Effects of Nurse Counseling on Walking for Exercise in Elderly Primary Care Patients

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Background. Counseling sedentary primary care patients can increase physical activity, but whether this approach will increase exercise and fitness in elderly adults with chronic diseases remains to be determined.

Methods. After receiving individualized nurse counseling to begin a program of walking for health, 60- to 80-year-old primary care patients were randomized to one of three levels of telephone contacts over 10 months: (i) 20 nurse-initiated calls, (ii) 10 nurse-initiated calls plus 10 motivational calls programmed through an automated phone calling system, or (iii) no program-initiated phone contacts. Self-reported (diary) walking adherence was the primary outcome; other activity, social support, health quality of life, and measured walking performance, mobility, and body mass index and girths were also assessed during the initiation (months 1–6) and maintenance (months 7–10) phases of the trial.

Results. Average adherence for the 181 participants to the goal of walking at least 20 minutes on 3 or more days per week was 44% for initiation and 42% for maintenance. Participants receiving the combination of nurse-initiated personal and automated phone calls walked significantly more frequently than those with no phone contacts. Fitness improved in all three groups; changes were generally correlated with self-reported walking. Having a companion was associated with more frequent walking. Perceived quality of physical and mental health did not change.

Conclusions. Simple and relatively inexpensive nurse contacts can motivate elderly primary care patients to walk for exercise, and this activity is associated with measurable health benefits.

REGULAR physical activity (PA) is associated with lower mortality, even after age 60 (1,2). Regular PA reduces cardiovascular events, prevents or improves management of diabetes, decreases pain and disability from arthritis, decreases risk of bone fractures, decreases risk of depression, and may maintain cognitive function (3–5). These benefits extend even to moderate intensity activity, which can be readily performed by most people, including elderly adults with chronic illness. Walking, for example, is a popular activity for elders and provides health benefits with low risk for injury (6,7).

Epidemiological data suggest that elders are at increased risk for health problems and functional impairment due to low levels of PA (3,8). The most effective way to encourage elderly individuals to increase PA is unclear. Promotion of PA through health care settings is one approach to changing sedentary lifestyles in this age group (9,10). Several recent trials have demonstrated some success in enhancing motivation for exercise and increasing activity through counseling in primary care clinics (11–13). Whether this approach will increase activity and fitness in elderly adults with chronic diseases remains to be determined. Additionally, what level of involvement is required by primary care (14) to motivate and sustain increased levels of activity in elderly adults is unknown.

The Seniors Telephone Exercise Primary Care Study (STEPS) was a randomized clinical trial designed to evaluate the effects over 1 year of three levels of follow-up telephone contacts on adherence to a walking-for-exercise program in elderly patients who had initially received individualized nurse counseling at a clinic visit. One group received 20 nurse-initiated calls, a second received 10 nurse calls plus 10 motivational reminder calls programmed through an automated phone calling system, while the third group received no telephone follow-up. The primary outcome was self-reported adherence to the goal of walking a minimum of 20 minutes at least 3 days per week during initiation (months 1–6) and maintenance (months 7–10) phases of the intervention. Additional outcome measures were obtained to assess the validity of the self-reported exercise and potential benefits from an increased exercise level, including walking test performance, body composition, mobility (gait and balance), and quality of life. We proposed that participants who received telephone follow-up nurse counseling would report greater adherence to the walking goals than participants who received no follow-up calls, and those who received personal calls would report greater adherence than participants receiving a mixture of personal and automated calls.

Methods

The study was conducted at the Department of Veterans Affairs Medical Center (VAMC) in Jackson, Mississippi. The study protocol was reviewed and approved by the institutional review board of the University of Mississippi Medical Center and the Research and Development Committee.
of the VAMC. Informed consent was obtained at the first screening visit, with verbal assent used for telephone prescreening. Participants were paid $15 for completing each visit to help defray their expenses.

