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Authors
LEVEILLE, SUZANNE G
LaCROIX, ANDREA Z
HECHT, JULIA A
et al.

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The Cost of Disability in Older Women and Opportunities for Prevention

SUZANNE G. LEVEILLE, R.N., M.N.,[1] ANDREA Z. LaCROIX, Ph.D.,[1,2] JULIA A. HECHT, Ph.D.,[2]
LOUIS C. GROTHAUS, M.S.,[2] and EDWARD H. WAGNER, M.D., M.P.H.[2,3]

ABSTRACT

Although women's life expectancy exceeds that of men, older women bear a higher burden of morbidity and disability. The purposes of this study were to determine the association between physical disability and levels of health care use and costs in older women and to investigate several potential risk factors for the development of physical limitations that may be amenable to clinical and public health interventions. The study population was 1337 women aged 65 and older who were members of a large health maintenance organization and who agreed to participate in a randomized controlled trial of health promotion interventions. Level of physical function at baseline was measured by the number of reported restricted activity days during the past year and by a six-item physical function scale that determined ability to perform a range of functional tasks from vigorous activity to daily hygiene. Level of physical function at baseline and the trajectory of functional status during 1 year of follow-up were both major determinants of health care use and costs. Overall costs were 62% lower among older women who maintained high function compared to their counterparts whose functional status worsened. Risk factors for the development of physical limitations among those women with high function at baseline included low income, the number and severity of chronic diseases, number of alcoholic drinks at a sitting, lack of physical activity, lack of positive affect, and use of tranquilizers. These findings indicate that the onset and progression of disability in older women are costly and may be preventable. Randomized controlled trials are urgently needed to identify safe, effective, and affordable interventions to prevent disability in older women.

INTRODUCTION

THE UNITED STATES POPULATION AGED 65 and older is growing rapidly, from 11.3% in 1980 to a projected 21.6% by the year 2040.[1] This is especially true for older women, for whom life expectancy has increased at a faster rate than for men. In 1930, the life expectancy for women was 2 years longer than that for men. By 1978, this difference had increased to over 7 years.[2] As of 1987, in the population aged 65 and over, women outnumbered men 3:2.[1] Though life expectancy is greater in older women than in men, most epidemiologic studies show that older women bear a higher burden of morbidity and disability.[2]

The costs of health care are rising in the United States, especially for older people, who are the largest consumers of health care. Twenty percent of all doctor visits and 30% of all hospital discharges are among persons aged 65 and older.[1] Although the overall cost for health care of the elderly has increased, the rising costs are only partially due to the population growth. Between 1970 and 1981, the number of Medicare beneficiaries increased 2.25% annually, whereas health care costs increased 16.3% per year.[3]

Past studies have attempted to relate specific chronic conditions to the use of health services by older adults. For example, heart disease was estimated to account for approximately twice the number of doctor visits and nearly three times the number of bed disability days compared with cancer or stroke.[2] However, the presence of a particular chronic condition in older persons does not adequately predict level of physical functioning and

health care use. Measures of disability are more relevant descriptors of the combined effects of aging and illness, including comorbidity. Those studies that have examined disability in relation to health care use and costs often have focused solely on severe disability in the older population as measured by limitations in activities of daily living.[4] This strategy fails to account for the broad range of physical abilities in older adults and instead concentrates on the minority whose health is gravely impaired.

The growing number of older women and their higher levels of disability provide a compelling incentive to better understand the impact of disability on health care use and costs and to identify safe, low-cost, and effective strategies for both maintaining a high quality of life and controlling health care expenditures. The purpose of this article is to examine the association between physical function and health care use and costs in community-dwelling elderly women. Additionally, we sought to identify risk factors that were predictive of change in physical functioning that may be amenable to clinical and public health interventions.

SUBJECTS AND METHODS

Study population

The study subjects came from a random sample of the population of 45,000 enrollees aged 65 and older of Group Health Cooperative of Puget Sound, a large health maintenance organization in western Washington. For the purposes of this report, the study population was restricted to 1337 women who completed a mailed baseline questionnaire and agreed to participate in a randomized trial of health promotion interventions. Informed consent was obtained from all participants as part of the baseline questionnaire. Details regarding eligibility and recruitment for the trial and the characteristics of participants and nonparticipants have been reported previously.[5] Although the overall rate of participation was 36%, participants and nonparticipants did not differ significantly in prevalence rates of chronic conditions or in a variety of health status indicators, including disability days.

