Community Exercise Program Use and Changes in Healthcare Costs for Older Adults

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Background: Regular exercise is associated with many health benefits. Community-based exercise programs may increase exercise participation, but little is known about cost implications.

Methods: A retrospective, matched cohort study was conducted to determine if changes in healthcare costs for Medicare-eligible adults who choose to participate in a community-based exercise program were different from similar individuals who did not participate. Exercise program participants included 1114 adults aged ≥65 years, who were continuously enrolled in Group Health Cooperative of Puget Sound (GHC) between October 1, 1997 and December 31, 2000 and who participated in the Lifetime Fitness (exercise) Program© (LFP) at least once; three GHC enrollees who never attended LFP were randomly selected as controls for each participant by matching on age and gender. Cost and utilization estimates from GHC administrative data for the time from LFP enrollment to December 31, 2000 were compared using multivariable regression models.

Results: The average increase in annual total healthcare costs was less in participants compared to controls (+$642 vs +$1175; p=0.05). After adjusting for differences in age, gender, enrollment date, comorbidity index, and pre-exposure cost and utilization levels, total healthcare costs for participants were 94.1% (95% confidence interval [CI], 85.6%–103.5%) of control costs. However, for participants who attended the exercise program at an average rate of ≥1 visit weekly, total adjusted follow-up costs were 79.3% (95% CI, 71.3%–88.2%) of controls.

Conclusions: Including a community exercise program as a health insurance benefit shows promise as a strategy for helping some Medicare-eligible adults to improve their health through exercise.
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Introduction

Higher physical activity levels are associated with lower mortality from coronary heart disease, hypertension, type-2 diabetes mellitus, stroke, obesity, osteoporosis, and mental health disorders.[1–3] In addition, balance and resistance training protect against falling and fractures in older adults.[3,4] Because chronic disease burden, disability, and healthcare utilization increase with age,[5] older adults may benefit significantly from exercise adoption. Intervention studies in older adults show that group-based community exercise programs can increase time spent exercising, frequency of exercise, and aerobic capacity.[5,6] However, group-based community programs often require direct payment of fees for facility use or instruction. If such programs were at least cost-neutral when included as a health benefit by an insurance provider, they might be more accessible to older adults, who may in turn achieve potentially meaningful health benefits.

Few economic analyses have been conducted in the United States that compared the impact of exercise promotion strategies with costs.[7–9] Only one cost study was identified that focused specifically on a community-based exercise program for older adults,[7] but lack of a control group and inability to confirm baseline comparability between groups weaken its validity. Given this limited information about cost implications of community exercise programs, the current study analyzed healthcare costs and utilization for individuals participating in a community-based exercise program in west-

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ern Washington—the Lifetime Fitness Program© (LFP). LFP is a widely disseminated, group-based program currently offered to community-dwelling older adults through 35 senior centers in the Seattle/Puget Sound area. The program was designed to increase health and function of relatively sedentary but independently living adults by providing endurance, strength, balance, and flexibility training that can be incorporated into a self-maintained home program. Since October 1998, Group Health Cooperative of Puget Sound (GHC) has paid the charge-per-visit for all of its Medicare-covered enrollees who elect to participate in LFP sessions. Therefore, this study was conducted to determine if changes in healthcare costs or utilization for Medicare-eligible enrollees of a large health maintenance organization (HMO) are related to their choice to participate in a community exercise program that is offered as a health benefit.

Methods

Study Setting and Participants

GHC is a large mixed-model HMO in Washington State. Two matched cohorts were sampled from patients aged ≥65 years who were continuously enrolled in GHC between October 1997 and December 2000. The exposure cohort included all eligible GHC enrollees who participated in the exercise program at least once. A frequency matching procedure based on age and gender was used to select three enrollees, who had never participated in the exercise program, to serve as controls for each program participant.

