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Intervention Research

Promoting Seniors' Health With Home Care Aides: A Pilot

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Abstract

Purpose: Regular physical activity (PA) benefits older adults. However, frail older adults lack opportunities to be physically active. This pilot study aimed to test and enhance the feasibility of a PA program delivered by home care aides (HCAs) for community-dwelling older adults in a Medicaid-funded home care setting and to generate preliminary efficacy and cost data.

Design and Methods: HCAs were trained to deliver a brief motivational enhancement and three chair-bound movements to motivate their older clients to do PA daily and to help maintain their independence in the community. Mixed methods were used to evaluate clients' function and health before and after the 4-month intervention.

Results: Clients' daily activity function and health outcomes (physical fitness, self-rated health, pain interference, and fear of falling) improved significantly. The program was well-received by clients ($N = 54$) and their HCAs ($N = 46$) as indicated by high retention rates among client participants (93%) and remarks provided by clients.

Implications: Building PA into the everyday care of older adults and the routine work of HCAs is feasible. The intervention has the potential for further implementation and dissemination.

Keywords: Activities of daily living, Medicaid, Implementation science, Home and community-based services, Physical activity, Quality improvement

Regular physical activity (PA) benefits older adults. Implementing and sustaining PA programs for older adults with disabilities, however, is challenging (Cress et al., 2004). Few initiatives target older adults who have difficulty walking or doing basic daily activities. PA programs led by physical therapists may be efficacious for frail older adults (Gill et al., 2002; Jette et al., 1999), but too expensive for wide dissemination. Our goal was to pilot test a PA program led by home care aides (HCAs) who regularly visit frail older adults to provide personal care. The specific aims were to test and enhance the feasibility of the HCA-led PA program and measurement strategies, and generate preliminary efficacy and cost data. This study was also intended to be a critical step towards building PA into the everyday care of frail older adults and the routine work of HCAs. Implementation frameworks (determinant frameworks; Brownson, Colditz, & Proctor, 2012; Damschroder et al., 2009; Greenhalgh, Robert, Macfarlane, Bate, &

Kyriakidou, 2004; Nilsen, 2015) guided the description of the program features designed to facilitate implementation and dissemination. These features included intervention characteristics (e.g., low complexity, low cost, alternative advantages) and factors associated with the implementation process (e.g., external collaboration), outer settings (e.g., client needs, inter-organizational networks, HCA workforce, state mandated HCA in-service training) and inner settings (e.g., implementation climate, readiness for implementation).

Building evidence-based practices into routine practice is critical for enhancing the quality and effectiveness of long-term care (Wilson, Brady, & Lesesne, 2011). Previous research clearly indicates significant health benefits of regular PA for all ages and for all abilities (Cress et al., 2004). However, current long-term care norms encourage dependent behavior in older service recipients. Care workers assist frail older adults with daily activities, which leads to disuse of existing skills, and loss of function and autonomy. To challenge this passive care model, an intervention program to stimulate frail older adults' functional reserves was started in nursing home settings (Resnick, Gruber-Baldini, Galik, et al., 2009; Resnick, Gruber-Baldini, Zimmerman, et al., 2009) and adapted for persons with Parkinson's disease in home settings (Pretzer-Aboff, Galik, & Resnick, 2011). Our pilot project builds on this body of literature and an existing evidence-based program: Healthy Moves for Aging Well (HM).

HM, developed by the Partners in Care Foundation, is a low-cost PA program, specifically designed to safely enhance the activity level of frail older adults with limitations in 2–4 activities of daily living (https://www.ncoa.org/wp-content/uploads/Healthy-Moves.pdf). HM builds on evidence-based PA (Rikli & Jones, 2013a; Rikli & Jones, 2013b) and behavioral change (Prochaska & DiClemente, 1983). The PA consists of three chair-bound movements: seated step-in-place (for lower extremity strength and aerobics), arm curls (for upper body endurance and strength), and ankle point and flex (for increased ankle flexibility and increased blood circulation to manage and prevent ankle swelling). The original HM, delivered by case managers and trained lay coaches, was tested in an observational study using a single group pre-post design with 338 clients. This study produced positive outcomes in terms of increased performance in the face-to-face coaching group, and reduced falls and pain (Yan, Wilber, & Simmons, 2011; Yan, Wilber, Wieckowski, & Simmons, 2009). The original HM was endorsed by the Administration on Aging and National Council on Aging Evidence-based Preventive Initiative (National Council on Aging, 2011). The current study translated the original case manager-led HM into a model where HCAs work with their clients.