Data collection

The baseline questionnaire included measures of demographic characteristics, physical and psychosocial health status, and health behaviors.[6] Participants have been followed annually by mailed quesionnaire or telephone interview and asked to complete questionnaires that were shortened versions of the baseline survey. For the purposes of this analysis, change in physical function was based on differences between reported disability at baseline and first annual follow-up.

Two disability measures were used, restricted activity days and a six-item version of the Medical Outcomes Study (MOS) physical function scale.[7,8] Restricted activity days were ascertained based on two questions: (1) In the past 12 months, did you cut down the things you usually do, such as going to work or working around the house because of illness or injury? (2) If yes, how many days did you cut down on the things you usually do

because of illness or injury? The distribution of restricted activity days in this community-based population is highly skewed. Nearly 75% of participants reported no days of limited function. Therefore, for the purposes of analysis, the number of restricted activity days was categorized into five groups (0, 1–7, 8–30, 31–179, and ≥180 days). Our previous studies of restricted activity days as a measures of physical function have shown this indicator to have cross-sectional validity and to be responsive to change over time in physical health status.[6,9]

The MOS physical function scale asked subjects to identify whether and for how long their health had limited their functioning in six hierarchical domains of activity, ranging from vigorous activities to walking, climbing stairs, and daily hygiene.[7,8] The scale was scored as a Guttman scale with a coefficient of reproducibility of .91 and a coefficient of scalability of .61.[6] The Guttman scale ranges from 0 for no limitations in activity to 6 for limitations in self-care activities (e.g., daily hygiene). The originators of the MOS physical function measure have demonstrated the cross-sectional construct validity and internal reliability of the measure.[10] Our previous studies have demonstrated the responsiveness of the MOS scale to clinically important changes in health status over time.[9] For both restricted activity days and the MOS physical function scale, a change in functional status was defined as a difference of at least two levels between the baseline and 1-year follow-up measures. Change was categorized into four groups based on initial level of function and the direction of the change as follows: sustained high function, sustained limited function, improved, or worsened.

Several risk factors for disability were evaluated based on responses to the baseline questionnaire, including age, household income, living arrangements, cigarette smoking, alcohol use, physical activity, height and weight [used to calculate body mass index as weight (kg)/height (m²)], and vision and hearing impairments. Positive affect score was obtained from a 10-item scale with items adapted from Veit and Ware.[11] The scale correlates strongly and inversely with a depressive symptom scale ($r = -.59$).[6] Use of tranquilizers was obtained directly from the Group Health Cooperative pharmacy database and measured by number of times a prescription was filled for any drug classified as a tranquilizer (i.e., benzodiazepines, meprobamate) in the previous year. The Chronic Disease Score, based on use of prescription medications for a 1-year period, is derived from a weighted sum of medications taken for major chronic illness and reflects both the number and severity of up to 19 chronic conditions ranging from heart disease and hypertension to diabetes, ulcer, and gout.[12] The measure has been shown to be an excellent predictor of disability, health care use, and mortality in previous studies of older and middle-aged adults.

Health care use measures were obtained from routinely collected computerized databases at Group Health Cooperative. Outpatient visits included all medical, nursing, mental health, ancillary care, and laboratory and radiology visits to the health plan. Primary care and specialty physician visits, a subset of all outpatient visits, were evaluated separately. Hospitalizations were categorized into two groups based on the primary discharge diagnosis recorded in the database. Major hospitalizations included those with a primary diagnosis of myocardial infarction, other heart disease, cerebrovascular disease, hip fracture,

Alzheimer's disease, and cancer of the lung, breast, colon, rectum, or prostate. All other hospitalizations were considered as a separate group.

Estimates of the cost of health care services and drugs also were obtained from routinely collected computerized databases at Group Health Cooperative. Pharmacy costs were calculated based on the actual cost of medications dispensed to each study subject during three time periods of interest in this study: the year before baseline and the first and second years of follow-up. Costs of inflation were not removed from the actual costs. Outpatient costs were calculated based on the average cost of all types of outpatient visits combined for persons aged 65 and older during the 1990 calendar year. The average yearly cost of outpatient visits in the various disability groups was calculated as the product of the mean number of visits in each group and the average cost per visit. Average daily inpatient costs were derived for enrollees aged 65 and older at Group Health Cooperative and used to calculate the cost of inpatient care in the various disability groups based on the number of days of hospital care for each group.