Data Sources

Inpatient utilizations, primary care visits, and three summary cost variables (total, inpatient, and primary care) were chosen for comparison. Although total healthcare costs include additional categories such as emergency costs, pharmacy costs, and long-term care costs, exploratory analyses were limited to two categories that represent major domains of both inpatient and outpatient health care. Primary care costs were selected because a more general "outpatient" cost summary was not available. Primary care costs include all direct and indirect costs associated with visits or telephone calls by primary care or preventive medicine personnel that are related to either direct patient care, or to preventive services or risk factor reduction counseling. Each cost summary measure was obtained from GHC administrative data, which have been used extensively for prior research.[10–12] The source of cost estimates was the Decision Support System (DSS), which integrates clinical information, units of service, and actual costs from the general ledger for 15 separate feeder systems. GHC identifies all costs as either direct patient care costs or overhead costs (those shared by more than one department). All overhead costs are fully allocated to individual patient care departments. Departments captured in the database include medical staff, nursing, pharmacy, laboratory, radiology, hospital inpatient, and community health services. Units of service are weighted by relative value units for ancillary departments, technical relative value units for radiology, College of Anatomical Pathology units for laboratory, and visit length for outpatient visits. From this process, the precise cost for each unit of service delivered is then calculated, and costs are assigned to patients based on units of service used.

To compare outcome differences after visiting the exercise program, all costs and utilizations occurring between the index date (date of the first LFP visit) and December 31, 2000 were used. Controls were assigned index dates that were identical to their matched participant. Because the duration of follow-up varied according to each individual's index date, follow-up primary care visits and all healthcare costs were expressed as average annual values per person.

Data Analysis

Potential confounders considered a priori included differences in age, gender, health status, index date, baseline lifestyle, readiness to change lifestyle, and cost and utilization levels before the index date. A comorbidity index known as the Chronic Disease Score (CDS)—based on automated pharmacy data, age, and gender—was used to adjust for possible health status differences. The CDS has been shown to predict total healthcare costs over a 6-month period and has been found to correlate with hospitalization and death in adult GHC enrollees.[13] Adjustment was made for differences in average costs resulting from different lengths of follow-up and differences in calendar time by including index date in each regression model. Cost and utilization levels before visiting the program were determined from the interval between October 1, 1997 and each individual's index date. October 1, 1997 was chosen as a starting date because it provided at least 1 year of baseline data before GHC began to offer the exercise benefit in October 1998. Baseline measures were annualized similar to follow-up values. Information regarding baseline lifestyle habits, such as physical activity, diet, and tobacco use, as well as level of motivation to change lifestyle, was unavailable from computerized GHC records. Therefore, all adjusted cost and utilization comparisons reported here are average estimates for individuals with the same age, gender, chronic disease profile, and pre-exposure costs and utilization, at comparable points in time.

Healthcare cost data are highly skewed and often demonstrate a variance proportional to the square of the mean (gamma distribution). To analyze cost data, gamma regression with a log-link function was used to explicitly take this nonconstant variance into account.[14] Similarly, Poisson regression was used to compare utilization counts between individuals in each group. For analyzing inpatient costs, where a large percentage of individuals had no related expenses during the follow-up period, a 2-part model was used.[14] For this approach, logistic regression was first used to estimate the relative odds of having any inpatient costs and then gamma regression was used to compare inpatient costs only for individuals in each group who had any costs. Because individuals with and without inpatient costs may inherently be quite different, 2-part models were not combined into a single point estimate, but each result was instead reported and interpreted separately. In all regressions, robust standard errors that did not require the distributional assumptions to be exact were used. A dummy variable for exposure status was used to estimate the cost and utilization differences between

Table 1. Study sample characteristics before visiting the exercise program

Characteristic	Controls (n=3342)	Participants (n=1114)	p-value[a]
Demographics			
Age	74.9	75.0	0.77
Gender (% female)	75.3	75.3	-
Comorbidity measures			
Chronic Disease Score[b]	$5150	$5190	0.73
Serum HDL cholesterol (mg/dL)	56.3 (n=1016)	55.7 (n=408)	0.48
Serum triglycerides (mg/dL)	185.5 (n=683)	185.9 (n=281)	0.96
Hemoglobin A1C in diabetic participants (%)	7.78	7.73	0.68
Utilization summary measures			
Percent hospitalized during baseline period[c]	14.7%	16.5%	0.13
Annual primary care visits	4.4	5.3	<0.001
Cost-summary measures			
Annual total healthcare costs	$3933	$4407	0.032
Annual inpatient costs[d]	$3512	$3374	0.71
Annual primary care costs	$589	$717	<0.001