Our study is innovative because it specifically targets frail older adults and because it is delivered by HCAs who regularly visit them in a Medicaid-funded home care program. The occupation of HCAs, also called homemakers and personal care assistants, is projected to add more new jobs than any other between 2014 and 2024: 458,100 jobs (Bureau of Labor Statistics, 2016). HCAs tend to develop long-term relationships with their clients and thus are well-positioned to help their clients with regular PA. Building on a small pilot study that demonstrated the feasibility and safety of HCA-led HM (Park & Chodzko-Zajko, 2014), we tested the program in a large metropolitan area to produce preliminary data for developing a randomized controlled trial.

Our 4-month intervention was guided by social cognitive theory and motivational enhancement theories (Bandura, 1986; Miller & Rollnick, 2002; Prochaska, DiClemente, & Norcross, 1994). Social cognitive theory emphasizes the importance of self-efficacy (for both the HCA and client—enhanced through direct instruction, encouragement and reinforcement of progress) and outcome expectancies (believing that PA will result in tangible benefits for both the HCA and client). In addition, social cognitive theory suggests the importance of significant others (i.e., change agents such as HCAs), and social support quality for increasing adherence to and maintenance of the behavior change. HCAs were trained to use a brief motivational enhancement to increase their clients' intrinsic motivation for making and sustaining changes in PA when introducing the three moves (Runkle, Osterholm, Hoban, McAdam, & Tull, 2000). The initial HM session with the client and regular reminders at each home visit encouraged the client to increase and sustain motivation to stay "active" and enhance PA levels to prevent functional decline and dependence (Paterson, Jones, & Rice, 2007; Paterson & Warburton, 2010).

Methods

Our model was pilot-tested with 54 older home care clients and their aides (N = 46) in a single group pre-post design. This study took place in Chicago within the Illinois Department on Aging Community Care Program (CCP), in collaboration with state, community-based organizations, and the labor union that represent HCAs (Muramatsu et al., 2015). Financed partly by Medicaid, CCP provides home and community-based services for more than 70,000 people with disabilities aged 60 and older who have assets under $17,500. CCP home care is provided by HCAs employed by state contracted home care agencies. Clients can receive home care from their family members if the latter become home care agency employees. HCAs must have a high school diploma or general education diploma, 1 year of HCA work experience, or demonstration of continued progress towards a general education diploma.

Recruitment and Retention

Working closely with the research team, the home care agency identified potentially eligible clients via HCA contacts and supervisor referrals and obtained written consent to release contact information to the research team from 107 clients (Figure 1). Client eligibility criteria included being a recipient of CCP in-home support services and

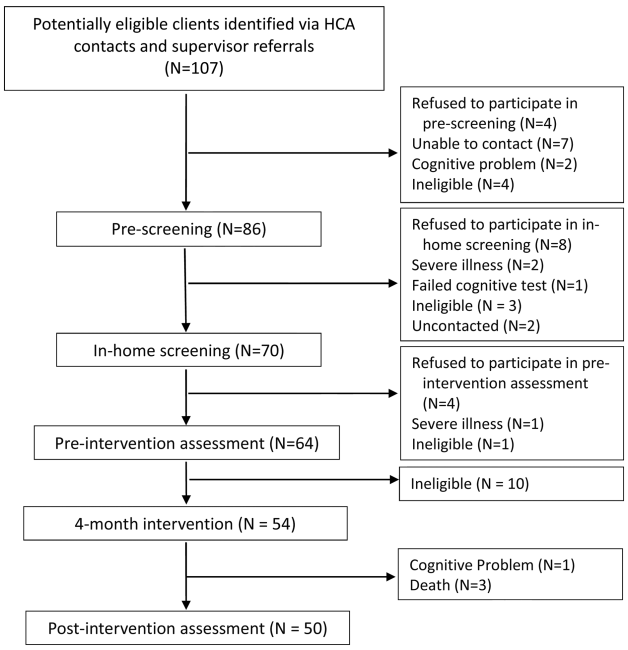

Figure 1. Flow diagram of home care clients recruitment and retention in Promoting Seniors' Health with Home Care Aides: A Pilot.

