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Healthcare Cost Differences with Participation in a Community-Based Group Physical Activity Benefit for Medicare Managed Care Health Plan Members

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Abstract

OBJECTIVES—To determine whether participation in a physical activity benefit by Medicare managed care enrollees is associated with lower healthcare utilization and costs.

DESIGN—Retrospective cohort study.

SETTING—Medicare managed care.

PARTICIPANTS—A cohort of 1,188 older adult health maintenance organization enrollees who participated at least once in the EnhanceFitness (EF) physical activity benefit and a matched group of enrollees who never used the program.

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MEASUREMENTS—Healthcare costs and utilization were estimated. Ordinary least squares regression was used, adjusting for demographics, comorbidity, indicators of preventive service use, and baseline utilization or cost. Robustness of findings was tested in sensitivity analyses involving continuous propensity score adjustment and generalized linear models with nonconstant variance assumptions.

RESULTS—EF participants had similar total healthcare costs during Year 1 of the program, but during Year 2, adjusted total costs were $1,186 lower (*P*=.005) than for non-EF users. Differences were partially attributable to lower inpatient costs (−$3,384; *P*=.02), which did not result from high-cost outliers. Enrollees who attended EF an average of one visit or more per week had lower adjusted total healthcare costs in Year 1 (−$1,929; *P*<.001) and Year 2 (−$1,784; *P*<.001) than nonusers.

CONCLUSION—Health plan coverage of a preventive physical activity benefit for seniors is a promising strategy to avoid significant healthcare costs in the short term.

Keywords

aged; exercise; health promotion; healthcare costs; health maintenance organization; insurance

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Healthcare expenditures for seniors are projected to increase more than three times as fast as the U.S. gross domestic product over the next 25 years.[1,2] Much of the growth in healthcare spending is attributable to increased diagnosis and more-intensive management of leading chronic illnesses.[2] Chronic illnesses are on the rise, in part, because of increasing trends in unhealthy lifestyle behaviors, including physical inactivity.[3-8] Physical inactivity increases with age; only 39% of adults aged 65 and older report participating in regular moderate or vigorous physical activity, compared with approximately 50% of adults aged 35 to 54.[9]

In an attempt to lower expenditures without restricting coverage, some health plans are expanding prevention benefits to include formal physical activity and weight-management programs that target behaviors most closely linked to the development and progression of chronic disease. These programs provide behavioral skills, social support, and problem solving to promote participation in healthier lifestyles well beyond just attendance in formal program sessions.

Because lifestyle interventions can be costly to finance, health plans have great interest in assessing whether coverage of a physical activity benefit is financially sustainable. Past research in this area has been limited.[10–20] One strategy used in past research to assess financial sustainability was to determine whether the health benefits attributable to a program translated into lower future healthcare expenditures. These prior studies have been limited by short follow-up periods (6–12 months) or a lack of available data to address potential sources of bias and confounding when programs are offered in real-world settings. The healthcare costs of older adult Medicare managed care beneficiaries participating in an elective, community-based group exercise program called LifetimeFitness (now EnhanceFitness (EF)) were compared with those of a cohort of otherwise similar health plan enrollees who did not participate.[10] Total annualized healthcare costs of users and nonusers were similar, but members who used the program at least once per week on average had significantly lower total and inpatient healthcare costs than nonusers.[10]

That prior study adjusted for differences in other member-level demographic and clinical characteristics associated with differences in future healthcare costs, but the approach had some important limitations. First, data were available only to evaluate average differences in healthcare costs for the first 12 months after enrollees began participating in the EF program. Because many of the expected health benefits of physical activity participation take time to accrue, the 12-month time frame may have been too short to identify meaningful health improvements that could lead to lower future costs. Second, data regarding the propensity of individual enrollees to engage in healthy and preventive behaviors were not available. Members who take an active interest in preventive services are more likely to participate in an elective physical activity benefit and may be more likely to have lower future healthcare expenditures, regardless of EF use. Thus, this new study was conducted to extend our prior analyses by examining the association between EF participation and healthcare utilization and costs beyond 1 year and incorporating information about the use of other preventive services to reduce the potential for residual confounding and selection bias.

METHODS

Study Setting and Participants

This retrospective cohort study was conducted with members of Group Health Cooperative of Puget Sound (GHC), a large mixed-model health maintenance organization in Washington state that enrolls nearly 60,000 Medicare beneficiaries. All Medicare enrollees who were aged 65 and older, were enrolled in GHC between October 1, 1997, and December 31, 2004, and elected to participate in EF at least once were sampled (1,676 members).