[a]Unadjusted comparisons using t-test for unequal variance (continuous variables) or chi-square test (dichotomous variables); comparable p-values were found when Poisson (utilization) or gamma (costs) regression analyses were used to adjust for possible differences in index date.
[b]The Chronic Disease Score is expressed as predicted 1-year costs. Higher costs represent higher comorbidity; similar costs suggest similar comorbidity levels.
[c]Baseline period varies by index date of enrollment. Average duration of baseline period was 18.3 months for both participants and nonparticipants.
[d]Average annualized inpatient costs for persons who had inpatient costs.
HDL, high-density lipoprotein.

study groups. Because this study was interested primarily in differences in total healthcare costs between program participants and controls, and because all subgroup analyses were purely exploratory, statistical tests were not adjusted for multiple comparisons. All statistical procedures were conducted using Stata, version 7.0 statistical data analysis software (Stata Corporation, College Station TX, 2000). All protocols were approved by the Institutional Review Boards of both the University of Washington and Group Health Cooperative of Puget Sound.

Results

Baseline Characteristics

Average annual total healthcare costs before exercise program participation were about $475 higher in participants than controls (Table 1). A large part of this difference was attributable to higher primary care use. On average, exercise program participants had about one additional primary care visit and $129 greater primary care costs annually before starting the program. Notably, similar CDS between groups suggests that differences in costs were unlikely because of major comorbidity differences.

Unadjusted Comparisons Between Participants and Controls

The mean follow-up interval for all participants was 20.7 months. Over this period, 98.4% of controls had at least some healthcare costs, 94.3% had primary care costs, and 18.9% were admitted to the hospital at least once. Average total costs for all participants were less than for controls ($5049 versus $5107), but differences were not statistically significant (p=0.82) (Table 2). However, because participants had higher costs at baseline, the mean increase in annual total healthcare costs after visiting the exercise program was significantly less than for controls (+$642 versus +$1175; p=0.05). During follow up, 15.1% of exercise program participants were admitted to the hospital at least once. Thus, the percentage of individuals hospitalized during the follow-up period was 3.8% (95% CI, 1.4%–6.3%) lower in participants than in controls. In addition, average annual inpatient costs for the 352 (31.6%) participants who had inpatient costs were $836 (95% CI, $86–$1587) lower than for the 1033 (30.9%) controls with inpatient costs.

Adjusted Comparisons Between Participants and Controls

After adjusting for possible differences in age, gender, index date, CDS, and each of the pre-exposure cost and utilization variables (Table 2), total costs for all participants were $301 lower (95% CI, $735 lower–$179 higher) than for controls. The adjusted follow-up risk of hospitalization was 4.9% (95% CI, 2.5%–7.1%) lower in participants than in controls (Number needed to attend at this level to prevent one hospitalization [NNT] 20; 95% CI, 14–40), and adjusted inpatient costs for participants were $708 lower (95% CI, $1336 lower–$76 higher) than controls.

Table 2. Costs and utilization after visiting the exercise program					
	Controls	Program participants (n=1114)[a]			
Outcomes	(n=3342)	Unadjusted		Adjusted[b]	
Utilization summary measures	Mean	Mean	p-value	Mean	p-value
Percent hospitalized during follow-up[c]	18.9%	15.1%	0.004	14.0%	<0.001
Annual primary care visits	4.8	6.0	<0.001	5.3	<0.001
Cost summary measures					
Annual total healthcare costs	$5107	$5049	0.82	$4806	0.21
Annual inpatient costs[d]	$3975	$3138	0.04	$3267	0.074
Annual primary care costs	$719	$898	<0.001	$819	<0.001

[a] p-values derived using robust standard error estimates from gamma (costs) or Poisson (utilizations) regression analyses.
[b] Average follow-up costs or utilizations for participants from multiplying average control values by the ratio of participant/control values derived from multivariate regression models that adjusted for age, gender, index date, Chronic Disease Score, and baseline measures.
[c] Follow-up period varies by index date of enrollment. Average duration of follow-up period was 20.7 months in both participants and nonparticipants.
[d] Values and comparisons based on average annual inpatient costs for only those individuals who had any inpatient costs.

Effects of Program Attendance Rate

Average exercise program attendance over the follow-up period was 0.94 visits per week. However, 50% of participants had fewer than about 3 visits monthly. No information was available on how program attendance related to total physical activity levels of participants, but it is unlikely that meaningful health benefits would occur after only a few visits. For this reason, participants were separated into higher- and lower-use subgroups, and each of these subgroups was compared with controls to explore if outcome effects varied by frequency of program use. It was felt that the average program attendance rate was a reasonable place to divide these two subgroups, so higher users were defined as having average attendance rates of ≥1 visit per week; lower users had average attendance rates of <1 visit per week.

