

UC San Diego

UC San Diego Previously Published Works

Title

Effects of Provider Practice on Functional Independence in Older Adults

Permalink

<https://escholarship.org/uc/item/5849c4z6>

Journal

Journal of the American Geriatrics Society, 52(8)

ISSN

0002-8614

Authors

Phelan, Elizabeth A
Williams, Barbara
LaCroix, Andrea Z
et al.

Publication Date

2004-08-01

DOI

10.1111/j.1532-5415.2004.52350.x

Peer reviewed

Effects of Provider Practice on Functional Independence in Older Adults

Elizabeth A. Phelan, MD, MS,* Barbara Williams, PhD,[†] Andrea Z. LaCroix, PhD,^{‡||¶}
Lou Grothaus, MS,[‡] James P. LoGerfo, MD, MPH,^{†§} and Edward H. Wagner, MD, MPH[#]

(See Editorial Comments by Dr. David Reuben on pp 1393–1394)

OBJECTIVES: To examine provider determinants of new-onset disability in basic activities of daily living (ADLs) in community-dwelling elderly.

DESIGN: Observational study.

SETTING: King County, Washington.

PARTICIPANTS: A random sample of 800 health maintenance organization (HMO) enrollees aged 65 and older participating in a prospective longitudinal cohort study of dementia and normal aging and their 56 primary care providers formed the study population.

MEASUREMENTS: Incident ADL disability, defined as any new onset of difficulty performing any of the basic ADLs at follow-up assessments, was examined in relation to provider characteristics and practice style using logistic regression and adjusting for case-mix, patient and provider factors associated with ADL disability, and clustering by provider.

RESULTS: Neither provider experience taking care of large numbers of elderly patients nor having a certificate of added qualifications in geriatrics was associated with patient ADL disability at 2 or 4 years of follow-up (adjusted odds ratio (AOR) for experience = 1.29, 95% confidence interval (CI) = 0.81–2.05; AOR for added qualifications = 0.72, 95% CI = 0.38–1.39; results at 4 years analogous). A practice style embodying traditional geriatric principles of care was not associated with a reduced like-

lihood of ADL disability over 4 years of follow-up (AOR for prescribing no high-risk medications = 0.56, 95% CI = 0.16–1.94; AOR for managing geriatric syndromes = 0.94, 95% CI = 0.40–2.19; AOR for a team care approach = 1.35, 95% CI = 0.66–2.75).

CONCLUSION: Taking care of a large number of elderly patients, obtaining a certificate of added qualifications in geriatrics, and practicing with a traditional geriatric orientation do not appear to influence the development of ADL disability in elder, community dwelling HMO enrollees. *J Am Geriatr Soc* 52:1233–1239, 2004.

Key words: health services for the aged; activities of daily living; delivery of health care; outcome and process assessment (health care)

A desirable goal or outcome of geriatric care is preservation of patient function, even in the presence of chronic disease.¹ The Institute of Medicine recommends that functional status be used as the principal outcome measure for prevention in older adults.² The trajectory of functional status over time has been shown to be a major determinant of healthcare use and costs.³

Many studies have investigated the influence of individual risk factors on functional status in the elderly,⁴ and characteristics of providers and their practices appear to affect patient outcomes for specific disease states,^{5,6} but there have been no published studies of the influence of provider factors on functional outcomes in older adults.

Several cornerstones of good geriatric care can be identified. These include careful use of pharmaceuticals, routine evaluation for the presence of geriatric syndromes, and close collaboration between the primary care provider (PCP) and allied health professionals.⁷ Few studies have examined the extent to which these principles are incorporated into generalist geriatric care.⁸ No studies, to the authors' knowledge, have evaluated whether incorporation of these principles into outpatient care affects patient outcomes.

From the *Department of Medicine, Division of Gerontology and Geriatric Medicine, [†]Department of Health Services, School of Public Health and Community Medicine, [‡]Department of Epidemiology, and [§]Department of Medicine, Division of General Medicine, University of Washington, Seattle, Washington; ^{||}Center for Health Studies, Group Health Cooperative of Puget Sound, Seattle, Washington; [¶]Fred Hutchinson Cancer Research Center, Seattle, Washington; and [#]The MacColl Institute for Healthcare Innovation, Group Health Cooperative of Puget Sound, Seattle, Washington.

