Implementation and Effectiveness of a Community-Based Health Promotion Program for Older Adults

Jeffrey I. Wallace,1,2 David M. Buchner,1,2,3,4 Lou Grothaus,2,4 Suzanne Leveille,4
Lynda Tyll,4 Andrea Z. LaCroix,2,3,4 and Edward H. Wagner2,3,4

1Department of Medicine, University of Washington, Seattle.
2Northwest Prevention Effectiveness Center, University of Washington, Seattle.
3University of Washington School of Public Health and Community Medicine, Seattle.
4Center for Health Studies, Group Health Cooperative of Puget Sound, Seattle.

Background. Because preventing functional decline in older adults is a national priority and senior centers have been identified as potentially important venues for health-promotion activities, a trial of a multicomponent disability prevention program was conducted at a senior center.

Methods. One hundred older adults were recruited for a 6-month randomized clinical trial. All members of the experimental group received an exercise intervention, nutrition counseling, and a home safety assessment. Smoking and alcohol interventions were delivered to at-risk subjects. Outcome variables included the Medical Outcomes Study Short Form (SF-36) health survey, the CES-Depression scale, bed days, and restricted-activity days.

Results. A single study announcement resulted in a response sufficient to recruit 100 subjects. The exercise program was well received: 85% of intervention subjects completed the 6-month program and adherence was excellent, with over 90% attendance at exercise classes. After 6 months the intervention group had significantly better scores on 7 of 8 SF-36 subscales and fewer depressive symptoms than controls.

Conclusions. Senior centers may be excellent sites for community-based health promotion interventions: participation and adherence rates may be acceptable, interventions can be designed that are feasible in this setting, and these interventions appear to affect health status positively. The study program improved physical and psychosocial functioning and is a promising model for preventing functional decline through activities based at senior centers.

The prevention of functional decline and preservation of independence with aging have been recognized as major clinical and policy priorities for the health care of older adults (1). Disability that threatens independence is prevalent in older adults, and the National Institute on Aging estimates that from $54 billion to $80 billion per year is spent on loss of independence, including costs of home and nursing home care (2). While many behavioral and environmental risk factors for functional impairments in older adults have been identified (3–6), research on the feasibility and effectiveness of disability-prevention programs in community settings has been limited. Two recent trials of geriatric assessment and interventions to reduce risk factors for disability did reduce functional decline among community-dwelling elderly, but one involved relatively intensive and expensive home visits (7), while the other was limited to HMO enrollees and showed dissipation of effects over time (8).

Because an estimated 25% of American seniors use senior centers, this setting may offer an attractive site for conducting health promotion activities for older adults (1). The potential for senior centers to provide preventive services was recognized in the Year 2000 National Health Objective 8.8: “to increase to at least 90% the proportion of people aged 65 or older who had the opportunity to participate during the preceding year in at least one organized health promotion program through a senior center” (1). The purpose of this pilot study was to evaluate the feasibility and efficacy of delivering an integrated disability-prevention intervention at a neighborhood senior center. This study builds upon prior work in an HMO setting demonstrating that a modest intervention to reduce targeted risk factors for disability could lower the incidence of functional decline and falls (8). The intervention in this trial has been intensified by the addition of a supervised exercise program, and the study setting has been moved to a community senior center. The long-term goal of this research is to develop and test a cost-effective and practical community-based disability-prevention intervention for older adults.

METHODS

Study Design

We conducted a 6-month randomized controlled trial of a disability-prevention program among users of a suburban senior center. The intervention group received a multiple risk-factor intervention with exercise as the central component. After the 6-month trial the exercise intervention was opened to all subjects: controls were allowed to join the exercise sessions, and intervention subjects were allowed to continue, as desired.
Study Setting and Community Survey
The study was based at the Northshore Senior Center, a community senior center run by Seattle–King County Senior Services. A random sample survey of 750 individuals age 65 years and older living in the catchment area of the senior center was conducted to evaluate how senior center users and study participants compared to older adults living in the same neighborhood. The community survey was conducted by telephone (and in person for those unable to respond by phone) and included questions about lifestyle, service needs, life concerns, and measures of physical, social, and emotional health. The survey response rate was 58%. Approximately 25% of survey respondents identified themselves as users of the Northshore Senior Center. All study subjects completed a similar questionnaire.