Members of the higher use subgroup (n=473) comprised 42.5% of all participants and had an average attendance of 1.74 visits per week over the follow-up interval. Lower users (n=641) attended at an average rate of 0.35 visits per week. At baseline, both subgroups had similar age, gender, and CDS compared to controls. Similar to all users, each subgroup had significantly more baseline primary care visits when compared to controls (high users 4.9 visits, low users 5.7 visits, controls 4.4 visits). There were no other important baseline differences in any other cost or utilization measures between higher users and controls. Compared to controls, lower users had higher annualized total healthcare costs ($4535 v $4004; p=0.05), a higher percent hospitalized (18.1% v 14.7%; p=0.03), and higher annualized primary care costs ($626 v $761; p<0.001) before first visiting the exercise program.

Adjusted follow-up cost comparisons between controls and each subgroup are presented in Figure 1. Compared to controls, higher users had significantly lower total healthcare costs (20.7% lower, 95% CI, 11.8%–28.7%). Among higher users, the adjusted follow-up hospitalization risk was 7.9% (95% CI, 4.5%–10.6%) lower than in controls (NNT 13; 95% CI, 9–22);

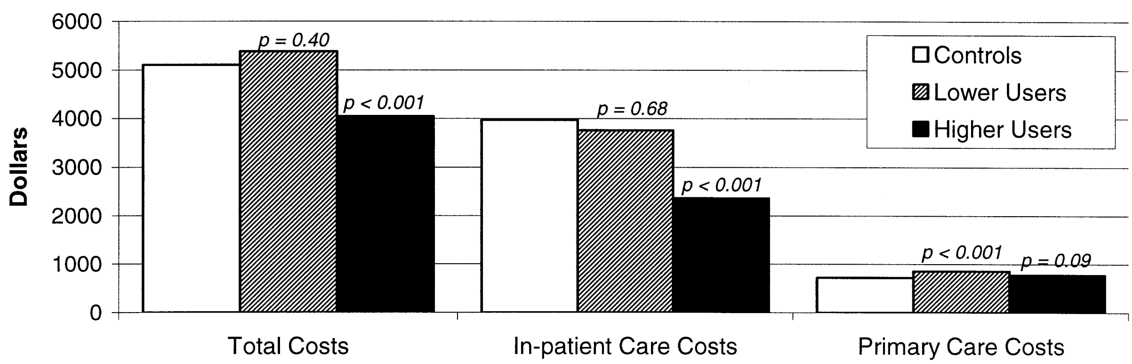

Figure 1. Adjusted annual healthcare costs by level of exercise program use. Note: p-values are for comparisons between each use-group and controls; p-values derived using robust standard error estimates from gamma regression analyses that adjusted for age, gender, index, date, Chronic Disease Score, and baseline cost and utilization levels. Inpatient cost comparisons based only on individuals who had any inpatient costs during the follow-up period; total and primary care cost comparisons based on all individuals. Average costs for participant subgroups estimated by multiplying average control costs by the cost ratio from each gamma regression analysis.

annual inpatient costs for higher users were 40.5% (95% CI, 20.4%–65.5%) lower than controls. Similar to follow-up comparisons between all participants and controls, lower users had no significant differences in total healthcare costs and had higher primary care visits and costs compared to controls.

Discussion

Major Findings

In this study, Medicare-covered HMO enrollees who participated in a community-based exercise program had smaller increases in annual total healthcare costs than similar enrollees who did not participate (+\$642 v +\$1175; p=0.05). Although no significant differences were found in adjusted total healthcare costs between all exercise program participants and nonparticipants, participants had significantly fewer hospitalizations and displayed a strong trend toward lower inpatient costs compared to nonparticipants. In addition, it was found that higher program attendance (≥1 visit per week) was associated with significantly lower healthcare costs and utilization for most of the major summary measures studied. Higher users had adjusted annual total healthcare costs that were \$1057 (95% CI, \$603–\$1466) lower, an adjusted risk of hospitalization that was 7.9% (95% CI, 4.5%–10.6%) lower, and adjusted annual inpatient costs that were \$2068 (95% CI, \$1042–\$3345) lower than controls. It is notable that these promising effects in higher users were observed at a relatively low attendance rate (average 1.74 visits/week) and under normal daily operating conditions of this program.