speaking English adequately. Clients were also required to have a cognitive status sufficient to follow directions and be capable of performing the three chair-bound moves (i.e., able to sit in a chair independently for 15+ min). Further, they were willing to have UIC notify their primary care physician of their study participation, and their HCA agreed to participate in the study. Excluded were those who had a legal guardian appointed, were receiving hospice care or had a terminal diagnosis, or had chest pain. HCA eligibility criteria included being over 21 years old, being English speaking, being willing and able to implement the HM routine for 4 months, having an eligible and interested client, and intending to stay with the home care agency for 12 months.

Initial phone screening interviews were conducted by an office staff member (N = 86). Those screened in were assigned to one of the two trained interviewers. The interviewer visited the client's home to administer a Mini Mental State Examination 2nd Edition Brief Version (Folstein, Folstein, White, & Messer, 2010), observed the client's ability to sit in a chair, and obtained informed consent (N = 70). Consented clients' state-designated case coordination units and primary care physicians were notified of the study. The same interviewer conducted the baseline interview and physical performance assessment with clients (N = 64) in their homes, which took 76 min on average (range: 21–158 min). Ten of the 64 clients subsequently became ineligible (had a stroke N = 1; their HCAs could not attend the HM training, N = 9). Fifty-four clients received the intervention from 46 HCAs (including eight HCAs with two participating clients). Subsequently, three clients died of causes unrelated to HM, and one client dropped out because of increased cognitive problems. Post-intervention assessment with 50 clients and 41 HCAs was scheduled at Month 4 to incorporate HM activities into state-mandated HCA training.

Intervention

Once clients completed baseline assessments, their HCAs were invited to a half-day training session led by the research team. The training covered how to deliver the HM brief motivational enhancement and three chair-bound movements to their clients, how to remind their clients to do HM everyday as part of regular home care visits, and how to log their HM activities. The 4 hr of training counted toward state-mandated in-service training hours. Eight sessions were offered to accommodate waves of participant recruitment.

The 4-month intervention started immediately after training. On the first home visit, HCAs covered the eight-step process where HCAs assessed readiness for PA and had their clients set personally meaningful goals, and taught the three moves. This process took 27 min on average (range: 10–45 min). HCAs were asked to remind their clients of their personal PA goal/routines as part of their regular home care and to fill out a simple log that indicated whether HM routines were discussed or observed during each visit. Either during a HCA visit day or by themselves on non-visit days, clients were asked to do the following everyday: 15 arm curls two times (holding a 1-pound weight supplied by the project, or a soup can or water bottle); ankle point and flex up to 30 s on each foot three times; and seated step-in-place up to 1 min. Those who experienced any of the "red flags" (radiating pain, numbness, tingling, loss of range of motion, loss of function, swelling, night pain, chest pain, and shortness of breath) or any unusual pain or discomfort, were instructed to stop exercising immediately and call their doctor or 911. Clients were also asked to fill out a daily log. The frequency of HCA home visits depended on the client's care needs assessed by the Illinois Determination of Needs instrument (typically 3 times/week or 12 hr/week).

Data Collection

Clients were asked to complete baseline and 4-month face-to-face interviews and fitness tests with a trained interviewer. Interviewers directly entered data securely using a tablet via Research Electronic Data Capture (REDCap), a secure web-based data collection/entry/management system (Harris et al., 2009).