Statistical methods

Outpatient and inpatient health care use during the first year of follow-up was first examined in relation to the two measures of disability at baseline (restricted activity days and the MOS physical function scale). Change in disability status between baseline and the first year of follow-up was then examined in relation to levels of use during the same time period. Between-group differences and tests for trend were assessed using Chi-square tests and linear and logistic regression analysis. Costs were calculated according to change in physical function between baseline and 1-year of follow-up based on the MOS scale. To examine the stability of health care expenditures in the years surrounding the change in disability status, costs were calculated for the year before baseline, the year of the health status change (baseline to first year), and the second year of follow-up.

Potential risk factors associated with the onset of disability were evaluated prospectively among women with no or only minor functional limitations at baseline. The study group for this analysis was restricted to participants who reported having no limitations or limitation only in the kinds or amounts of vigorous activities performed on the MOS physical function scale. Risk factors were evaluated in relation to loss of physical function at the first year of follow-up. Estimates of relative risk and 95% confidence intervals were obtained using multiple logistic regression after adjusting for age and then for all risk factors that were found to be significantly ($p < 0.05$) associated with change in disability status before adjustment.

RESULTS

The average age of the women studied was 73.1 years. Ninety-five percent were white. Levels of outpatient and inpatient health care use according to the number of restricted activity days reported at baseline are presented in Table 1. For most types of health care services, the lowest level of use occurred among women with no restricted activity days during the previous year, whereas the highest level of use occurred among women who reported 8–30 restricted activity days. In the latter group compared to the former, there were 49% more outpatient visits on average and 69% more women hospitalized. Tests for trend were significant in all areas ($0.0001 < p < 0.01$) with the exception of hospitalization for primary diagnoses classified as "Other" and length of stay. For the 11.5% of women who were missing data on restricted activity days at baseline ($n = 154$), levels of use were similar to women who reported 8–30 restricted activity days (data not shown).

The same pattern of results was observed when baseline disability was classified on the basis of the MOS physical function scale (Table 2). A significant increase in all areas of use with increasing levels of functional impairment from no limitations to limitations in self-care activities was observed (test for trend $p < 0.01$). The only exception was for hospitalizations

TABLE 1. OUTPATIENT AND INPATIENT HEALTH CARE USE ACCORDING TO NUMBER OF RESTRICTED ACTIVITY DAYS AT BASELINE: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER

Sample size	No. of restricted activity days in the year before baseline			
	0 (809)	1–7 (136)	8–30 (130)	≥31 (108)
All outpatient visits ($\bar{x}$)***	11.5	13.4	17.1	15.3
Primary care visits ($\bar{x}$)***	4.3	4.8	5.9	5.1
Specialty visits ($\bar{x}$)***	2.1	2.4	3.9	3.3
Hospitalized (%)**	14.1	17.6	23.8	19.4
Major diagnoses (%)***	3.2	6.6	5.4	10.2
Other diagnoses (%)	10.9	11.0	18.5	9.3
Average length of stay[a] ($\bar{x}$ days)	7.0	6.8	6.7	5.8

*Test for trend $p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Average length of stay among those hospitalized.

TABLE 2. OUTPATIENT AND INPATIENT HEALTH CARE USE ACCORDING TO LEVEL OF PHYSICAL FUNCTION: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER

	Physical function limitation at baseline[a]						
Sample size	No limitations (428)	Vigorous activity (280)	Walking uphill, climbing stairs (105)	Bending, lifting, stooping (121)	Moderate activity (218)	Walking one block (94)	Self-care activities (67)
All outpatient visits ($\bar{x}$)***	10.6	13.0	14.7	12.7	15.8	16.0	18.5
Primary care visits ($\bar{x}$)***	3.9	4.3	5.5	4.6	5.5	5.8	6.5
Special visits ($\bar{x}$)***	2.0	2.8	2.5	2.1	3.2	2.8	3.9
Hospitalized (%)***	14.3	17.1	12.4	12.4	19.7	29.8	29.9
Major diagnoses (%)	3.3	5.0	3.8	1.7	4.6	10.6	6.0
Other diagnoses (%)**	11.0	12.1	8.6	10.7	15.1	19.1	23.9
Average length of stay[b] ($\bar{x}$ days)**	4.4	5.3	11.5	10.9	7.2	8.3	9.7

*Test for trend $p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Based on Medical Outcomes Study physical function scale. The scale was scored as a Guttman scale, with individuals classified into 7 ordered and mutually exclusive categories according to the most severe limitation reported. The scale ranges from 0 (no limitations) to 6 (limitation in self-care activities).
[b]Average length of stay among those hospitalized.

due to major diagnoses. There were 75% more outpatient visits among older women with limitations in performed self-care activities compared to those with no limitations. For those few women who were missing data on level of physical function (1.8%, $n = 25$), the use of health services resembled that of women with no limitations in activity, the category of highest function (data not shown).