Participants

Inclusion and exclusion criteria.—Potentially eligible patients were identified by review of medical records prior to scheduled visits with cooperating primary care providers. A letter was mailed to potentially eligible patients describing the opportunity to participate in a research health promotion program. Patients who expressed interest were contacted by the research nurse for telephone prescreening. Those who met the criteria were scheduled for the first of three baseline (BL) screening visits for determination of eligibility and, after obtaining informed consent, BL measures. Inclusion criteria were 60–80 years of age, enrolled in primary care clinic, noninstitutionalized and independent in activities of daily living, stable health, willing to increase walking for exercise and attend research clinic visits, and satisfactory performance on a 6-minute walking (6MW) test. Patients already walking for exercise at least 20 minutes per day 2 or more days per week on a regular basis were excluded. Other exclusion criteria were developed to ensure the safety of patients in unsupervised walking (Table 1). Each participant’s medical data were reviewed by the nurse practitioner coinvestigator, and questionable issues were resolved by the physician coinvestigator.

Attrition.—Figure 1 shows the patient flow through the study. Of the 475 participants contacted by phone, 253 agreed to be screened. Reasons for failure to be screened included: lack of interest (37%), inability to attend the extra research visits (29%), patient or family health concerns (15%), too active (8%), communication barriers (5%), and various other (6%). Of the 253 who entered screening, 41 (16.2%) were excluded from participation. Exclusions during the screening visits resulted from being too active (46%), lack of interest (32%), various health exclusions (12%), inadequate exercise test performance (8%), and cognitive impairment (4%). Only 31 (15%) of the 212 randomized participants failed to complete the 12-month trial: 11 failed to return to clinic, 14 experienced illness or accidents that precluded further participation in the walking program, and six withdrew. The number failing to complete the study and reasons for attrition did not differ between intervention groups. Thus, 181 (85%) randomized participants completed the trial.

Intervention Procedures

Clinic-based activity counseling.—After completing BL measures, all participants viewed a locally developed motivational and walking/exercise safety video that portrayed older men and women walking in various settings. Participants then set individualized goals for a home-based walking program in a discussion with the nurse and wrote a walking plan. The nurse instructed participants on keeping a weekly walking diary and explained they would receive $1 in Veterans Affairs (VA) canteen coupons for each diary they returned, regardless of how much walking they recorded. Thus, all participants, including those who did not receive follow-up phone calls, were asked to keep walking diaries throughout the study.

Telephone follow-up.—After the intervention components common to all participants were completed, they were randomized to one of the three groups for different telephone follow-up interventions: (i) 20 personal phone calls (PC) over 12 months; (ii) 10 personal phone calls from the nurse interspersed randomly with 10 automated phone calls (P&AC) that delivered a message recorded by the nurse; or (iii) no phone contacts (NC). For the PC and P&AC groups, phone

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Table 1. Exclusion Criteria

<table>
<thead>
<tr>
<th>Uncontrolled hypertension</th>
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<tbody>
<tr>
<td>Coronary bypass surgery within 1 year</td>
</tr>
<tr>
<td>Myocardial infarction within 6 months</td>
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<tr>
<td>Atrial fibrillation or recent-onset arrhythmia</td>
</tr>
<tr>
<td>Congestive heart failure within 6 months, unstable angina</td>
</tr>
<tr>
<td>&gt;30% occlusion of internal carotid artery</td>
</tr>
<tr>
<td>Pulmonary edema within 6 months</td>
</tr>
<tr>
<td>Deep vein thrombosis within 6 months</td>
</tr>
<tr>
<td>Cerebrovascular accident within 6 months</td>
</tr>
<tr>
<td>Severe pulmonary disease with FEV1 ≤ 1.50</td>
</tr>
<tr>
<td>Neuromuscular or joint disorder aggravated by exercise</td>
</tr>
<tr>
<td>Diabetes with hemoglobin A1C &gt; 10</td>
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<tr>
<td>Dialysis or impaired renal function</td>
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<tr>
<td>Severe emotional disturbance or cognitive impairment</td>
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<tr>
<td>Acute depressive episode with suicidal ideation within 6 months</td>
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<tr>
<td>Current substance abuse</td>
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<tr>
<td>Unable or unwilling to communicate with the nurse by telephone</td>
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</tbody>
</table>

Note: FEV1 = forced expiratory volume, 1 second.
contacts were once/week for a month, then decreased in frequency to semimonthly and then monthly. Automated calls were phased in beginning with month 2. The schedule of calls was not predictable. During each 5-minute personal call, the nurse judged the participant’s motivational stage of change (15) and tailored her counseling accordingly using a semistandardized protocol. Automated calls, designed to maintain contact and cue walking in an inexpensive and efficient manner, delivered a brief message recorded by the nurse such as, “This is your STEPS nurse reminding you to keep up your walking . . . the weather is hot now so be sure to drink plenty of water.” These were delivered by a Phone Tree (Personal Communication Systems, Winston-Salem, NC). The nurse explained the follow-up assignment to participants as they completed their counseling. All participants were encouraged to phone at any time if they had questions or concerns.