Measures

Our primary outcomes were daily activity difficulties and dependency, the complementary components of the disability continuum in frail older adults (Gill, 2010; Gill, Robison, & Tinetti, 1998). Three measures were used: (a) a scale consisting of six items specifically targeted by HM (HM6), (b) Basic Activities of Daily Living (BADL) (Gill et al.,

2002; Gill et al., 1998; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963; Siu, Reuben, & Hays, 1990), and (c) four items from Instrumental Activities of Daily Living (IADL; Lawton & Brody, 1969). Secondary outcomes assessed by trained interviewers included the performance of three HM movements and the Short Physical Performance Battery (SPPB; Guralnik et al., 1994). Other self-reported outcomes included levels of difficulty with ankle point and flex, self-rated health, pain, interference with daily activities due to pain, pain medication usage, fear of falling, and history of falls in the past 4 months (frequency and injuries). Process outcomes included exercise-related social support from HCAs and family adapted from Sallis and colleagues (Sallis, Grossman, Pinski, Patterson, & Nader, 1987).

Client baseline interview questions assessed their age, gender, race/ethnicity, education, marital status, living arrangement, frequency of contacting family/friends, number of chronic diseases, insurance, cared for by a family HCA or non-family HCA, and duration of the HCA-client relationship. HCAs' baseline characteristics (age, gender, race, education, marital status, living arrangement, number of chronic diseases, insurance) were assessed by self-administered questionnaires at the initial HCA training session.

The post-intervention interviews with clients included open-ended and closed-ended questions about their experience with HM (number of days clients did HM in the past week, motivation to continue HM for the next 4 months, satisfaction with the help from their HCAs and their family to start or continue HM, overall satisfaction with HM, perception of the level of difficulty with the program, and interest in a step-up program.) Open-ended questions probed why clients felt they were (not) motivated to continue HM in the next 4 months, why they felt HM was easy or hard for them, and what they liked or disliked about HM.

Fidelity checks included documenting the extent to which the intervention's core components were delivered and received as intended (Gearing et al., 2011). HCAs' delivery of the HM's first day activities was monitored either by in-home observation (20 HCA-client pairs observed by one or two researchers) or by phone interview with HCAs (27 of 34 HCAs responded). Clients' receipt of the intervention was monitored via a 5-item phone interview ($N = 45$) conducted once during their 4-month intervention period (on average the 22nd day, ranging from Day 1 to Day 93) and by clients' post intervention surveys at Month 4 which indicated the level of satisfaction with HM (see below).

Relevant cost elements (e.g., intervention materials, time spent on HM) were identified and recorded. Daily HM activities were monitored using daily activity logs submitted monthly by HCAs and clients (45 clients and 40 clients' HCAs submitted at least 1 month of logs).

Analytic Strategy

Paired t tests were conducted to assess unadjusted mean changes in clients' primary, secondary, and process outcomes between the pre- and post-intervention assessments (two-sided, $\alpha = .05$). Stata 13 (StataCorp, 2013) was used for analysis.

Conventional content analysis and summative content analysis (Hsieh & Shannon, 2005; Patton, 2015) were performed to analyze qualitative responses to open-ended survey questions. Two research assistants identified key themes and developed a codebook independently. When the two disagreed on codes, final codes were determined in consensus with the Principal Investigator. Using the final codebook, one of the two research assistants coded the open-ended survey data and summarized the findings.

Results

Participant Baseline Characteristics

Clients were typically African American and female adults with a mean age of 77 and with limited educational background (Table 1). Most were not currently married and lived alone, but visited or talked with family or friends "often." All had multiple chronic conditions; 57% had experienced a fall in the past 2 years; 91% had Medicare, 56% had Medicaid, 52% had both Medicare and Medicaid; almost one-third had mild cognitive impairment; and 37% were cared for by a family HCA. The length of client-HCA relationships was 22 months on average, up to 9 years. HCA participants were typically African American, single women with a mean age of 49; 48% had multiple chronic conditions, 30% had Medicare, 48% had Medicaid, and 22% had both Medicare and Medicaid.