Women who sustained high function during the first year of follow-up used the fewest health care services during that year (Table 3). Those who reported an increase in the number of restricted activity days, classified as those who worsened, used twice the amount of outpatient services. Nearly one half of the group that worsened were hospitalized, compared to less than 10% of those who sustained high function. Decreased physical functioning according to the MOS scale also was associated significantly with increased use (Table 4). Those who worsened

had nearly two times the number of outpatient visits and over three times the number of hospitalizations as those who maintained high function.

The total pharmacy costs for participants according to change in physical function during the first year of follow-up are presented in Figure 1. Pharmacy costs are presented separately for the years before, during, and after the measured change in functional status. Costs increased for all groups over the 3 years, in part related to inflation in drug prices during this period, but the differences between the groups remained evident at every time point. Women who had impaired physical function had higher pharmacy costs over all 3 years, and those with the highest costs were persons who were on a downward trajectory in terms of physical function. Worsened physical function was associated with two and one-half times higher pharmacy costs than maintenance of high function ($177 vs $70, respectively,

TABLE 3. OUTPATIENT AND INPATIENT HEALTH CARE USE ACCORDING TO CATEGORY OF CHANGE IN NUMBER OF RESTRICTED ACTIVITY DAYS BETWEEN BASELINE AND 1 YEAR OF FOLLOW-UP: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER

	Category of change in number of restricted activity days			
Sample size	Sustained high function (582)	Sustained limited function (265)	Improved function (118)	Worsened (110)
All outpatient visits ($\bar{x}$)***	9.8	13.0	13.9	19.5
Primary care visits ($\bar{x}$)***	3.7	5.1	4.5	6.2
Special visits ($\bar{x}$)***	1.8	2.3	3.3	3.4
Hospitalized (%)***	7.7	17.4	11.0	42.7
Major diagnoses (%)	1.2	5.7	3.4	16.4
Other diagnoses (%)**	6.5	11.7	7.6	26.4
Average length of stay[a] ($\bar{x}$ days)**	2.3	5.9	3.1	9.2

*Test for trend $p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Average length of stay among those hospitalized.

TABLE 4. OUTPATIENT AND INPATIENT HEALTH CARE USE ACCORDING TO CHANGE IN LEVEL OF PHYSICAL FUNCTION[a]
BETWEEN BASELINE AND 1 YEAR OF FOLLOW-UP: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER

Sample size	Sustained high function (247)	Sustained limited function (604)	Improved function (195)	Worsened (204)
All outpatient visits ($\bar{x}$)***	9.0	13.5	13.4	17.1
Primary care visits ($\bar{x}$)***	3.4	4.8	5.1	5.4
Special visits ($\bar{x}$)***	1.8	2.6	2.6	3.3
Hospitalized (%)***	8.9	16.2	11.8	28.4
Major diagnoses (%)	2.0	4.5	0.5	8.3
Other diagnoses (%)***	6.9	11.8	11.3	20.1
Average length of stay[b] ($\bar{x}$ days)*	3.5	5.6	3.6	7.8

*Test for trend $p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
[a]Based on Medical Outcomes Study physical function scale.
[b]Average length of stay among those hospitalized.

during the first year of follow-up). As expected based on the utilization data presented in Table 4, outpatient costs also were highest among the group who worsened in physical function, $2747 per subject on average during the period in which their functional loss occurred (Fig. 2). In contrast, the average cost of outpatient visits among women who sustained high function was $1449 per subject.

The magnitude of the differences in health care costs was most evident for inpatient hospital services (Fig. 3). Women whose physical function worsened during the first year of follow-up had seven times higher costs for inpatient services compared to women who sustained high function. Subjects who improved in physical function had lower costs during the year of improve-

ment (reflecting their lower rate of hospitalization that year), but their hospital costs rose again to 87% of their baseline costs in the second year of follow-up.

Overall, the combined costs of pharmaceuticals, outpatient visits, and inpatient care were 62% lower in women who sustained high function ($1757) compared to their counterparts whose level of physical function declined ($4599).