This research was conducted while Dr. Phelan was a Pfizer/AGS Foundation for Health in Aging Postdoctoral Fellow. This research was supported by Grant K23 AG20982 from the National Institute on Aging.

Address correspondence to Elizabeth A. Phelan, MD, MS, Department of Medicine/Gerontology and Geriatric Medicine, 325 9th Avenue, Box 359755, Seattle, WA 98104. E-mail: phelane@u.washington.edu

In this report, two hypotheses are examined: patients cared for by a PCP who has a high degree of experience caring for elderly patients or a certificate of added qualifications in geriatrics (CAQ-G) will be less likely to develop activity of daily living (ADL) disability, and patients cared for by a PCP who has a practice style that embodies geriatric principles—namely, avoidance of prescribing high-risk medications,⁹ proactive clinical assessments aimed at detecting geriatric syndromes, and adoption of a team approach to patient care—will be less likely to develop ADL disability. To examine these hypotheses, patient characteristics were ascertained from data collected as part of a cohort study, and these data were linked to provider characteristics obtained from review of Internet data, automated provider panels, automated pharmacy data, and data collected from chart abstractions.

METHODS

Patient Participants

The Adult Changes in Thought (ACT) Study, a prospective longitudinal cohort study of the incidence of dementia in 2,581 individuals aged 65 and older who were members of Group Health Cooperative (GHC) of Puget Sound, a large group model health maintenance organization (HMO) in western Washington,^{10,11} served as the source of data on patient characteristics for the analyses detailed herein. Subjects were identified for enrollment in ACT between March 1994 and April 1996 through a random sampling procedure of GHC members aged 65 and older who had no diagnosis of dementia in their medical record and were not residing in a nursing home, creating a study population representative of the population of Seattle, Washington, with respect to ethnicity and socioeconomic status. The average age of participants was 75.3 years at the time the cohort was assembled. Participants were followed from enrollment using biennial in-person interviews and physician evaluations. A group of older adults who had had a continuous relationship with one physician was sought to permit characterization of the influence of that physician's experience, training, and practice style on the elder's function. Thus, analyses were limited to a random sample of ACT participants who had been members of GHC for at least 2 years before their enrollment in ACT, who had a PCP assigned to them at the time of enrollment, and who had been under the care of that PCP for at least 2 years before enrollment. In addition, to comment on a pattern of practice for a given provider, it was required that a PCP have at least five patients enrolled in ACT. This sampling approach yielded 56 PCPs for 800 patients (Figure 1). The institutional review boards of GHC and the University of Washington approved the study.

Setting

GHC provides comprehensive medical care to more than 500,000 enrollees, of whom approximately 60,000 are 65 and older. The annual disenrollment rate (including deaths) for Medicare enrollees averages less than 5%. Family physicians and a few internists provide primary care. The provider population has an annual turnover rate that is

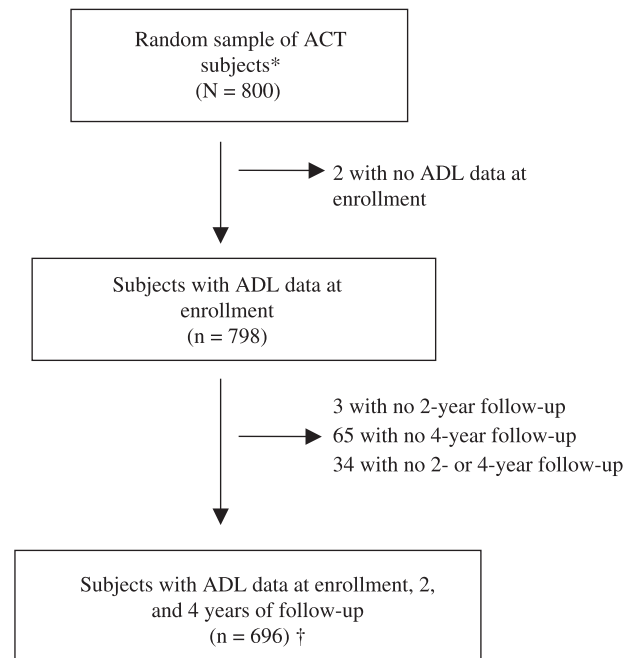


Figure 1. Subject flow.