Clients' Outcomes Improved

The pre- and post- intervention data ($N = 50$) indicated statistically significant improvement in two measures of daily activity function in home care clients: HM6 ($p = .012$) and IADL ($p = .001$; Tables 2 and 3). Other outcomes that significantly improved included physical performance measured by the number of arm curls ($p = .008$) and ankle point and flex ($p = .01$), and SPPB ($p = .001$), especially balance ($p = .009$). Improvement was also seen in self-rated health ($p = .033$), interference with daily activities due to pain ($p = .027$), and reduction in the use of pain medication ($p = .049$) and fear of falling ($p = .036$). Exercise-related social support provided by HCA increased ($p < .001$), but not social support provided by family.

Clients' Participation was High

Clients reported high levels of HM activities in the activity logs (days with HM activities recorded) and the post-intervention survey (days of HM activities during the last 7 days) with 50% ($N = 25$) being exceptionally high (30 days or more recorded in the log and 5–7 days/week at the end of the intervention), 32% ($N = 16$) high (30 days or more in the log, or 2–7 days/week at the end), 16%

Table 1. Baseline Characteristics of Study Participants: Home Care Clients and Their Home Care Aides

	Clients percent or mean (range) *N* = 54	Home care aides percent or mean (range) *N* = 46
Age	77 (63–101)	49 (22–73)
Female	78	91
African American	96	93
High school or higher	69	91
Not married currently	91	85
Live alone	56	20
Often contact with family/friends	67	—
Number of chronic conditions	6 (2–10)	2 (0–6)
Two or more chronic conditions	100[a]	48[b]
Fell in the previous 2 years	57	—
Medicare[c]	91	30
Medicaid[c]	56	48
MMSE[d] 2nd Edition Brief Version	13.9 (8–16)	—
Cared by a family-HCA	37	—
HCA-client relationship (months)	22 (1–108)	—

Notes: [a]Top three chronic conditions in clients: arthritis/rheumatism (85%), hypertension (82%), and vision problems (70%).
[b]Top three chronic conditions in home care aides (HCAs): hypertension (33%), vision problems (29%), and arthritis/rheumatism (24%).
[c]52% of clients and 22% of HCAs were insured by both Medicare and Medicaid. 5% of clients and 43% of HCAs were not insured by Medicare or Medicaid.
[d]Mini Mental State Examination.

(*N* = 8) low, and 2% (*N* = 1) none (did not receive HM from HCA).

HM was Delivered and Received Well

Fidelity data indicated high levels of intervention fidelity: all but one HCAs delivered the HM 8-step process, most clients (98%) received the intervention.

Clients had high levels of satisfaction with HM overall (98%) and with the help they received from HCAs to start HM (98%) and continue HM (94%). The majority (70%) were highly motivated to continue HM beyond the 4-month intervention period (on a scale of 0 to 10, 46% were totally motivated at 10, and 24% highly motivated at 7 to 9). Clients mentioned HM's physical and psychological health benefits as reasons for motivation ("*It makes me feel better, my joints feel better, and I'm able to sleep better at night*"; "*The way I feel once I've done them motivates me to continue to do them. I just feel better in general, more relaxed*"). Others found HM to be instrumental for attaining personal goals ("*I'm not ready to fall apart. I want to stay together as long as I can. I'm trying to do it as long as I can…*"; "*[Exercises] are beneficial and I enjoy them. They're not difficult or burdensome*"). Sixteen percent of clients were moderately motivated (levels 4 to 6 on a 0–10 scale), ambivalent about continuing HM (e.g., "*I know that exercise is good for me but do not usually feel like exercising*"), and 12% were not motivated (levels 0 to 3) because of psychological barriers (*"I am tired and don't feel like it"*) or alternative activities (*"Once I'm healed from my foot I will go back to the gym. I need something more challenging"*).

Clients reported what they liked about HM, including physical and psychological benefits, the whole program or specific moves, specific features (e.g., HM is home-based, HM keeps one busy or alert). Asked about what they did not like about HM, 74% reported nothing, 8% indicated that HM was not challenging enough, and 10% made other comments (e.g., "*I haven't found anything that I didn't like. I am glad to be a part of it*"; "*I wish that I had more strength to do our exercises over the last 4 months. I didn't, due to a hospital visit and not feeling well afterwards"*). Even those who found HM not challenging enough provided positive feedback (e.g., "*The moves and the program made me do something*"; *"That exercises could be done every day, not all exercise programs can be performed daily"*).