Measurement and Procedures

Unless otherwise indicated, all measures were obtained at one of the three BL screening visits and at both follow-up visits. Demographics were recorded at BL. Participants returned for follow-up at 6 and 12 months postrandomization. Diary data were censored after month 10 because some participants completed their final visit during month 11 to coincide with another clinic visit and avoid extra travel. The data collector was blinded to intervention group assignment and at the end of the trial was unable to guess individual patient group assignment better than what would be predicted by chance. The nurse was blinded to walking diary adherence data and other self-report follow-up data.

PA and Exercise Behavior

Participants recorded episodes of at least 10 minutes duration walking for exercise in weekly walking diaries. These were sent to the study data collector by mail. Participants received $1 in VA canteen coupons for each week a diary was returned regardless of the amount of walking recorded. For comparability to recent intervention trials, we used percentage adherence as the primary self-reported activity measure (16–20). Average monthly percentage adherence was calculated from the number of walking sessions reported divided by the number of sessions prescribed. For diary walking, any missing data were considered a nonwalking day.

Validation of self-reported walking was performed by contacting the participants’ significant others by telephone to inquire of their knowledge of the participant’s walking. Additionally, a subsample of 51 participants wore accelerometers at the waist programmed to record activity at 3-minute intervals (Tritrac R3D activity monitors; Professional Products, Reining International, Madison, WI) all day while awake between two of the BL visits and preceding either the 6- or 12-month follow-up visit. Use of the monitors proved challenging, and forgetting to wear or return the monitors resulted in missed data for many other participants. Displays of accelerometer activity counts were examined visually for bouts of light-moderate to moderate activity that corresponded in time to recorded diary walking episodes.

As additional assessments of PA, participants were asked by interview to recall, day by day, the minutes walking for exercise during the 7 days preceding the visit. The 7-day Physical Activity Recall (PAR) (21) was administered at BL and 6 months to estimate weekly hours spent in moderate intensity PA of any type. Activity of 3–6 METS was coded as moderate activity (22). The PAR protocol also included an item asking for an estimated total time per day walking for any reason.

Fitness and Health Risk Indicator Outcomes

Demographics and health status.—A demographics questionnaire and simple health history interview supplemented by medical record review was completed at BL. Body composition was assessed by height at BL only and body weight in indoor clothing without shoes; body mass index (BMI) was calculated from these values. Waist and hip circumferences were measured using standardized protocols (23). Alcohol intake was assessed for the week preceding the research visit. Tobacco use history was assessed by self-report; expired carbon monoxide levels at BL for smokers and nonsmokers validated the self-report. The Short Portable Mental Status Questionnaire (24) was administered at BL to screen for cognitive impairment; those who missed more than three items were excluded.

Endurance.—A standardized 6MW test in a climate-controlled, quiet, 100-foot hard-surfac ed hospital corridor was used as a measure of cardiovascular endurance (25–28). The test-retest intraclass correlation coefficient for a subsample of 62 participants tested at two BL visits 3 weeks apart was 0.89, and the mean change in walk distance for this subgroup was 2.4 (95% confidence interval = –40.3–35.5) feet. Some participants also completed a submaximal treadmill test at BL; results were reviewed by the physician coinvestigator to screen for adverse responses to exercise.

Mobility (gait and balance).—The Tinetti performance-oriented assessments of balance and gait (29,30) were used as a means of identifying patients who should be excluded due to high risk for falls and as an outcome measure. STEPS interobserver agreement for a subsample of 20 participants was more than .90.

Falls, injuries, and health care utilization.—Falls with injury, injuries, and illnesses including onset of new symptoms were documented from the medical record and interviews with participants at follow-up visits.

Quality of life.—The physical and mental health summary scores of the Medical Outcomes Study Short Form-36 (SF-36) (31,32) were used to assess participant perceptions of quality of life.