EF is a group-based exercise program that meets three times per week and is offered to community-dwelling older adults at more than 30 community-based sites in the Seattle/ Puget Sound area. Certified fitness instructors teach the program, which is designed to increase health and functional abilities of relatively sedentary older adults. All classes follow a standardized format of 5 minutes of warm up, 20 to 25 minutes of moderate-intensity aerobics, 20 minutes of resistance strength training, and 10 minutes of flexibility and balance training. In addition to providing direct supervision of light-to-moderate to moderate physical activities, the EF program provides regular ongoing contact with health plan members to build self-efficacy and experience with new physical activities and to provide social support to promote participation in healthier lifestyles that are expected to extend well beyond attendance in formal program sessions.[21] Since October 1998, GHC has paid the per-visit costs for all of its Medicare-eligible enrollees who elect to participate in the EF program.

Using a 3:1 age- and sex-frequency-matching procedure, 5,027 members who met the age and enrollment criteria for EF but did not attend a single visit were identified as controls. Each EF participant was assigned an index date equating to the first day of the month in which they first visited an EF class. Similarly, the same index date was assigned to each matched control to create similar pre-exposure and follow-up time periods. After excluding members who had baseline long-term care utilization, who were missing RxRisk comorbidity indicator data, who disenrolled from the health plan, or who were missing total cost data during the first year after their index date, the final sample consisted of 1,188 EF users and 2,462 matched controls. RxRisk is a measure of chronic disease burden and comorbidity that has been previously shown to explain as much variation in total healthcare costs as ambulatory care groups.[22,23] Institutional review boards at the University of Washington and Group Health Cooperative of Puget Sound approved the study protocol.

Measures and Data Sources

The primary analysis addressed the effect of EF participation on differences in total healthcare costs over 2 years. Secondary measures of program effectiveness included inpatient hospitalization and costs, primary care visits and costs, and specialty care visits and costs. The source of cost estimates was the GHC administrative Decision Support System, which integrates clinical information, units of service, and actual costs from the general ledger for 15 separate feeder systems. GHC identifies all costs as 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 using 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 cost for each unit of service delivered is then calculated, and costs are assigned to patients based on units of service used. To provide estimates that reflect present-day healthcare costs, all costs were scaled to 2005 U.S. dollars using consumer price index multipliers specifically for the medical care sector.[24]

The independent variables included age and sex, RxRisk, an indicator of whether an enrollee had any arthritis visits in the previous year, indicators of whether they were included in GHC's heart disease or diabetes mellitus disease registry, and baseline (pre-index) cost and utilization. GHC programmers used age, sex, and pharmacy utilization data for a 6-month period before the index date to calculate RxRisk values for each member.[23] A “prevention score” was also constructed for each individual, based on the sum of the number of times a member received colon cancer screening (fecal occult blood test or flexible sigmoidoscopy), a screening mammogram, prostate cancer screening, an influenza vaccine, or a pneumococcal vaccine during the 2 years preceding the index date (range 0–8).

Data Analysis

Ordinary least squares (OLS) regression was used to model utilization and costs, because OLS generates unbiased treatment effect estimates in large data sets (≥500 observations), even when assumptions about normality and homoskedasticity are not met.[25] For analyzing inpatient costs, when a large percentage of individuals had no related expenses during the follow-up period, a logistic model was first used to compare proportions hospitalized, and then an OLS model was used to estimate inpatient costs only for individuals who had one or more inpatient utilizations. A dummy variable was entered for EF exposure status in each model to estimate the cost and utilization differences between study groups. In all regression models, covariates were included for age, sex, RxRisk, prevention score, inclusion in the GHC heart disease and diabetes mellitus registries, history of any arthritis visits, and the baseline value of the dependent utilization or cost variable. Adjustment for baseline cost or utilization outcome differences addressed the potential for confounding and is a method to avoid bias from regression to the mean.[26]

Because many of the health benefits of physical activity are likely to have a dose-dependent relationship,[27,28] an evaluation was performed to test if regular use of EF (≥1 visit/week) was associated with lower healthcare costs, when compared to members who were nonusers (controls) or lower-level users. Average attendance per week was calculated by adding all EF visits across the year and dividing by 52. “Higher” EF use was defined as 52 or more visits in the first 12 months after the index date (i.e., an average rate of 1 visits/week), because this was congruent with the definition used in a prior analysis of EF.[10] All remaining EF users (those with average attendance <1 visit/week) were classified as “lower” users.

The partial regression coefficient for EF use from each OLS regression model was added to (or subtracted from) the unadjusted mean outcome value for EF nonusers to obtain the adjusted means for EF users. All presented *P*-values are from OLS models and use robust standard error estimates that did not require distributional assumptions to be exact.