Potential risk factors for loss of physical function were studied among women with high functioning according to the MOS scale at baseline. Baseline characteristics of women who sustained a high level of physical function during the first year of follow-up were compared to women who developed functional limitations during that year. Women with worsened physical
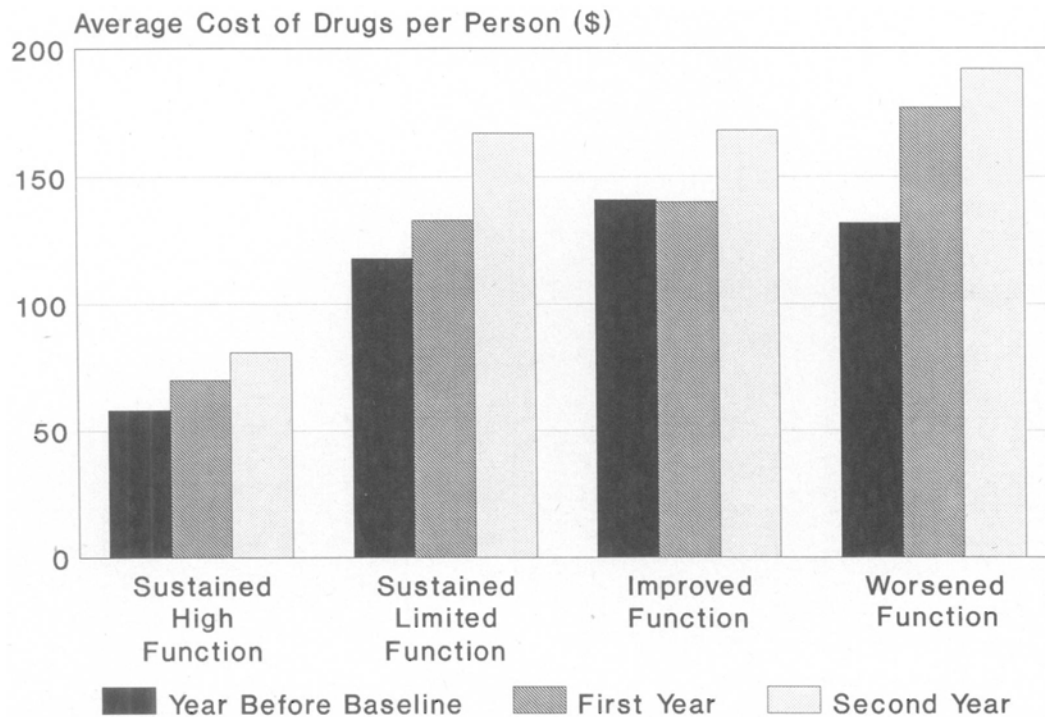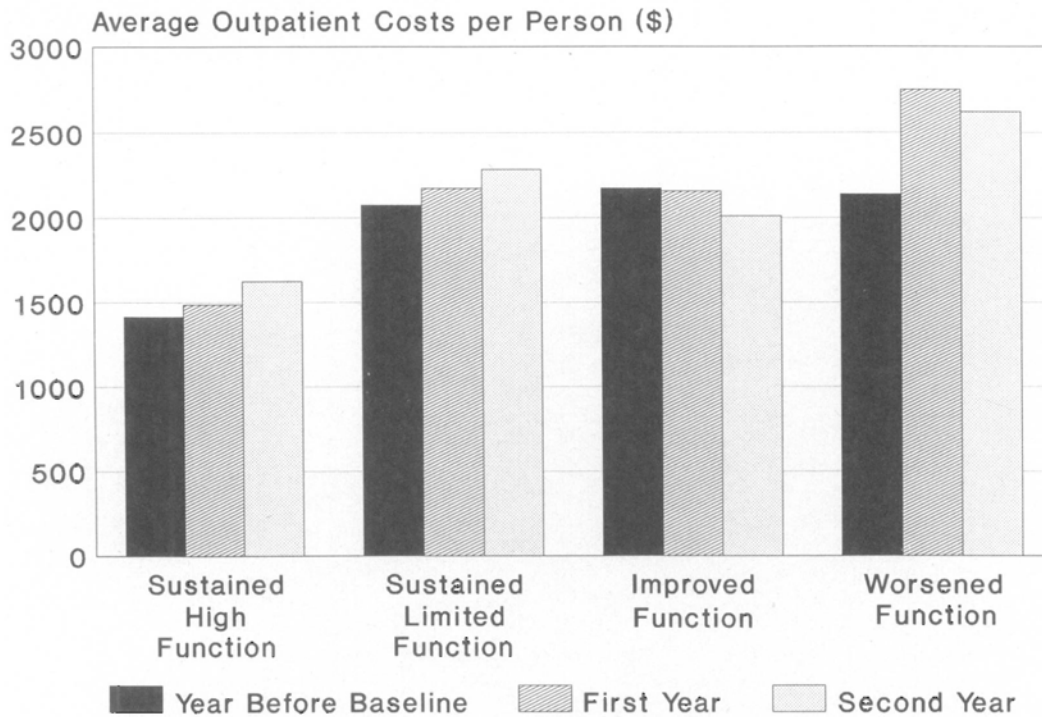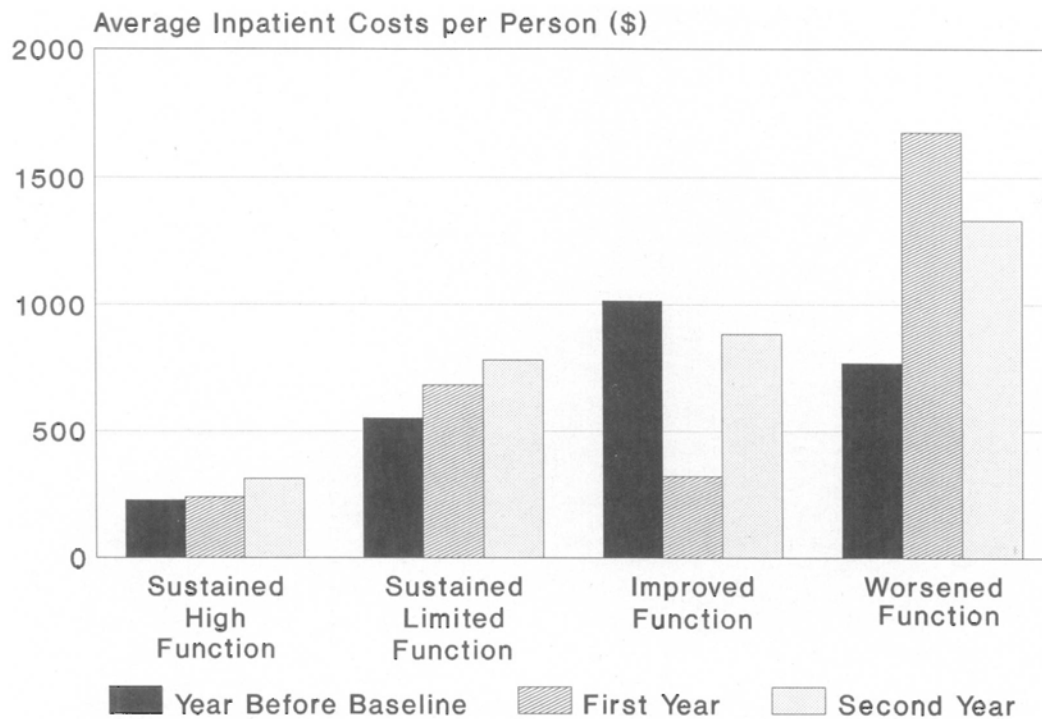