Subject Recruitment
Subjects were recruited by a single advertisement in the Senior Center newsletter and a notice on the center bulletin board. To enhance recruitment, potential subjects were informed that the exercise intervention would be made available to all study participants after the 6-month trial ended. Subjects were eligible if they were age 65 or over and ambulatory. Potential subjects were invited to the senior center for screening tests and a brief evaluation by a study physician in order to identify individuals too disabled, too cognitively impaired, or too ill to participate in the trial. Specific exclusion criteria included legal blindness; a timed “Up and Go” test (9) greater than 30 s (time to rise from a chair, walk 3 m, and return to the chair); a score of less than 24 on the Folstein Mini-Mental State exam (10); a myocardial infarction or change in angina pattern in the past year; presence of other medical conditions that precluded or contraindicated exercise (i.e., end-stage heart or lung disease, recent deep venous thrombosis, severe degenerative joint disease requiring joint replacement, severe inflammatory arthritis). In addition, each subject’s primary physician was contacted to ascertain if he or she had concerns about the patient’s participation.

Two hundred eight older adults responded to the advertisement, more than enough to meet the recruitment goal of 100, and thus the last 39 respondents were never screened. Of 169 screened, 30 were ineligible (18 due to age under 65 years old; 5 due to acute illness; 4 due to severe cardiac disease; 2 due to their physician advising against enrollment; and 1 due to mobility problems); 39 declined participation (“too busy,” “too far,” etc.); and 100 were randomized (53 to the intervention group and 47 to the control group).

Data Collection
Information obtained at baseline, 2 months, and 6 months included demographic data, tobacco and alcohol use, self-rated health status, measures of activity and exercise, and the following study outcome measures: all eight Medical Outcomes Study Short-Form 36 (SF-36) health assessment scales (physical functioning, role limitations due to physical health, role limitations due to emotional problems, social activity limitations due to health, bodily pain, mental health index, energy/fatigue, and general health perceptions) (11), the CES-Depression scale (12), and physical disability as measured by self-reported restricted-activity days (days in the past year that usual activities were restricted due to illness or injury) and bed days (days in the past year spent in bed due to illness or injury). Although these self-report measures of activity and bed days rely upon subject recall, they have been shown to be valid and responsive measures of physical disability among older adults (13,14).

Interventions
All intervention group subjects received a 30- to 60-min visit at the senior center with a registered nurse to review risk factors for disability, develop a targeted health promotion plan, and introduce the supervised exercise program. The nurse and subject reviewed baseline data, focusing on current exercise habits, alcohol and tobacco use, dietary habits, and home safety issues. The CAGE questionnaire (15) was administered to subjects who reported drinking alcohol three or more days a week or ingesting three or more drinks on any single occasion in the past month. Individuals reporting drinking problems or answering yes to two or more CAGE questions were urged to seek evaluation for alcoholism by their physician or other alcohol treatment services in the community. Those scoring zero or one on the CAGE received a pamphlet that highlighted both the pharmacologic effects of alcohol in older adults and behavioral strategies for limiting use (16). The smoking intervention involved referral of current smokers to smoking cessation classes in the community and/or the choice of two self-help programs. All intervention subjects received nutrition tip sheets that emphasized four areas: fiber and carbohydrates; fats and cholesterol; calcium and sodium; calories and water. Home safety evaluations, which emphasized reducing risks for falls, were performed using a self-administered hazard checklist (17). To increase compliance with suggested interventions, the study nurse contacted subjects by telephone at 2, 4, and 16 weeks to review the subject’s progress toward goals, motivate continued behavior change, and identify problems with compliance.

The exercise program was conducted in groups of 10–15 by a trained exercise instructor and consisted of a 60-min exercise session, 3 times a week, for 6 months. Each workout took place at the senior center and included a 10-min warm-up phase that incorporated balance exercises, 15–20 minutes of strength training, 20 min of walking/aerobic activity, and a flexibility and cool-down phase.

Statistical Analysis
Study participants were compared to community survey respondents with two-tailed t tests for continuous variables, and chi-square tests for binary variables (utilizing SAS and SPSS 6.1 software). Similar analyses were performed to compare study participants randomized to the intervention and control groups for baseline differences. Outcome data from the 2- and 6-month evaluations were analyzed using two-tailed t tests for unadjusted comparisons of intervention and control group means, and with regression analysis and analysis of covariance to compare adjusted group means after controlling for baseline age, gender, race, mari-
tal status, income, education, self-perceived health status, if hospitalized in the past 12 months, and the baseline level of the outcome variable under analysis.