Random sample of Adult Changes in Thought (ACT) subjects meeting the following criteria:

1. enrolled in group health continuously for at least 2 years before enrolling in ACT
2. had a primary care provider (PCP) at the time of enrollment in ACT
3. remained under the care of the same PCP for at least two years before enrollment in ACT
4. had a PCP who had at least five patients enrolled in ACT

*Includes 76 subjects who died. Those who died were imputed as activity of daily living (ADL) disabled for purposes of multivariate analyses.

consistently under 10%. Although some have a CAQ-G, none are fellowship-trained geriatricians. Practice guidelines around geriatric care have not been developed, and variability in provider practice behaviors related to the care of older adults has been documented.⁹ Referrals to allied health professionals are at the discretion of the PCP, and there are no financial incentives to limit referrals.

Outcome Measure

For these analyses, the outcome measure was disability in basic ADLs, defined as any difficulty performing any of the basic ADLs according to the modified Katz ADL Index.¹² ADLs were assessed cross-sectionally for ACT subjects as part of the cohort study at 2 years and again at 4 years of follow-up. The ADLs assessed were bathing, dressing, feeding, using the toilet, and transferring out of a bed or chair. Each item began with the phrase, "Because of health or physical problems, do you have any difficulty. ..." Each had a yes/no response option. Participants for whom ADL data were missing at the time of their enrollment in ACT ($n = 2$) were excluded from the analyses. There were three subjects without ADL follow-up data at 2 years, 65 subjects without ADL follow-up data at 4 years, and 34 without ADL follow-up data at both time points. Characteristics of those

without ADL follow-up data, as well as reason for lack of follow-up, were examined to determine whether the lack of ADL data was potentially related to the outcome of interest.

Independent Variables

Main Independent Variable

The main independent variable, provider practice style, was assessed using data collected specifically for the purposes of this study that pertained to three aspects of practice: prescription of high-risk medications;⁹ proactive assessments (screening) for geriatric syndromes, including cognitive impairment, depression, falls, urinary incontinence, insomnia, involuntary weight loss, and hearing and vision problems; and a team approach to care, with referrals to allied health professionals serving as the proxy for this aspect. Data concerning prescribing behavior and referrals to allied health professionals were obtained from automated sources, and data about screening for geriatric syndromes were derived from direct chart review of outpatient visits. Automated data on referrals were limited because of patient ability to self-refer within the system for many types of services (e.g., mental health, ophthalmology), but data on referrals to two types of allied health professionals—dietitians and physical therapists—were available. Because GHC has a health screening form for preventive care that covers all of the geriatric syndromes, and patients often complete this form themselves before their preventive care visit, it was decided to examine whether the provider acted in any way to address or manage those syndromes for which a patient screened positive. The period over which these aspects of practice were assessed was the first 2 years of observation after a subject's enrollment in ACT. This period was chosen because of the need for some plausible temporal relationship between care provided and the time at which the outcome (incident ADL disability) was assessed. It was also felt that a patient's enrollment in a prospective cohort study was unlikely to substantially alter provider practice, because providers were not involved in the study to any degree and were likely to be only peripherally aware of it.

Patient Factors

Information about patient factors that have been associated with ADL disability in other studies were obtained from self-reported data from the ACT biennial assessments: demographic characteristics (age, sex, education, income, race); comorbid conditions (arthritis, congestive heart failure, depression, diabetes mellitus, hypertension, stroke, poor vision); cognitive impairment (a Cognitive Abilities Screening Instrument (CASI)¹³ score < 81); behavioral factors (low level of physical activity (defined as walking for exercise less than 3 days per week for at least 15 minutes at a time), low frequency of social contact (defined as a response of probably or definitely false to the question, "I often meet or talk with family or friends"), high-risk alcohol consumption (defined as endorsement of any problem (social, marital, work related, traffic violations, or aggressive behavior such as a fight) associated with drinking, and smoking (defined as having smoked more than 100 cigarettes)); and physiological factors (low or high body mass index (<23 or ≥ 27)¹⁴ and reduced lower extremity per-