Most clients (80%) reported that HM was "just right," 4% that it was "hard" and 16% that it was "too easy". This result indicates that the low intensity exercise was generally challenging enough for most home care clients. Reasons for "just right" included that HM was *"simple, not too hard, and doable"* and *"not burning, not too strenuous."* Reasons for "hard" were mostly health related, such as "*my health has not been great, especially flare-up of asthma made exercises feel harder*" and "*because of the pain and swelling in my legs, it was difficult"*).

Discussion

The pilot study demonstrated the feasibility and promise of partnering with HCAs to promote PA among older home care clients. The intervention was received well by older clients and their HCAs. Clients' self-reported function improved significantly after the intervention. Of note is the significant improvement in clients' function measured in difficulty and dependence in ADLs targeted by the intervention and in IADLs. This finding corroborated with improved physical performance. Enhanced exercise-related social support from HCAs was consistent with our expectation that the intervention would empower HCAs to motivate their clients to start and continue their PA, which in turn would help maintain or improve their clients' function. Other outcomes such as fear of falls, self-reported health, and pain interference also showed improvement. Our results were consistent with Yan and colleagues (2009), which indicated declines in the number of falls and pain among frail older participants of the original case manager-led HM. Our results were also consistent with a small but growing literature on the benefits of home-based exercise programs for frail older adults in terms of less functional decline (Gill et al., 2002; Pretzer-Aboff et al., 2011), improved physical performance

Table 2. Home Care Client Outcome Measures

Outcomes	Measures
Primary outcomes	
Daily activity difficulties and dependency[a]	HM6: Six items[b] targeted by *Healthy Moves for Aging Well*, range 0–12.
	BADL (Basic Activities of Daily Living): Eight items[c], range 0–16.
	IADL (Instrumental Activities of Daily living): Four items[d], range 0–8.
Secondary outcomes	
Physical performance	
Healthy Moves	Number of seated steps in place in 1 min.
	Number of arm curls with a standard 1 lb. weight in 30 s, an average of left and right arms.
	Number of ankle point and flex in 30 s, an average of left and right ankles.
SPPB (Guralnik et al., 1994)	Total score, range 0–12.
	Balance tests, range 0–4.
	Walking speed tests, range 0–4.
	Chair stand tests, range 0–4.
Ankle point & flex difficulty	Self-reported difficulties with ankle point and flex, range 1–3 (not at all, some, a lot).
Self-rated health	General self-rated health, range 1–5 (*poor* to *excellent*).
Pain	A scale adapted from SF36 to measure pain, after taking pain medication if applicable, range 0–10.
Pain interference	Interference with daily activities due to pain (*not at all* to *extremely*), range 1–5.
Pain medication usage	Whether the participants take pain medication (Yes/No).
Fear of falling	Short Falls Efficacy Scale-International (FES-I), seven items, 4-point scale (*not at all worried* to *very worried*), range 7–28 (Kempen et al., 2008).
Falls	Number of falls in the past 4 months.
	Whether any reported falls led to injury that needed medical attention (Yes/No).
Process outcomes	
Exercise-related social support[e]	Frequency of support assessed separately for family or friends, and home care aides. Three items, range 3–9. Adapted from Sallis et al. (1987).

Notes: [a]Two questions were asked for each daily activity. (a) At the present time, how much difficulty (none/some/a lot), on average, do you have doing the task without help from another person? (b) Do you need help from another person to (do the task)? Each activity received a score of 0 (*no difficulty/no help*), 1 (*difficulty but no help*), or 2 (*need help*). Participants' total score was created for each scale. Adapted from Gill et al. (2002).

[b]Pulling or pushing large objects, pouring a drink from a carton, picking up your feet to avoid tripping, walking up one step, walking from room to room, and getting to the toilet.

[c]Walking from room to room, bathing, upper/lower-body dressing, transferring from bed to chair, eating, using the toilet, and grooming.

[d]Shopping by yourself for small items, preparing meals if you already have the ingredients, light daily tasks, and doing laundry.