FIG. 1. Average cost of drugs per person according to change in level of physical function during 1 year of follow-up

FIG. 2. Average outpatient costs per person according to change in level of physical function during 1 year of follow-up

function during the first year of follow-up were older and poorer, had more chronic illnesses, and were more likely to live alone than women who maintained high function (Table 5). In addition, women who lost physical function were more likely to have smoked in the past but less likely to smoke currently. Women who sustained high function had lower levels of alcohol consumption and a lower proportion who reported no regular exercise. The use of tranquilizers was significantly greater

FIG. 3. Average inpatient costs per person according to change in level of physical function during 1 year of follow-up

TABLE 5. CHARACTERISTICS OF WOMEN WHO SUSTAINED HIGH PHYSICAL FUNCTION[a] AND WHO DECLINED IN PHYSICAL FUNCTION DURING 1 YEAR OF FOLLOW-UP: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER WITH HIGH PHYSICAL FUNCTION AT BASELINE

	Change in level of physical function	
Sample size	Sustained high function (535)	Worsened (148)
Age at baseline*	71.9	73.7
Income < $15,000 (%)**	36.6	56.5
Chronic disease score ($\bar{x}$)**	1.3	2.2
Living alone (%)*	43.8	53.8
Current smokers (%)	7.7	4.1
Former smokers (%)	25.1	32.4
Number of alcoholic drinks when drinking*	1.2	1.4
Exercise level: Sedentary (%)*	41.3	54.1
Positive affect score ($\bar{x}$)*	46.2	43.2
Using tranquilizers (%)**	10.6	19.6
Impaired hearing (%)[b]*	4.3	8.0
Impaired vision (%)[c]*	10.4	16.9
Body mass index ($\bar{x}$ kg/m^2)	24.5	25.1

*Chi-square or t-test for between-group differences significant at $p < 0.05$; **$p < 0.01$.