formance (defined as difficulty walking half a mile or walking up 10 steps).¹⁵

Provider Factors

Information about experience taking care of elderly patients, defined as the total number of patients aged 75 and older managed by the PCP over a 5-year period (1990–95), was obtained from computerized records of patient panels for each provider. Information on whether the PCP held a CAQ-G was obtained from the Web sites of the American Board of Internal Medicine and the American Board of Family Practice. Case-mix was evaluated using the GHC chronic disease score (CDS).¹⁶ The CDS predicts annual healthcare costs based on pharmacy data about treatments for various chronic medical conditions; the revised CDS with empirically derived weights predicting primary care visits was used¹⁶ because this was most highly correlated with ADL disability and thus would account for more of the variance due to case-mix than other weighting options (total costs, outpatient costs); the CDS was determined from computerized records for the 6 months before the patient's enrollment in ACT.

Statistical Analyses

Patient and provider characteristics were examined using chi-square tests for categorical variables and means and standard deviations for continuous variables. Patterns of care (from the standpoint of its geriatric orientation) were examined using chi-square tests for two periods as a means to assess the stability of practice behavior over time: enrollment to 2 years after enrollment, and 2 to 4 years after enrollment, for patients alive over both periods and free of ADL disability at enrollment in ACT. Subsequent analyses were limited to patients who reported no ADL disability at enrollment in ACT ($n = 549$).

To address potential confounding of the association between practice style and ADL disability by patient characteristics, logical groupings (also referred to herein as family models) of related variables—demographic, clinical, behavioral, and physiological characteristics—that have previously been shown to be associated with ADL disability were entered together into logistic regression models; each model controlled for age, sex, and race. Variables that were significant at the $P < .10$ level from each family model were then entered into a larger model. Those that remained significant at the $P \leq .05$ level were noted and adjusted for in subsequent modeling.

Logistic regression was used to evaluate provider characteristics that might be associated with ADL disability, controlling for age, sex, race, and clustering by provider. Those that remained significant at the $P \leq .05$ level were noted and adjusted for in subsequent modeling.

ADL disability at 2 years and 4 years of follow-up was examined in relation to provider practice style using logistic regression and adjusting for case-mix,¹⁶ patient and provider factors found to be significantly ($P < .05$) associated with ADL disability in logistic models, age, sex, race, and clustering by provider using the robust cluster option in Stata. Duration with same PCP was not included as a covariate as a measure of continuity because it was highly correlated with age. All analyses were performed using Stata, version 7 (Stata Corp., College Station, TX).

RESULTS

Characteristics of Patients at Enrollment in ACT

Patients had a mean age \pm standard deviation of 75.2 ± 6.2 , more than half were women, and nearly all were white (Table 1). More than three-quarters had completed a high school education, a majority had annual income of \$15,000 or more, and most (84.2%) rated their health as good to excellent (data not shown). About one-quarter (21.9%) reported difficulty with ADLs; transferring out of bed or chair was the ADL for which difficulty was most frequently reported ($n = 143$ (17.9%)), followed by dressing ($n = 39$ (4.9%)) and bathing ($n = 37$ (4.6%)). The mean number of chronic conditions was 1.5 ± 1.2 ; the most prevalent were hypertension, arthritis, and depression. The vast majority (90.5%) had normal cognitive function, defined as a CASI score greater than 86 (data not shown). About half (51.5%) reported walking for exercise 3 or more days a week; the prevalences of other behavioral risk factors for disability, other than ever having smoked, were less than 10%. The mean number of primary care visits for 6 months before patients' enrollment in ACT was 2.2 ± 0.9 (data not shown). Of the 549 patients who were free of ADL disability at enrollment, 380 (69.2%) remained with their same PCP during the 2 years after their enrollment in ACT (data not shown).

Characteristics of Patients without ADL Data at Follow-Ups

Figure 1 summarizes numbers of subjects missing ADL data at follow-ups. As a group, subjects missing 2-year, 4-year, or 2- and 4-year follow-up ADL data differed in certain ways from those with follow-up ADL data at all points; they were older (mean age 75.2 vs 74.5, $P = .00001$) and poorer (mean annual income \$26,740 vs \$30,102, $P = .02$) and had more comorbidities (mean comorbidities 1.9 vs 1.4, $P = .00001$) and poorer self-rated health (32.8% with fair or poor self-rated health vs 13.7%, $P = .0001$).