[e]For example, "During the past 4 weeks, how often did your home care aide exercise with you?" Response categories: 1 (*hardly ever/never*), 2 (*sometimes*) and 3 (*a lot*).

(Gine-Garriga, Roque-Figuls, Coll-Planas, Sitja-Rabert, & Salva, 2014; Vestergaard, Kronborg, & Puggaard, 2008), and reduced mobility decline (Clegg, Barber, Young, Iliffe, & Forster, 2014).

Our pilot study had a number of strengths, including rigorous research and measurement protocols, extensive fidelity checks, and a mixed methods approach. The implementation process produced refined intervention materials and a strong collaborative network of providers, community organizations, state agencies, and academic institutions. The program was implemented with providers and agencies that were receptive to change. Our results make a compelling case for a fully-powered randomized controlled trial to demonstrate the efficacy of the HCA-led HM in home care, which would be critical for dissemination and uptake (Wilson et al., 2011).

This study was limited with a relatively small sample size and a one-group pre-post research design. Further efforts should target recruitment at clients with functional limitations appropriate for HM, incorporate follow-up programs for those who have achieved initial goals or those who have difficulties initiating or continuing the program, and involve clients' families. Given the project's focus on the HCAs' role, it was not surprising that family support for PA did not improve after the intervention. However, one of the HCAs reported that her efforts to promote HM were sabotaged by her client's adult child who believed that PA should be more rigorous than HM to be effective. This case signaled the need to inform family members, for example, by distributing a brochure on HM for the client's family and friends. Long-term outcomes (e.g., use of nursing home, emergency room, hospital and other services) should be explored with the use of external data such as Medicare, Medicaid or state-owned data.

There are challenges to replicating this research. Although the intervention requires few resources, efficacy and effectiveness research in home care is resource intensive. Recruiting and retaining home-bound clients and their HCAs can be challenging (Muramatsu et al., 2015). Understandably, home care clients are often cautious about

Table 3. Clients' Function and Health Before and After the 4-Month Intervention ($N = 50$)[a]

	Baseline	4-Month	
	Percent or Mean (*SD*)	Percent or Mean (*SD*)	*p*-value
Function (primary outcome)			
HM6[b]	5.18 (2.29)	4.32 (2.55)	.012*
BADL[c]	4.08 (3.15)	3.86 (3.60)	.590
IADL[d]	5.86 (2.35)	4.88 (2.62)	.001*
Seated steps in place	93.20 (33.15)	102.31 (38.28)	.054
Arm curls	17.77 (5.06)	19.26 (5.61)	.008*
Ankle point & flex	19.57 (6.28)	21.65 (7.26)	.010*
SPPB[e] total score	4.71 (2.34)	5.40 (2.37)	.001*
Balance tests	2.46 (1.49)	2.90 (1.31)	.009*
Walking speed tests	1.50 (0.80)	1.60 (0.79)	.300
Chair stand tests	0.75 (0.70)	0.90 (0.81)	.110
Ankle point & flex difficulty	1.65 (0.66)	1.51 (0.58)	.090
Self-rated health	2.56 (0.73)	2.84 (0.93)	.033*
Pain score	3.36 (2.62)	3.00 (2.82)	.380
Pain interference	2.32 (0.94)	2.02 (1.13)	.027*
Pain medication usage	68	50	.049*[f]
Fear of falling	15.52 (5.17)	14.10 (5.50)	.036*
Number of falls, 4 months[f]	0.64 (1.55)	0.46 (0.95)	.350
Exercise support from HCA	5.02 (2.04)	7.00 (1.77)	.000*
Exercise support from family	4.10 (1.47)	4.04 (1.48)	.770

Notes: [a]Four SPPB test scores, $N = 48$; Three HM tests (seated steps in place, arm curls, and ankle point & flex), $N = 49$.
[b]HM6—Healthy Moves 6-item scale.
[c]BADL—Basic Activities of Daily Living.
[d]IADL—Instrumental Activities of Daily Living.
[e]SPPB—Short Physical Performance Battery.
[f]The number of people who reported falls that led to injury required medical attention in the past 4 months reduced from 4 at baseline to 0 after the intervention.
*Statistically significant ($p < .05$).