Psychosocial Correlates and Potential Mediators of Adherence

Motivational readiness for regular PA was assessed using an adaptation of the exercise stages of change (33). Perceived social support for exercise was assessed at BL and 12 months by the family and friend social support scales de-
veloped by Sallis and colleagues (34) and by a count of the number of days walking with a companion as recorded in the walking diaries.

Data Analysis Plan

Analyses were based on a modified intention to treat sample (all randomized participants excluding those who withdrew, became ineligible due to health deterioration, or failed to return after screening). We did not impute values for missing data. Analysis of variance (ANOVA) and chi-square procedures were used to evaluate group differences at BL. The effects of participant characteristics identified a priori as potential covariates of adherence outcomes (age, ethnicity, urban vs rural home location, BMI, and tobacco use status) were evaluated in preliminary models. These were all found to be not significant and were not included in subsequent analyses. Most analyses were intervention Group by Time repeated-measures ANOVA using SAS PROC GLM (SAS, Cary, NC), with least squares means used to compare group means for significant effects. Expected associations between adherence and changes in walking with changes in fitness and quality of life were examined with Spearman correlations. Alpha level was set at .05.

RESULTS

Participant BL Characteristics and Success of Randomization

The average age of the 179 male and two female participants was 68.7 years, 28% were minorities, 79.6% were married or cohabiting, 12.7% used tobacco, and they had an average of 3.8 comorbid medical conditions. BL participant characteristics were not different between any of the three treatment groups (Table 2).

Table 2. Selected Characteristics of the Sample at Baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PC</th>
<th>P&amp;AC</th>
<th>NC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>59</td>
<td>62</td>
<td>60</td>
<td>181</td>
</tr>
<tr>
<td>Age, years&lt;sup&gt;1&lt;/sup&gt;</td>
<td>69.3 (4.7)</td>
<td>68.0 (4.4)</td>
<td>68.7 (5.0)</td>
<td>68.7 (4.7)</td>
</tr>
<tr>
<td>Ethnicity, % minority</td>
<td>33.9</td>
<td>32.3</td>
<td>20.0</td>
<td>28.7</td>
</tr>
<tr>
<td>Education, % high school</td>
<td>55.8</td>
<td>40.3</td>
<td>58.3</td>
<td>51.9</td>
</tr>
<tr>
<td>Married or cohabiting, %</td>
<td>81.0</td>
<td>77.4</td>
<td>80.0</td>
<td>79.6</td>
</tr>
<tr>
<td>Home location, % rural</td>
<td>61</td>
<td>46.8</td>
<td>61.7</td>
<td>56.4</td>
</tr>
<tr>
<td>Financial hardship, %</td>
<td>13.6</td>
<td>6.5</td>
<td>6.7</td>
<td>8.8</td>
</tr>
<tr>
<td>Hours worked for pay per week</td>
<td>9.4 (25.5)</td>
<td>5.0 (13.6)</td>
<td>7.8 (6.4)</td>
<td>7.4 (19.1)</td>
</tr>
<tr>
<td>Current tobacco use, %</td>
<td>10.2</td>
<td>14.5</td>
<td>13.3</td>
<td>12.7</td>
</tr>
<tr>
<td>Alcohol use, %</td>
<td>26.0</td>
<td>15.0</td>
<td>19.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Comorbidities&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3.8 (1.6)</td>
<td>3.8 (1.5)</td>
<td>3.9 (1.4)</td>
<td>3.8 (1.5)</td>
</tr>
</tbody>
</table>

Note: PC = personal calls; P&AC = combination of personal and automated calls; NC = no calls initiated by the program.

<sup>1</sup>Mean (SD).

<sup>2</sup>Comorbidities counted were diabetes, coronary heart disease, high cholesterol, arthritis, obesity, hypertension, history of myocardial infarction, and history of stroke.

Self-Reported Adherence to Walking and Validation of Diary Data

Diary records for each of the intervention groups demonstrated that more than half the participants initiated a walking program that met the study goal of walking for at least 20 minutes 3 days a week (Figure 2). Almost half were still walking at 6 months, and about 40% were still recording walking at the goal level at 10 months. Adherence remained relatively stable over time for the PC group but slowly declined for the P&AC and NC groups. Adherence for the P&AC group was significantly better than for the NC group during both the initiation and maintenance phases, and was not significantly different from the PC group. Results were very similar for minimal walking of at least 1 day/week (data not shown).