RESULTS

Characteristics of the 100 randomized study subjects and the community survey respondents are shown in Table 1. Nearly all were White and relatively highly educated. Study participants were generally similar to community survey respondents who used the neighborhood senior center except that study subjects were younger, performed more volunteer work, and less often reported poor or fair health. Study subjects were also similar to community residents who did not use the senior center in many demographic and health status measures, including restricted-activity days, CES-D scores, and 7 of 8 SF-36 subscales (data not shown), although study subjects were younger, more often female, less often smokers, less often rated their health as poor or fair, and had a trend toward less hospitalizations in the past year ($p = .08$). Study subjects were also about twice as likely to participate in social activities (club meetings, volunteer work) than community residents who did not use the center. For subjects in the randomized trial there were no significant differences between the control and intervention group in baseline characteristics, except that the study control group was slightly older than the intervention group (Table 2).

Table 1. Demographic and Health Status Characteristics of Study Participants and Community Survey Respondents*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Study Participants (n = 100)</th>
<th>Community Survey Respondents (n = 282)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean)</td>
<td>71.9</td>
<td>74.4†</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>73%</td>
<td>73%†</td>
</tr>
<tr>
<td>Race (% White)</td>
<td>99%</td>
<td>97%†</td>
</tr>
<tr>
<td>Marital status (% married)</td>
<td>59%</td>
<td>66%†</td>
</tr>
<tr>
<td>Income (median)</td>
<td>$24,250</td>
<td>$21,330</td>
</tr>
<tr>
<td>Education (median years)</td>
<td>14.1 yr</td>
<td>13.6 yr</td>
</tr>
<tr>
<td>Hospitalized in past 12 months (%)</td>
<td>12%</td>
<td>19%†</td>
</tr>
<tr>
<td>Restricted-activity days/past year‡</td>
<td>36%</td>
<td>36%†</td>
</tr>
<tr>
<td>Bed days/past year§</td>
<td>24%</td>
<td>25%‡</td>
</tr>
<tr>
<td>CES-D score (0 best, 60 worst)</td>
<td>12.4</td>
<td>12.1†</td>
</tr>
<tr>
<td>Currently smoking (%)</td>
<td>1%</td>
<td>3%‡</td>
</tr>
<tr>
<td>Exercising 3 times/week (%)</td>
<td>37%</td>
<td>38%†</td>
</tr>
<tr>
<td>Attend weekly clubs/meetings (%)</td>
<td>43%</td>
<td>41%†</td>
</tr>
<tr>
<td>Volunteer ≥ once/month (%)</td>
<td>57%</td>
<td>42%‡</td>
</tr>
<tr>
<td>Fair or poor self-perceived health (%)</td>
<td>2%</td>
<td>15%‡</td>
</tr>
</tbody>
</table>

* Differences between study participants and center users or between study participants and non-center users are not significant ($p > .05$) unless otherwise noted.
† Classification based on whether respondents said they did or did not use neighborhood senior center.
‡ Percent reporting usual activities were restricted ≥ 1 day in the past year due to illness or injury.
§ Percent reporting staying in bed ≥ 1 day in the past year due to illness or injury.
$^P < .05$ for comparisons to study participants.
$^P < .01$ for comparisons to study participants.

Ninety percent of the subjects completed the 6-month trial. Of the 10 subjects who dropped out, 8 were in the intervention group and 2 in the control group. Both controls dropped out because of illness. Reasons for dropping out among the intervention group were illness (2), injury (1, not study related), no longer interested (3, all of whom quit within the first 2 weeks of the trial), moved (1), and prolonged vacation (1). Both control subjects and 6 of the 8 intervention subjects who dropped out did so within the first 2 months of the trial. Baseline health and functional status scores for the 10 subjects who dropped out were not significantly different from the 90 who completed the trial, except that dropouts scored significantly lower on the SF-36 social function subscale.

Among the 45 subjects who remained in the intervention group, attendance at the thrice-weekly exercise classes was over 90%. After the 6-month trial period ended, 51% of controls joined the supervised exercise program and about half of intervention subjects continued to attend the exercise classes. Three subjects fell during the exercise routine. Two of these three subjects did not seek any medical attention or miss any subsequent classes; the third did see a physician and missed one class before resuming without further incident. Very few subjects "risked in" for the smoking (1% were current smokers) or the alcohol (8% were identified as potential problem drinkers) interventions, thus limiting compliance and outcome evaluations for these interventions. Nurse follow-up phone interviews with par-
Participants indicated that 92% had read the nutritional tip sheets, 83% reported that they were useful, and 90% reported meeting some or all of their nutritional goals.