[a]Based on Medical Outcomes Study physical function scale.

[b]Impaired hearing criteria: Subject could not usually hear and understand what a person says without seeing his or her face either if the person whispers or if he or she speaks in a normal voice from across a quiet room, whether or not the subject wore a hearing aid.

[c]Impaired vision criteria: With glasses, unable to read newsprint or could not recognize a friend across the street, or vision problems were not correctable and made it difficult to do such things as read, see numbers on the telephone, or tell whether the stove was on or off.

TABLE 6. RELATIVE RISKS RELATING BASELINE DEMOGRAPHIC CHARACTERISTICS AND HEALTH BEHAVIORS TO LOSS OF PHYSICAL FUNCTION AFTER 1 YEAR OF FOLLOW-UP: GROUP HEALTH COOPERATIVE WOMEN AGED 65 AND OLDER WITH HIGH PHYSICAL FUNCTION AT BASELINE

	Age adjusted	Multivariate adjusted
	(95% confidence interval)	
Age at baseline (per year)	1.06	1.04
	(1.03–1.09)	(0.98–1.10)
Income < $15,000	2.11	2.32
	(1.36–3.30)	(1.24–4.36)
Living alone	1.34	0.92
	(0.91–1.96)	(0.50–1.70)
Chronic disease score[a]	1.21	1.16
	(1.11–1.31)	(1.01–1.33)
Impaired vision	1.54	1.00
	(0.90–2.63)	(0.42–2.35)
No. of alcoholic drinks[b]	1.43	1.52
	(1.04–1.96)	(1.04–2.23)
Exercise level[c]		
Low	1.00	1.00
Medium	0.83	0.84
	(0.50–1.37)	(0.40–1.78)
High	0.66	0.79
	(0.43–1.00)	(0.41–1.52)
Positive affect score[d]	0.64	0.61
(per 10 point increase)	(0.51–0.80)	(0.43–0.84)
Taking tranquilizers	2.04	1.50
	(1.24–3.35)	(0.66–3.45)

[a]Range of chronic disease score was 0–11.

[b]Range of number of alcoholic drinks when drinking was 0–4.

[c]Exercise level defined as follows: Low, not exercising enough to sweat or get out of breath; Medium, exercises enough to sweat or get out of breath for 15 minutes less than 3 times per week; High, exercises enough to sweat or get out of breath at least 3 times per week for 15 minutes.

[d]Range of positive affect score was 18–60.

among women whose functional status worsened, and they had lower scores on the positive affect measure. Vision and hearing impairments were more common among the women who declined in physical function, and they tended to be heavier, according to Quetelet's index. All of these differences were statistically significant, with the exceptions of smoking, hearing impairment, and body mass index.

Relative risks for loss in physical function associated with the significant risk factors are presented in Table 6 after adjustment for age and for all risk factors simultaneously. Lower income persisted as a strong and independent predictor of worsening physical function, as did the number of chronic conditions requiring drug therapy (as measured by the chronic disease score). A higher positive affect score was significantly associated with a decreased risk of losing function. For each 10 point difference in score indicating greater positive outlook and mood, there was a 40% decrease in risk of losing physical function. Among the modifiable behaviors, there was a 50% increase in risk for disability with each additional alcoholic drink consumed when drinking. Several modifiable risk factors continued to

show important associations with functional decline, although the relative risks were not statistically significant in the multivariate model. Tranquilizer use was associated with a 50% increased risk of functional decline. Higher physical exercise levels were protective for loss of function. Finally, vision impairment was not an independent predictor when adjustments were made for other risk factors.

DISCUSSION

In this study of community-dwelling women aged 65 and older, the level of physical function at baseline and the trajectory of functional status during 1 year of follow-up were both major determinants of health care use and costs. In all areas of health care, including primary and specialty care visits, ancillary services, and inpatient care, expenditures were highest for women who lost functional abilities during the 1-year period and lowest for those who maintained their functional health. Even

compared to women who had impaired but stable function, those on a downward trajectory in functional status had much higher costs in all service areas studied. Women who sustained high function consumed a fraction of the health care dollars that were consumed by women whose functional status worsened. Overall, costs were reduced by 62% in the nondisabled group.