Within each study phase, there were significant effects for time (month) and phone call group condition. During the initiation phase (months 1–6), adherence declined over time, with significantly better walking during month 1 than the succeeding months, \( F(5,890) = 4.75, \ p = .0003, \ p < .01 \) for differences between month 1 and other least squares means < .01. Throughout this phase, adherence for the P&AC group was significantly better than for the NC group, \( F(2,178) = 5.95, \ p = .003, \ p < .004 \); PC adherence was significantly better than that of PC. Within each phase, adherence was significantly different from the NC group.

During months 7–10 (maintenance phase), there was again a significant effect for time, with adherence for month 7 better than other months, \( F(2,534) = 3.40, \ p = .02, \ p < .01 \) for differences between month 7 and other least squares means < .01; \( p < .01 \); see Figure 2. For adherence to the 3 days/week goal, PC and P&AC groups did not differ, but had better adherence than NC, \( F(2,178) = 4.49, \ p = .01, \ p < .05 \).
difference between P&AC and NC = .004 and \( p \) for difference between PC and NC = .06. Similarly, for the minimal walking of at least 1 day/week, adherence for the telephone contact groups did not differ \( F(1,178 = 4.67) \), \( p = .01 \), but both had better adherence than the group without phone contacts, with \( p \) for difference between PC and NC = .05 and \( p \) for difference between P&AC and NC = .004.

Direct observation or knowledge of walking was confirmed by reports from significant others for 83% of PC, 91% of P&AC, and 71% of NC participants. Accelerometer records from the week preceding the 6- or 12-month follow-up visit for 90 participants indicated bouts of increased activity matching 73% of reported diary walking episodes.

Other Activity and Walking Measures

The other self-reported walking and activity measures indicated improvements for participants in all three groups at the 6- and 12-month assessment visits. Minutes walking for exercise during the past 7 days increased overall from 24.3 (±58.4) minutes at BL to 87.2 (±99.4) minutes per week at 12 months (\( p = .0001 \)). Across time, the P&AC group reported more time walking for exercise than the other two groups (\( p = .002 \)). Total estimated time per day walking for any reason also increased significantly, from 31.5 (±44.4) minutes at BL to 50.2 (±46.6) minutes at 12 months (\( p = .0001 \)). Total weekly hours of moderate intensity PA from the PAR increased from 3.6 ± 4.5 hours at BL to 5.1 ± 6.2 hours at 6 months (\( p = .001 \)). Vigorous PA was infrequent in our sample and was not analyzed. Accelerometer activity counts for the subsample of 51 participants who produced usable records at BL and follow-up were marginally greater at follow-up (\( p = .07 \)).

Psychosocial Correlates and Potential Mediators of Adherence Outcomes

At the 12-month follow-up visit, 64% of PC, 73% of P&AC, and 62% of NC group participants reported being in the “action” or “maintenance” stage of motivational readiness for walking for exercise (not significantly different). The PC intervention group participants perceived significantly less family support for exercise than the other two intervention groups throughout the study (\( p = .05 \)). Unexpectedly, scores for perceived family support decreased for all three intervention groups from BL to 12 months (\( p = .02 \)). Perceived friend support scores, however, increased over time (\( p = .02 \)), with no between-group differences. According to diary notations, 69.5% of participants at least occasionally walked with someone. Those who had a companion at least some of the time walked more often (average adherence 64%) than those who never had a companion (average adherence 36%), \( p = .02 \). The mean (days per month) frequencies of having a walking companion for the three intervention groups across the 10 months were PC = 1.8 ± 3.6, P&AC = 3.1 ± 4.4, and NC = 1.8 ± 3.0 (\( p = .12 \)).

Fitness and Mobility Outcomes

6MW test performance improved from an average 1430 (±359) feet at BL to 1504 (±301) feet at 12 months with no significant differences between groups (\( p = .0001 \)). Change in 6MW distance correlated significantly with self-reported adherence and with changes in time spent walking. Table 3 shows correlations between percentage adherence and changes in walking time and 6MW performance with other outcomes.

Tinetti scores also improved (from 25.4 ± 2.1 to 26.7 ± 2.0) for all groups across time (\( p = .0001 \)), and these improvements were significantly correlated with changes in time spent walking for exercise and changes in 6MW performance.