Statistical procedures were conducted using Stata 9.0 statistical data analysis software (Stata Corp., College Station, TX).

Sensitivity Analyses

Two sensitivity analyses were performed. First, models were rerun using a propensity score (PS) quintile with regression adjustment approach to improve balance in observed covariates and reduce potential selection bias,[31] based on a logit model to generate each patient's propensity of being in the high or low EF user subgroups. The PS was then entered as an additional covariate in the regression models, but inclusion did not change the statistical significance or relative magnitude of estimates for any cost or utilization outcomes. Thus, non-PS-adjusted models are presented to provide the most straightforward estimates of absolute cost and utilization differences between groups.

Second, cost and utilization outcomes were estimated using generalized linear models with a gamma (costs) or negative binomial (utilization) distribution assumption and a log-link function to assess whether the choice of estimation approach affected the results.[29] There were no major differences in the magnitude or statistical significance of cost or utilization effects, so the OLS model results are presented in the remainder of this article.

RESULTS

EF users and controls were of similar age and sex and had comparable comorbidity (RxRisk) scores (Table 1), although EF users were somewhat more likely to be in the GHC heart disease registry (20.4% of EF users; 16.8% of controls; P=.007) and to have any arthritis visits (19.6% of EF users; 16.6% of controls; P=.02). EF users also had approximately 0.5 more visits to primary care and to specialty care providers (P<.001). Moreover, they received 0.5 more preventive services (2.3 vs 1.8; P<.001) over the 2 years before EF use. Annual total healthcare costs at baseline for EF users were approximately $586 higher than for controls ($5,963 vs $5,377; P=.048), with more than half of this cost difference attributable to higher primary care and specialty care costs.

Cost and Utilization Difference Between All EF Users and Controls

Predicted differences in costs and utilization summary measures between all EF users and matched controls are shown in Table 2. During the first 12 months after their index date, EF users had a lower hospitalization rate but more primary care visits and higher primary care costs than members who never used EF; total and specialty care costs over the first year were not significantly different between groups. During the second year (13–24 months after the index date), EF users still had higher predicted primary care costs than controls, but they had significantly lower inpatient and total health-care costs (difference: controls–EF users= $1,186; P=.005).

Effect of Attendance Level on Cost and Utilization Differences

Of the 1,188 EF users, 539 (45%) had an average of one or more visits per week during the first 12 months of use. During this period, lower EF users had more predicted primary and specialty care visits and higher primary care costs than nonusers; total, inpatient, and specialty care costs were similar (Table 3). Conversely, higher EF users had no difference in predicted primary care and specialty care visits but significantly fewer hospitalizations (13.6% vs 14.3%; P<.001), lower adjusted specialty care costs, and lower adjusted total healthcare costs ($1,929 lower; P<.001) than nonusers over the same time period.

The delayed effects of EF use were next explored by comparing healthcare cost and utilization data for members who were high or low EF users during Year 1 and remained continuously enrolled in GHC for a second full year (13–24 months after the index visit date). During Year 2, participants who had been lower EF users during Year 1 continued to have more predicted specialty care visits and higher primary care costs than nonusers. Lower EF users also had significantly lower inpatient costs than controls, but specialty and total healthcare costs were similar. During Year 2, higher EF users continued to have significantly fewer hospitalizations (12.9% vs 13.4%; *P*=.009) and lower predicted total healthcare costs ($1,784 lower; *P*<.001) than nonuser controls.

DISCUSSION

Medicare managed care members who elected to participate in a community-based physical activity benefit (EF) had similar predicted total healthcare costs in the first year after visiting the program and significantly lower total costs (~$1,200 lower; *P*=.005) in the second year than age- and sex-matched health plan members who did not participate. These differences were largely attributable to significantly lower inpatient costs for EF users that were not simply explained by differences in high-cost outliers.

Evidence was also found of a program "dose" effect. After adjustment, lower EF users had more primary and specialty care visits than nonusers and similar total costs during the 2 years after their first EF visit. Conversely, more-frequent users of EF had fewer hospitalizations and lower total healthcare costs than nonusers during the first 12 months after beginning EF and persistent differences in total healthcare costs during the second year after beginning the program. In the absence of strong randomized trials demonstrating improvements in health after initiation of a community-based physical activity health benefit, these findings may be the most compelling evidence available that health plan coverage and use of a preventive health benefit by seniors can help to improve health and return short-term cost savings.