The results strongly support the conclusion that functional decline, even over a short duration of follow-up, is caused by a combination of several independent risk factors, many of which are amenable to clinical and public health preventive interventions. The number and severity of chronic conditions could only partially predict disability. Important independent predictors included level of alcohol use, amount of exerise, use of tranquilizers, and positive outlook, all of which are potentially modifiable. Despite equal access to health care services in this group of HMO enrollees, socioeconomic status also was a strong predictor, with poorer women having nearly two and one-half times the risk for functional decline.

Our findings relating disability levels at baseline to levels of health care use are consistent with previous studies that have examined the association between disability and use. In a national sample of people age 80 and older, the physically able were less likely to be hospitalized and had fewer physician visits.[13] In a recent study by Wolinsky and Johnson,[4] age, higher education, having private health insurance, ADL difficulties, and lower body limitations were all found to be associated with higher use.

Higher income and education levels have been associated with higher use in previous reports.[4,14,15] Despite the socioeconomic diversity of the women in our study, there were no barriers to access to health services based on financial status. Diehr et al. found that HMO enrollees were more likely to use outpatient services than members of fee-for-service systems.[16] The authors also reported that overall costs for health services were higher (per enrollee and per user) in a fee-for-service setting even though a lower proportion of enrollees received services. In our study population, the high functioning group may have been inclined to seek more outpatient services than they would have in a fee-for-service system. However, the greater number of physician visits in the disabled groups probably reflects greater patient need for both initial physician consultation and follow-up. Hence, the differences in use and costs between the groups studied most likely underestimate the differences due to functional status that would be observed in a fee-for-service environment.

In addition, the data presented on costs may underestimate differences between the disability groups for another reason. Although the actual cost of drugs was calculated for each subject in the study, it was not possible to calculate the actual cost of inpatient and outpatient care for each study subject. Computerized data on the cost of these types of services was not available until 1990. For this reason, we calculated an estimate of the average cost of an outpatient visit for all Group Health Cooperative enrollees aged 65 and older and applied this estimate to the average number of outpatient visits in each disability group. The same approach was taken to estimate the cost of a day of hospital care in Group Health Cooperative seniors. However, average costs probably underestimate the actual costs for older adults whose health status is declining and probably overestimate the actual costs for older adults who have no or few serious health problems. Had data been available on actual costs, we would expect to see even more dramatic cost differentials between the disability groups.

Many of the risk factors for functional decline that we identified are consistent with previous reports. Long-term predictors of functional decline in the Alameda County cohort ($n = 841$) included age, race, income, smoking, weight, alcohol consumption, and chronic diseases.[17] In a national sample of initially nondisabled older adults studied over a 2-year follow-up period, lack of exercise and visual impairment in addition to demographic and disease factors were found to be related to functional decline.[18] Our finding that prevalence rates of current smoking were similar among women who sustained high function and those who declined whereas past smoking was more common among women who lost function may be explained by a higher cessation rate among women in response to deteriorating health status. Use of tranquilizers and other sedatives has been related to the occurrence of falls and hip fractures in older populations.[19,20]

The purpose of this report was to increase our understanding of the relationships between risk factors, onset of disability, use of health services and health care costs in older women. We know of no other research that has examined the relationship between functional loss and increased costs. With our growing understanding of the complex factors leading to disability and the added costs of declining functional status, a disease-oriented approach to geriatric health care is no longer adequate to meet the economic and social challenges we face in the aging of our society. Prevention of loss of physical function is key to controlling health care costs and maintaining quality of life for older women.

Our findings emphasize the effects of behavioral factors over a relatively short period of time (1 year), indicating the vulnerability of persons in this age group. Nevertheless, we have reason to be optimistic about prospects for prevention. Several risk factors for disability were identified that are potentially amenable to clinical and public health interventions, such as alcohol counseling, mental health services, including the detection and treatment of depressive symptoms, exercise programs, and alternatives to treatment with tranquilizers. Randomized, controlled intervention trials designed to prevent disability in older populations are urgently needed to evaluate the effectiveness of various health promotion strategies and to determine which interventions are the most beneficial and cost-effective. A subset of the women in this report is participating in a randomized controlled trial designed to prevent disability and falls through individualized assessment and counseling combined with interventions focused on increasing physical activity, removing home safety hazards, maintaining function with vision and hearing deficits, reducing daily alcohol intake, and reducing the use of long-acting sedatives. This study, and others like it in the future, should yield effective strategies for both preserving high levels of physical function and reducing health care costs in older women.

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Address reprint requests to:
Andrea Z. LaCroix, Ph.D.
Center for Health Studies
Group Health Cooperative of Puget Sound
1730 Minor Avenue, Suite 1600
Seattle, WA 98101-1448

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