Table 3 shows that nearly all the outcome measures improved over the 6-month follow-up period in the intervention group, and declined in the control group. Significant differences in unadjusted data were present between intervention and control groups at 6 months in 7 of 8 SF-36 subscales, and in the CES-D scale. Scores on the remaining SF-36 subscale and in bed days also favored the intervention group, but did not reach statistical significance. Adjustments for baseline differences in demographic variables, health, and functional status did not materially change these results—effect sizes were reduced slightly but remained statistically significant with one exception (bodily pain). Figure 1 depicts mean adjusted percent differences in SF-36 subscale scores between the intervention and control subjects at baseline, 2, and 6 months. This figure indicates that much of the differences observed between groups was evident at 2 months, with continued, but generally smaller, incremental improvements noted at 6 months. Figure 2 illustrates that the differences observed between groups in SF-36 subscale scores at 6 months were consistently due to improvements among intervention subjects combined with declines among controls. The overall adjusted effect sizes for the SF-36 subscales ranged from 10% to 30%; effect sizes were similar for both physical- and psychosocial-oriented SF-36 subscales.

DISCUSSION

This pilot study demonstrates the feasibility and efficacy of providing a health-promotion and disability-prevention program in a community senior center. Straightforward recruiting efforts were successful in attracting older adults to this study, and the disability-prevention program was readily implemented and well received at the senior center. The 90% attendance at the exercise classes and the significant percentage of controls who joined (and intervention subjects who continued) the exercise class after the 6-month trial ended demonstrated the high level of enthusiasm for the exercise program. The disability-prevention program was safe and made a significant impact on most of the study outcome measures by 6 months. The intervention group subjects improved in all SF-36 subscales while the controls declined, suggesting that the intervention served not only to avoid declines that otherwise might prevail among older adults, but also enhanced physical and psychosocial function.

Although prior exercise-based health-promotion interventions have been shown to improve specific physiologic (and to a lesser extent psychologic) measures in seniors (18,19), to our knowledge this study is one of the first to demonstrate a significant impact on SF-36 scores. Mechanistically, this pilot study attempted to prevent or reduce functional decline by changing certain behaviors, particularly physical activity, for which much evidence suggests an important role in the maintenance of health and function (20). Other risk factors addressed were alcohol misuse, smoking, poor nutrition, and the presence of home safety hazards. However, the low prevalence of other risk factors in the study population strongly suggests that it was the exercise component that most impacted health and functional status. It is also possible that the involvement with the study nurse and/or the social activation associated with regular attendance at the senior center contributed to the observed benefits.

While previous trials of exercise-based health promotion interventions have demonstrated short-term benefits on strength and function (18,19), positive disability-prevention effects may become attenuated with time (8). Lasting changes in health-related behaviors may be necessary for beneficial effects to be maintained following discontinuation of such interventions. The relatively short follow-up period

<table>
<thead>
<tr>
<th>SF-36 subscales</th>
<th>2 Months (Unadjusted)</th>
<th>6 Months (Unadjusted)</th>
<th>6 Months (Adjusted)†</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention</td>
<td>Control</td>
<td>p Value</td>
</tr>
<tr>
<td>Physical function</td>
<td>83.6</td>
<td>78.0</td>
<td>.10</td>
</tr>
<tr>
<td>Role limitations—physical</td>
<td>71.1</td>
<td>54.4</td>
<td>.03</td>
</tr>
<tr>
<td>Role limitations—emotional</td>
<td>82.2</td>
<td>73.3</td>
<td>.16</td>
</tr>
<tr>
<td>Social functioning</td>
<td>88.1</td>
<td>78.9</td>
<td>.04</td>
</tr>
<tr>
<td>Bodily pain</td>
<td>71.9</td>
<td>63.7</td>
<td>.05</td>
</tr>
<tr>
<td>Mental health</td>
<td>81.4</td>
<td>75.7</td>
<td>.05</td>
</tr>
<tr>
<td>Energy/fatigue</td>
<td>68.3</td>
<td>61.0</td>
<td>.04</td>
</tr>
<tr>
<td>General health perceptions</td>
<td>78.7</td>
<td>70.2</td>
<td>.02</td>
</tr>
<tr>
<td>CES-D score (0 best, 60 worst)</td>
<td>6.0</td>
<td>8.2</td>
<td>.06</td>
</tr>
<tr>
<td>Restricted-activity days‡</td>
<td>20.7</td>
<td>16.5</td>
<td>.72</td>
</tr>
<tr>
<td>Bed days§</td>
<td>0.16</td>
<td>1.93</td>
<td>.01</td>
</tr>
</tbody>
</table>