Limitations

Although adjustments for differences in age, gender, comorbidity, date of enrollment, and baseline differences in major healthcare cost and utilization measures were made, the authors were unable to adjust for possible differences in other lifestyle factors that might have made an impact on healthcare use. For example, because primary care utilization might be largely patient determined, more primary care visits by program participants might suggest that there could be additional important behavioral differences between participants and controls. Participants that seek out more healthcare contact might be more motivated to comply with medical treatments, increase physical activity, quit tobacco, and improve diet. These behaviors may result in lower healthcare costs over time regardless of exercise program attendance. Because health behavior information is not routinely recorded in this healthcare setting, the authors were unable to adjust for potential differences in behavioral characteristics between groups. In addition, it is important to note that subgroup analyses relating higher program use with lower healthcare costs could result if some participants were capable of more frequent exercise simply because of fewer health problems during follow up. Although the authors tried to control for comorbidity differences at baseline using the CDS, it was impossible to determine if subsequent changes in health status may have resulted in, or from, exercise participation. It is also important to note that this additional potential source of confounding only affects subgroup analyses where participants essentially defined their own "dose." The authors chose to conduct "dose–response" analyses despite these limitations because exploratory sub-analyses among higher users help to generate hypotheses about the magnitude of effects that might actually be anticipated after exercise program adoption and adherence.

Implications

To the authors' knowledge, this is the first analysis that shows differences in actual healthcare costs between participants and nonparticipants in a well-established community exercise program. Because this is a single observational study, no attempt to conduct a detailed analysis of potential cost savings, which could result from widespread adoption of this exercise program within GHC or a comparable healthcare organization, was made. However, a brief analysis suggests that cost savings might be substantial. GHC currently contributes approximately \$30,000 in annual administration fees to help maintain LFP, independent of the number of enrollees who participate, as well as an additional \$1.90 charge per enrollee per visit. These program costs are paid from an annual operating budget that is not included in any of the cost summary measures reported in this analysis. Using these figures, it is possible to estimate the cost savings to GHC for each enrollee who becomes a program participant ("Cost savings" = [Annual healthcare cost for nonparticipants − annual healthcare cost for participants] − [\$30,000/total number of participants] −[\$1.90 × number of visits per participant]). If it is assumed that nonparticipants who start to attend the program at a rate equal to the mean rate of all participants in the study (49 visits per year) will have total healthcare cost reductions of \$301 (95% CI, \$735 decrease–\$179 increase), then with 1000 new participants, the organization might save about \$178 (95% CI, \$612 saved to \$302 spent) per participant per year. Although this calculation does not include costs of marketing the program, it also does not consider numerous potential health benefits attributable to increased physical activity that may not be reflected by changes in total healthcare costs over this relatively short follow-up period. Alternatively, if it is assumed that total healthcare costs for enrollees who adopt and attend LFP at a rate equal to the mean rate for higher users in the study (90 visits per year) will decrease by \$1057 (95% CI, \$603–\$1466), then the organization might save about \$856 (95% CI, \$404–\$1265) per participant per year with 1000 new participants. In addition, the same equation suggests that it would take only 34 (95% CI, 23–70) participants at this higher use level before the program might begin to produce any cost savings for the organization.

This study alone cannot definitively determine if community exercise participation by older adult health plan enrollees leads to decreases in total healthcare costs, or if strategies by healthcare organizations to increase program participation might lead to even greater organizational cost savings. However, the results argue in support of conducting more detailed economic comparisons in the context of future prospective studies of community-based exercise programs. Future work should also attempt to define the impact of different factors that contribute to community program use and disuse. In addition, describing the specific intermediate clinical outcomes that might explain healthcare cost reductions, such as types of hospitalizations that might be avoided during regular program use, will help to clarify if associations between program use and healthcare costs observed here are causal. Further study in this area can advance our understanding of how community programs might help older adults to achieve exercise-related health benefits. This knowledge could promote efforts by healthcare organizations to develop partnerships with community exercise resources that might offer, at worst, cost-neutral strategies to help curb the growing burden of chronic illness in our aging population.

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