This study had some notable limitations. First, information was available only about the number of EF visits for each user and not about other sources of physical activity participation. As such, the current analysis cannot disentangle the benefits of EF visits from changes in physical activity occurring outside of the program, nor can it differentiate differences between higher use for short periods (e.g., visits twice per week for 6 months) from more consistent use at lower frequencies (e.g., visits once per week for 12 months). However, because EF program sessions meet approximately once weekly, it is likely that changes in lifestyle behaviors that occur outside of formal program visits may mediate potential health benefits resulting from EF program use. Changes in physical activity and other lifestyle behaviors have been observed in prior research of lifestyle interventions that do not include supervised physical activity and may result from the development of behavioral skills and social support in association with regular program visits.[30] Regardless of the exact mechanism for how EF use might improve the health of participants, exposure to this program appears to be a strong independent predictor of lower future healthcare expenditures in older adults. Second, information was not available about all variables that might confound associations between EF use and healthcare consumption (e.g., tobacco use, diet, other sources of physical activity). To reduce confounding and selection bias, covariate adjustment with several indicators of comorbidity, health status, and past use of elective preventive services was used. Sensitivity analyses were also performed using PS quintiles with adjustment, and similar results were obtained.[31,32] Although these data offer robust information about overall health and the prevention-seeking profile of each member, it is always possible that these methods were incomplete in adjustment for selection bias. Third, reverse causality is possible when exposure (the frequency of EF visits) is determined over the same period as the outcome (healthcare costs and utilization). To avoid reverse causality, healthcare cost and utilization outcomes were compared during Year 2 for groups with different EF "dosage" levels during Year 1 (i.e., before the measurement of outcomes). In adjusted models, members using EF at least once during Year 1 had total costs during Year 2 that were $1,186 ($P$=.005) lower than those of nonusers; those who used EF at least once per week during Year 1 had total costs during Year 2 that were $1,784 ($P$<.001) lower than those of non-users.

Given the ability of this analysis to incorporate longitudinal cost data and to use more-robust health plan data to adjust for differences in overall health-seeking behaviors of members, the results of this study provide the strongest evidence available to date that health plan efforts to offer coverage for an elective, group-based physical activity benefit for older adult members has the potential to offer return on investment in the short term. The potential for cost recovery will depend highly on the per-member costs of offering the program and the proportion of participating members who use the benefit regularly. Although greater program use will generate higher charges from EF program sites, these analyses suggest that savings may be possible only with regular program use. Thus, one unanswered question arising from this study is whether efforts to increase program participation by non-use and low-use members will result in similarly lower total healthcare costs as those observed in elective high users. Because efforts to promote higher program use are likely to generate additional costs for a health plan, it will also be worthwhile to consider the extent to which reduced future healthcare costs will offset additional programmatic costs (i.e., to promote adoption and maintenance). Answering these questions in the context of a large, group-randomized trial would require numerous health plans and considerable evaluation resources and is, thus, not likely to be forthcoming. To address these issues in a more-practical context, it will be important for health plans to collect information about the costs invested in efforts to increase use of community-based lifestyle benefits, as well as all cost inputs required to offer such a program for its members. Until then, this study provides valuable information for policy makers who may be considering whether to provide coverage for a community-based, group physical activity benefit for older adults.

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Table 1

Baseline Sample Characteristics

Characteristic	Controls (n = 2,462)	EnhanceFitness Users (n = 1,188)
Demographic		
Age, mean	75.4	75.7
Female, %	77.0	75.5
Comorbidity measures		
RxRisk comorbidity score, $*	2,770	2,676
High-density lipoprotein cholesterol, mg/dL, mean	56.1 (n = 855)	57.3 (n = 473)
Triglycerides, mg/dL, mean	200 (n = 564)	178 (n = 328)
Hemoglobin A1c, mg/dL, mean†	7.5 (n = 323)	7.4 (n = 132)
Diabetes mellitus, %	14.2	12.1
Existing cardiovascular disease, %	16.8	20.4
Any arthritis visits, %	16.6	19.6
Utilization measures		
Hospitalized, %	10.1	10.4
Primary care visits/year, mean	4.9	5.5
Specialty care visits/year, mean	2.9	3.4
Prevention score, mean‡	1.8	2.3
Cost measures, 2005 dollars, mean		
Total	5,377	5,963
Inpatient§	11,929	11,656
Primary care	914	1,082
Specialty care	789	949

*A measure of chronic disease burden and comorbidity that has been previously shown to explain as much variation in total healthcare costs as ambulatory care groups.

†Only for individuals in diabetes mellitus registry.

‡Prevention sum is the total of preventative services that the individual used in the previous 2 years (see text; range 0–8).

§For individuals who had any inpatient utilization.