*Sample sizes (both groups): 2 months = 92; 6 months (unadjusted) = 90; 6 months (adjusted) = 83.
†Means adjusted using analysis of covariance to control for baseline age, gender, race, marital status, income, education, self-perceived health status, if hospitalized in the past 12 months, and the baseline level of the outcome variable under analysis.
‡Mean number of days in the past year that usual activities were restricted due to illness or injury.
§Mean number of days in the past year stayed in bed due to illness or injury.
of this pilot study limits inferences regarding the persistence of benefits over time. Further research with longer-duration follow-up is needed to determine which interventions will best impact function and, perhaps more important, which interventions can provide sustained effects that will truly delay the onset of disability in older adults.

Other potential study limitations include incomplete subject follow-up. Although the overall dropout rate of 10% was fairly low, most (8 of 10) of the subjects who did not complete the 6-month trial were in the intervention group. No dropouts were related to adverse effects of the intervention. The subjects who dropped out did not differ significantly in their baseline physical health or function measures from those completing the trial except that they scored lower on the SF-36 social function subscale. This suggests it may have been the social aspects of the exercise class that did not appeal to some. That 3 of 8 intervention dropouts quit the study due to “lack of interest” within the first 2 weeks of the study further supports this explanation. Although the introduction of some bias cannot be fully excluded, because dropouts had similar baseline health to participants in both groups, it is unlikely that the differential dropout rate among controls and intervention subjects meaningfully affected the study findings.

Caution in generalizing the results of this pilot study, conducted at a senior center serving a predominantly White, relatively well-educated community, is warranted. While the community survey results found that study subjects shared numerous characteristics with older adults residing in the senior center catchment area, the survey response rate of 58% raises the possibility that the data from survey respondents might not be fully representative. Further, although similar to survey respondents in many health and demographic characteristics, study subjects were younger, less likely to report poor or fair health, and more likely to be engaged in social and volunteer activities, all suggesting that they were somewhat healthier than their counterparts in the community. Prior research suggests that more socially active, better educated, and more affluent people with healthier lifestyles tend to participate in health programs for older adults, while those most in need of assistance stay at home (21,22). Concerted efforts will be needed to attract less educated, less affluent individuals with less healthy lifestyles to senior centers, and to their health-related activities (23,24). Although some success in attracting frailer, at-risk elders to senior centers for health promotion activities has been demonstrated (25), it is likely that some high-risk populations will require alternative strategies (e.g., proactive phone follow-up or home-based programs) to access and engage in disability-prevention interventions.

The use of existing community-based sites such as senior centers is appealing because home-based efforts tend to be more costly to implement and maintain, and senior centers may offer advantages in terms of social activation and other resources that can be accessed on site (e.g., meal programs). As a first step toward demonstrating the feasibility and effectiveness of a senior center-based disability-prevention program, this pilot study did not attempt to target high-risk seniors for recruitment. We hope to address some of these generalizability concerns through ongoing research with a similar intervention in a larger, more diverse population of older adults.

The ease of implementation and effectiveness of this pilot study intervention suggests that a community-based disability-prevention program featuring supervised exercise may be a viable means to meeting some of the Healthy People 2000 goals to enhance function in older adults. The study intervention, conducted at an existing senior center, did not require large additional expenditures of resources and was readily integrated into the center’s activity programs. The social and intellectual activities already offered at senior centers may further enhance their health-promoting potential. The use of well-accepted facilities in the community, such as senior centers, to offer effective health-promotion and disability-prevention programs may be an important opportunity to reach large segments of the older adult population.
ACKNOWLEDGMENTS

This work was supported in part by grants from the Centers for Disease Control and Prevention (R48/CCR002181), from the National Institute on Aging (U01/AG09095 and R01/AG10943), and by the Department of Veterans Affairs (Health Services Research and Development Service). Dr. Wallace is the recipient of an Academic Award from the National Institute on Aging (K08/AG00615).

The authors are indebted to Don Bushnell for superb data management and statistical analysis; Lyn Holt, Fae Newman, and Jane Goodman for their excellent work in the field; Donald Patrick for his contributions to the community survey questionnaire; and Marianne Logerfo for helping to establish this research project at the Northshore Senior Center.

Address correspondence to Dr. Jeffrey Wallace, Harborview Medical Center, 325 Ninth Ave, Box 359755, Seattle, WA 98104. E-mail: irving@u.washington.edu

REFERENCES


Received October 7, 1996

Accepted April 23, 1997