Body girths decreased with time. Waist circumference decreased from 100.0 ± 12.7 cm at BL to 99.5 ± 13.3 cm (\( p = .03 \)), and hip circumference decreased from 104.3 ± 9.8 cm to 102.5 ± 10.0 cm (\( p = .0001 \)). BMI and weight were unchanged in any group. Change in body girth, weight, and BMI were significantly correlated with changes in time spent walking and change in 6MW (Table 3).

None of the above parameters were different between study groups.

Quality-of-Life Outcomes

There were no significant changes in physical or mental health quality of life as measured by the SF-36 summary scores over the course of this study. Changes in SF-36 physical health summary scores, but not mental health scores,

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**Table 3. Correlations of Diary Adherence and Change in Walking Time With Changes in Fitness and Quality of Life**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Percent Adherence</th>
<th>Weekly Walking Time Change</th>
<th>6-Minute Walk Change</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent adherence</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>.42</td>
<td>.39</td>
</tr>
<tr>
<td>Weekly walking time change, minutes</td>
<td>.43*</td>
<td>—</td>
<td>—</td>
<td>64.93</td>
<td>101.89</td>
</tr>
<tr>
<td>6-minute walk change, feet</td>
<td>.28*</td>
<td>.26*</td>
<td>—</td>
<td>74.83</td>
<td>207.63</td>
</tr>
<tr>
<td>Waist girth change, cm</td>
<td>—.14*</td>
<td>—.25*</td>
<td>—.34*</td>
<td>—.50</td>
<td>3.73</td>
</tr>
<tr>
<td>Hip girth change, cm</td>
<td>—.06</td>
<td>—.18***</td>
<td>—.27*</td>
<td>—.02</td>
<td>3.50</td>
</tr>
<tr>
<td>Body mass index change</td>
<td>—.04</td>
<td>—.16**</td>
<td>—.19***</td>
<td>—.06</td>
<td>1.14</td>
</tr>
<tr>
<td>Body weight change, pounds</td>
<td>—.05</td>
<td>—.16**</td>
<td>—.19***</td>
<td>—.22</td>
<td>3.59</td>
</tr>
<tr>
<td>Tinetti mobility change</td>
<td>.08</td>
<td>.14**</td>
<td>.31*</td>
<td>1.20</td>
<td>2.01</td>
</tr>
<tr>
<td>SF-36 Physical health summary score change</td>
<td>.07</td>
<td>.13**</td>
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<td>10.11</td>
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<td>SF-36 Mental health summary score change</td>
<td>.09</td>
<td>.05</td>
<td>.07</td>
<td>—.71</td>
<td>10.79</td>
</tr>
</tbody>
</table>

*Notes: Changes were computed by subtracting the baseline from the 12-month value. Positive values indicate improvements for 6-minute walking time, walking time, Tinetti mobility, and SF-36 summary scores. Negative values indicate improvements for waist and hip girths, body mass index, and body weight. SF-36 = Short Form-36.

\( p \leq .001 \); \( *p \leq .05 \); \( **p \leq .01 \); Spearman correlations; one-tailed tests of significance.
were modestly correlated with changes in weekly walking time (Table 3).

**Illness and Injury**

As expected, there were many illnesses and new symptoms detected during the trial. There were, however, few injuries. There were no differences in illnesses and injuries in relation to the tertiles of self-reported adherence to walking (Table 4). There was no evidence of a pattern of increased risk associated with increased walking, and no injuries were attributed to STEPS participation.

**DISCUSSION**

Individualized counseling provided by a nurse in a primary care setting led to initiation and maintenance of a self-monitored, home-based walking program in more than 40% of elderly (primarily male) patients willing and physically able to undertake such a program. Brief phone contacts between the nurse and participants resulted in improved adherence to the walking prescription during a 10-month follow-up interval. Using an automated phone calling device to deliver half the follow-up phone contacts was as effective in maintaining adherence as personal monthly calls from the nurse. Independent assessments of adherence to the walking prescription obtained through contacts with family members or through use of an accelerometer confirmed self-reported increases in PA recorded by diaries or at follow-up visits. The walking prescription of at least 20 minutes 3 days a week was associated with improved 6MW test performance, improved mobility and balance, and reduced body girth in this elderly population.