Table 2

Predicted Annual Adjusted Costs and Utilization After at Least One Visit to the EnhanceFitness (EF) Program

Outcome	Controls	EF Users	Mean Difference (EF Users–Controls)	*P*-Value
Year 1, n*	2,462	1,188		
Utilization measures				
Hospitalized, %	14.3	13.9	−0.4	.002
Primary care visits, mean	5.1	5.4	10.4	.006
Specialty care visits, mean	3.0	3.1	10.1	.22
Cost measures, $, mean				
Total costs	7,260	6,594	−666	.12
Inpatient costs†	13,273	14,117	1844	.69
Primary care	970	1,043	173	.03
Specialty care	945	904	−41	.44
Year 2,*,†	1,718	968		
Utilization measures				
Hospitalized, %	13.4%	13.2%	−0.2%	.07
Primary care visits, mean	5.3	5.4	10.1	.54
Specialty care visits, mean	3.2	3.4	10.2	.10
Cost measures, $, mean				
Total costs	7,979	6,793	−1,186	.005
Inpatient costs†	14,125	10,741	−3,384	.02
Primary care	990	1,091	1101	.03
Specialty care	1,032	980	−52	.32

Note: Predicted adjusted follow-up costs or utilization for participants from ordinary least squares (OLS) regression models adjusted for age, sex, prevention sum, RxRisk (chronic disease score), any arthritis visits, diabetes mellitus registry, heart registry, and baseline measure for dependent variable. *P*-values derived using robust standard error estimates from OLS (cost and utilization) or logistic (% hospitalized) regression; all costs in 2005 U.S. dollars.

*Year 1 comparisons include all members (2,462 controls; 1,188 EF users) with cost and utilization data available continuously or months 0 to 12 after the index date. Year 2 comparisons include all members (1,718 controls; 968 EF users) included in the Year 1 sample with cost and utilization data available for months 13–24 after the index date.

†Inpatient costs only or individuals who had any inpatient utilization during the Year 1 (or Year 2) evaluation period.

Table 3

Predicted Annual Adjusted Costs and Utilization 0–12 Months After One or More Visits to the EnhanceFitness (EF) Program, According to Level of EF Program Use During Year 1

Outcome	EF Nonuser Controls	EF Lower Users*	Mean Difference (Lower Users–Controls)	*P*-Value (Lower Users–Controls)	EF Higher Users*	Mean Difference (Higher Users–Controls)	*P*-Value (Higher Users–Controls)
Year 1, n*	2,462	649			539		
Utilization measures							
Hospitalized, %	14.3	14.2	−0.2	.26	13.6	−0.7	<.001
Primary care visits/year	5.1	5.8	+0.7	<.001	5.1	+0.03	.86
Specialty care visits/year	3.0	3.4	+0.4	.01	2.9	−0.2	.23
Cost measures, $							
Total costs	7,260	7,632	+372	.55	5,331	−1,929	<.001
Inpatient costs†	13,273	14,566	+ 1,293	.62	13,125	−148	.96
Primary care	970	1,102	+ 132	.003	972	+ 2	.96
Specialty care	945	1,033	+88	.23	748	−197	<.001
Year 2, n*	1,718	527			441		
Utilization measures							
Hospitalized, %	13.4	13.3	−0.1	.71	12.9	−0.5	.009
Primary care visits/year	5.3	5.7	+0.4	.15	5.2	−0.2	.52
Specialty care visits/year	3.2	3.5	+0.3	.04	3.3	+0.1	.67
Cost measures, $							
Total	7,979	7,289	−690	.19	6,195	−1,784	<.001
Inpatient†	14,125	10,580	− 3,545	.04	11,041	− 3,084	.076
Primary care	990	1,099	+ 109	.04	1,082	+92	.16
Specialty care	1,032	1,045	+ 13	.84	900	−132	.04

Adjusted follow-up costs or utilization for participants from ordinary least squares (OLS) regression models that adjusted for age category, sex, prevention sum, RxRisk (chronic disease score), any arthritis visits, diabetes mellitus registry, heart registry, baseline measure for dependent variable, high user (Y/N), and low user (Y/N). Nonusers are the reference group.

P-values derived using robust standard error estimates from OLS (cost and utilization) or logistic (% hospitalized) regression.

All costs in 2005 U.S. dollars; lower users had mean attendance of < 1 visit/week; higher users had mean attendance of ≥1 visits/week during Year 1.

*Year 1 comparisons include all members with cost and utilization data available continuously for all months 0 to 12, following the index date; Year 2 comparisons include all members included in the Year 1 sample and having cost or utilization data available for all months 13–24 following the index date.

† Inpatient costs only for those individuals who had any inpatient utilization during the 12-month time window.