research study invitations from strangers. Researchers must find creative ways to establish the first contact with clients. This can be accomplished through service providers and by working with persons who have trusted relationships with clients, such as HCAs or their supervisors. Initial recruitment messages for frail seniors should be carefully crafted. Mentioning "exercise" could turn away potential participants, because "exercise" tends to provoke an image of vigorous activities, not of gentle PA appropriate for home care clients. Once we established direct contact with participants, the research team quickly built up rapport with them. In particular, our research interviewers gained trust at their first home visits while screening older clients into the study and obtaining informed consent, which facilitated pre- and post-intervention interviews. The research staff's patience and commitment were critical for scheduling visits with frail seniors with fluctuating health conditions. Also, safety precautions are needed for the research staff who visit homes facing economic and social problems. Home-based intervention research with frail persons would require significantly more resources than intervention research in group or facility settings.

Potential challenges for implementation and dissemination exist. Limited and uncertain Medicaid and other public funding for homecare is a barrier. State-to-state variation in the financing and delivery of long-term care in the United States (Muramatsu & Campbell, 2002; Muramatsu et al., 2007; Muramatsu, Yin, & Hedeker, 2010) could require alternative mechanisms to integrate HM into mainstream home care. HM's total program costs can depend on local factors such as state mandates for HCA training. Future research on the program's cost-effectiveness should include sensitivity analysis to allow system-level variation, because evidence for cost-effectiveness would be critical for states and providers to adopt HM in public home care. Another important challenge for scaling up HCA-led HM is that HCAs and their clients could be more diverse than our research participants. Future research should document cases where HCAs or clients are not as ready as typical research participants and develop methods to help them. The program should also be tested with non-English speaking participants and with people with cognitive impairment.

Facilitators for promoting HCA-led HM in real-life home care outweigh these challenges. The pilot demonstrated this intervention's advantages, including low-complexity, lost-cost, and adaptability. HM meets the unmet need of a PA program appropriate for HCAs to bring to frail care recipients. Overall, this pilot program used under 25 dollars in supplies for each older participant and required little HCA time. On the first day, HCAs spent 26 min on average (range: 12–60 min). During the rest of the 4-month intervention period, the majority of HCAs did not report any extra time spent on HM activities. Those who reported extra time ($N = 17$) spent 7 min per day on average (range: less than 1 min to 40 min). In addition, the 4-hour HCA training was conducted as part of the state-mandated HCA training. The model should be transferable to different states or non-Medicaid programs, given that HCA-client dyads constitute the core of HM and home care.

Conclusion

Innovations are more likely to be adopted, implemented, and disseminated when they have unambiguous advantages and are considered less complex and more compatible with the intended adopters' norms and perceived needs (Greenhalgh et al., 2004). The intervention tested in this study promotes an active service model in which HCAs and their clients work together on a safe, gentle PA program to maintain or improve function and independence. Mounting evidence indicates physical and mental health benefits of PA in older adults with disabilities (Bauman, Merom, Bull,

Buchner, & Fiatarone Singh, 2016; Bherer, Erickson, & Liu-Ambrose, 2013; Chou, Hwang, & Wu, 2012; Langlois et al., 2013). Our program has a clear advantage over the current culture of home care that encourages home care clients to be dependent. Our model is compatible with older adults' desire for independent living and with the social policy goal of promoting functioning older adults. It helps align the interests of older adults, HCAs, home care agencies, the labor union that represents HCAs, and federal and state agencies that fund or administer home care programs. The program fills the gap of PA opportunities in the frailest segments of older populations and seeks to shift current health promotion research and practice from an almost exclusive focus on relatively high-functioning disabled seniors to one that is inclusive of seniors who are unable to stand or walk. Staying functional in the community as long as possible and maximizing population health is a common goal for aging societies. HCA-led HM will have fertile contexts for dissemination, not only in Medicaid programs in the United States, but also in other U.S. and global settings.

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Conflict of Interest

None declared.

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