Some studies of home- and community-based exercise with elderly adults have reported adoption and 12-month maintenance rates of more than 70%. Samples in these studies were typically recruited from the community, included more women, were usually younger, were of higher socioeconomic status, and were healthier than our participants (17,35). The only previous study examining the effects of exercise counseling for elderly participants in a primary care setting (12) did not target adherence to a specific type of exercise, so there were no comparable adherence data; however, about 50% of the participants were at the action or maintenance stage of motivational readiness at follow-up, compared to more than two thirds of our STEPS sample.

Changes in the PAR and a measure of general walking (minutes walking per day for any reason) failed to differentiate between the groups. Previous research on activity promotion in medical settings has also found that specific data on adherence or participation are more sensitive to change than general measures of PA (13). Similarly, we found, as have previous studies, that change in PA was associated with changes in physical health, but not mental health, quality-of-life scores (17,36).

It is possible that walking adherence may have been underestimated in our trial. Some participants did not return diaries because they told study staff they disliked the “paperwork.” We coded days with no diary records as not walking, whereas investigators in other studies have pursued diary data by telephoning participants. On the other hand, the validation methods we used (significant other contacts and accelerometer records) suggested the diaries had reasonable validity. The difficulty we had interpreting some of the accelerometer data is consistent with recent reports of variability in the validity of Tritrac R3D activity records (37).

A unique feature of this study is the use of combined human and machine-mediated interventions to increase PA. The combined intervention worked exceedingly well. Participants who received combined human and automated contacts maintained adherence to the walking prescription better than those in the group receiving no contact and were not significantly different from participants receiving human contacts at the same frequency. Additionally, our participants told us they enjoyed getting the recorded messages from the nurse. The nurse found programming the automated calls easy to do. The automated calling machine had other advantages: it could be programmed to call participants after usual clinic hours, and it would keep calling until someone answered, resulting in fewer missed calls. The benefits of the automated telephone contact system and its ability to stimulate continued adherence to the walking prescription equalivent to that obtained with human contacts suggest that the use of this technology should be explored with other health behaviors that may be responsive to brief reminders and continuing contacts.

To our knowledge, this is the first study of a primary care PA counseling program for elderly patients where participants demonstrated improved fitness in association with self-reported improvements in PA. As expected, participants who reported the best adherence demonstrated the most improvement in timed walking distance. Although 6MW performance has been reported to improve as a result of practice, it is unlikely this accounts for our findings, as tests in this study were spaced almost 12 months apart. In addition, no change in walking distance was observed in a subset of 62 participants who repeated the 6MW at an interval of 2–3 weeks at BL. Improvements in mobility and body composition were not well correlated with diary walking days but were correlated with improved walking distance. This may result from the fact that diary walking days did not quantify intensity or duration of activity. This explanation is supported by the significant correlations observed between these parameters and the increase in number of minutes of walking for exercise performed in the past week obtained by recall.
The results for the Tinetti gait and balance measures suggest that elderly men who walk at sufficient frequency, intensity, and duration to improve their performance on the 6MW test also improve slightly on indicators of risk for falls. This is a very encouraging result, as falls are a significant cause of morbidity and mortality in older patients. Our study’s good interobserver reliability and the lack of improvement in participants who did not walk suggest that observed improvements were unlikely to be due only to practice or measurement error.

Reductions in both waist girth and hip girth were also significantly associated with improvement on the 6MW and with increased weekly walking time. The lack of a change in body weight is consistent with research indicating that increased PA in the absence of dietary change does not produce much weight loss (38). Smoking status was not a significant correlate of outcomes in this study. Perhaps smokers who were healthy enough to qualify for STEPS were hardy enough to perform about as well as nonsmokers.

Finally, participants who had a walking companion at least some of the time had the best adherence over the duration of the study. Differences in social support may have contributed to differences in adherence outcomes between our intervention groups. Future PA interventions for the elderly population may be strengthened by encouraging participants to exercise with a partner at least some of the time.

We conclude that elderly primary care patients can be encouraged to initiate and sustain a self-monitored walking-for-exercise program through brief monthly human and automated telephone contacts (levels of participant contact that should be sustainable in a busy primary care practice), and this program will produce demonstrable health benefits.

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