data missing for any of the included variables.

A significant relationship between the service received (HIP vs. HACC) and being in receipt of ongoing personal care was found using logistic regression, after adjustment for potential baseline confounders (Table 4). HIP was found to substantially and significantly decrease the odds of having an ongoing service at both 3 and 12 months. Having a carer was also found to be related to having an ongoing service at both time points, but increased the odds, as did higher ADL dependency at 12 months.

Functional and quality of life outcomes

As per the study design, these were examined for the participants recruited into the subgroups; only those for whom data were available at initial collection, 3 and 12 months were included in the analyses. Also, because there were some differences between the groups at baseline, individual outcomes were examined using linear regression to investigate the difference between HIP and HACC groups after adjusting for these potential baseline confounders. Some improvement on all measures was shown by both groups during the first 3 months. The improvement in scores between baseline and 3 months was maintained by both groups over the next 9 months (i.e. 3–12 month follow-up). The exception was IADLs, where the HACC group showed an increase in dependency between the 3- and 12-month follow-up, resulting in there being a significant difference between the HACC and HIP *as-treated* groups in the change between baseline and 1 year ($P = 0.016$). No other differences between the groups were found.

Given that the difference in service outcomes found between the groups was not matched by differences between the groups in the total IADL and ADL scores, further analysis, at the individual functional item level, was undertaken. This was done by considering the percentage of each group that was assessed as independently able to perform each activity. At the initial data collection visit, nearly 50% of HIP clients were independent with showering, yet difficulty with showering is generally the most common reason that clients are referred for personal care. Further investigation identified that as the study protocol had determined that clients should have commenced their service prior to being recruited into the substudy, and clients had often chosen to have the Research Assistant visit in the second or third week after service commencement, that HIP clients had already had a number of restorative care visits and a strategy to re-establish self-care had already been implemented. Fortunately, the baseline telephone assessment, which is a routine part of eligibility assessment at referral for all home-care clients, included a dependency measure. It was therefore possible to compare the functional assessment at referral with the later assessments conducted for this study (Table 5).

These results show that a greater proportion of both groups were assessed as independent on most activities when visited at home by a Research Assistant as compared with the telephone assessment conducted at referral. However, the increase in independence of the HIP group in showering was substantially greater than in the HACC group, a 40% increase compared with a 12% increase by first home visit; a 60% compared with a 23%

Table 5 Percentage of subgroup clients with complete follow-up data (HIP: $N = 100$ and HACC: $N = 98$) independent in everyday activities at different time points

	Baseline HNI (%)	Initial PAF (%)	3 month (%)	1 year (%)
Housework				
HIP	0	2	9	11
HACC	2	7	8	6
Travel				
HIP	15	14	21	25
HACC	21	28	25	31
Shopping				
HIP	5	19	33	34
HACC	9	21	26	29
Medication				
HIP	68	65	69	64
HACC	55	54	62	54
Finances				
HIP	58	62	69	67
HACC	49	57	58	49
Phone				
HIP	77	86	92	88
HACC	67	85	89	84
Prepare food				
HIP	27	46	60	55
HACC	20	36	54	46
Laundry				
HIP	17	27	36	37
HACC	22	20	29	29
Walking				
HIP	67	97	96	94
HACC	63	92	94	89
Showering				
HIP	9	49	69	67
HACC	18	30	41	43
Grooming				
HIP	75	97	95	96
HACC	63	85	92	91
Eating				
HIP	87	91	94	91
HACC	71	85	88	90
Transfers				
HIP	81	98	97	97
HACC	77	95	94	93
Stairs				
HIP	14	39	44	46
HACC	10	26	38	38
Contenance				
HIP	76	91	93	95
HACC	68	92	90	85
Toileting				
HIP	89	98	96	94
HACC	82	95	97	91
Dressing				
HIP	58	81	86	78
HACC	51	70	73	72

HACC, Home and Community Care – control; HIP, Home Independence Program – intervention; HNI, HACC Needs Identification; PAF, Primary Assessment Form.

increase by 3 months; and, 58% vs. 25% at 12 months. All of these differences were significant [$\chi^2(1, N = 192) = 18.9, P < 0.001$; $\chi^2(1, N = 192) = 25.9, P < 0.001$; $\chi^2(1, N = 192) = 16.65, P < 0.001$].

Discussion

This RCT has shown that individuals who received a restorative home-care programme were considerably less likely to need ongoing personal care services than their counterparts who were randomised to receive 'usual' home care only. The magnitude of this effect was increased when individuals who did not actually receive a restorative intervention were removed from the analysis. These results support the hypothesis being tested and are consistent with the findings of the earlier non-randomised controlled trial of HIP (Lewin & Vandermeulen 2010) and with recent results from a UK prospective longitudinal study that found only 42% of individuals receiving a re-ablement service required ongoing home care compared with 95% of the control group (Glendinning *et al.* 2010).

The lack of consistent differences between the subgroups over time on the functional and QOL outcome measures is, however, inconsistent with our earlier HIP findings (Lewin & Vandermeulen 2010), as well as US and UK research (Tinetti *et al.* 2002, Gitlin *et al.* 2006, Glendinning *et al.* 2010). The most plausible explanation relates to limitations in the present study. Specifically, it was designed so that clients had commenced service prior to initial data collection. This was to safeguard against delays to service delivery. Importantly, these delays often meant that the participant had commenced the intervention and improved in self-care prior to collection of initial outcome data. For example, the proportion of the HIP intervention group subjects who could shower independently increased from 9% at the time of referral to 49% by the time of the initial data collection.

Another unavoidable limitation of this study that minimised differences between the control and intervention groups was contamination of the intervention. Namely, HIP's development over several years has meant that independence and re-ablement have been incorporated into Silver Chain's lexicon and strategic vision. Consequently, home-care staff may be encouraging their clients to do more for themselves and thus improve their functional independence, even though it was not necessarily accompanied by a formal referral for HIP services or the suggestion that the individual may in fact no longer need home care.

Home-care workers and clients appear to often share the view that once you need home care, you will need it forever. This view is reinforced by the current home-care funding system in which providers are contracted annually to provide certain volumes of different service types

and there is no incentive for providers to encourage people to be independent of services. The role of such expectations on service outcomes needs to be examined and separated out from the effect of different approaches to care.

A further methodological limitation of this study was that some of the Customer Centre Operators manipulated the randomisation process. Despite regular reports and training to minimise this risk, the problem persisted throughout recruitment. At a debriefing session following the end of the recruitment period, a handful of staff admitted that they tried to circumvent the process in the belief that particular clients would benefit most from assignment to the control or intervention group. For example, some clients who lived alone were preferentially assigned to the intervention group so that they could remain as independent as possible. Conversely, if clients were very dependent and lived with their carer, then they were preferentially assigned to standard care with the view that they would benefit least from a reablement approach. Although this manipulation of the randomisation process did produce some demographic and dependency differences between the intervention and control groups at baseline, the analyses adjusted for these confounders. It is acknowledged that the groups may have differed on other unknown confounders, which may limit the generalisability of our results.

Conclusion

Participation in a short-term restorative programme is effective in reducing the demand for ongoing home-care services. Adoption of a new paradigm for home care in Australia in which individuals first participate in a short-term restorative programme may substantially offset the projected increase in demand for home-care services associated with the five-fold increase in the numbers of the oldest old expected over the next 40 years.

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