Sixty-five subjects did not have ADL follow-up data at 4 years; 29 quit the study before the 4-year follow-up, 18 were switched to annual rather than biennial in-person visits because they developed cognitive decline, nine underwent a brief telephone interview rather than an in-person visit and no ADL measures were collected, five died, and four chose to skip the visit. Reasons for no ADL follow-up for the 34 subjects without ADL follow-up data at 2 or 4 years were similar.

Development of ADL Disability over the Follow-Up Period

Of the subjects who were free of ADL disability at enrollment and for whom ADL data were available at 2 years of follow-up ($n = 512$), 54 (10.6%) reported ADL disability at 2 years. Of the subjects who were previously free of ADL disability and for whom ADL data were available at 4 years of follow-up ($n = 393$), 74 (18.8%) reported ADL disability at 4 years.

Characteristics of Providers

Of the 56 PCPs, 73.2% were board certified in family medicine and 14.3% in internal medicine (12.5% undetermined). The mean number of ACT patients per PCP was

34 ± 17.5 (range 10–79). The mean number of patients aged 75 and older cared for over a 5-year period was 915 ± 532 (range 180–2,910). Twenty-two (39.3%) PCPs had cared for more than 1,000 patients; 12 (21.4%) had a CAQ-G.

Table 1. Characteristics of Patients at Time of Enrollment in Adult Changes in Thought (N = 798)

Characteristic	Value
Demographic	
Age, mean \pm SD	75.2 \pm 6.2
Female, %	58.9
Non-white race, %	8.7
Education, mean \pm SD	13.6 \pm 3.1
Income, \$, median (25th–75th percentile)	25,000 (17,500–50,000)
Functional, %	
Difficulty:	
Bathing	4.6
Dressing	4.9
Feeding	0.4
Toileting	1.1
Transferring out of bed or chair	17.9
Clinical	
Number of comorbid conditions, %	
0	21.7
1	36.8
2	23.3
≥ 3	18.2
Type of comorbid condition, %	
Arthritis	36.4
Congestive heart failure	4.4
Cognitive impairment*	2.9
Depression	19.9
Diabetes mellitus	11.5
Hypertension	39.6
Stroke	2.9
Poor vision [†]	6.0
Behavioral (%)	
Low level of physical activity [‡]	48.5
Infrequent social contacts [§]	5.0
High-risk alcohol use	9.7
Ever smoked	54.6
Physiological, %	
Body mass index, kg/m ²	
<23	19.3
≥ 27	48.1
Reduced lower extremity performance [#]	29.1

* Cognitive Abilities Screening Instrument score < 81.

[†] "No" response to (1) Can you see well enough to recognize a friend across a street, wearing eyeglasses or contact lenses, if you need them? or (2) Can you see well enough to read ordinary newspaper print, wearing eyeglasses or contact lenses, if you need them?

[‡] Walking less than 3 days per week for at least 15 minutes at a time.

[§] Responding probably or definitely false to "I often meet or talk with family or friends."

^{||} Any problem (social, marital, or work-related problems, traffic violations, aggressive behavior) associated with alcohol consumption.

[#] Smoked > 100 cigarettes.

[#] Difficulty walking half a mile or walking up 10 steps.

SD = standard deviation.

Table 2. Proportions of Patients Receiving Geriatrically Principled Care Over 2 and 4 Years of Follow-Up (N = 798)

Aspect of Care	From Enrollment to 2 Years of Follow-Up	From 2 to 4 Years of Follow-Up
	%	
No high-risk medications prescribed	85.1	89.1
Syndrome addressed by primary care provider if screen positive	59.5	33.2
Referral to nutrition or physical therapy	25.4	29.0

Receipt of Geriatrically Principled Care over 4 Years of Follow-Up

Table 2 describes the proportions of patients receiving care based on geriatric principles over the 4-year follow-up period. Most patients were prescribed no high-risk medications over either time period. The majority of patients were managed for geriatric syndromes when they screened positive over the first 2-year period, whereas only about one-third were managed when they screened positive over the second 2-year period. About one-quarter were referred to allied health professionals during both periods.

Findings from Analyses to Assess Confounding of the Association Between Practice Style and ADL Disability

Table 3 shows that several patient factors were associated with ADL disability: income, hypertension, and low or high body mass index. These factors were included in the final logistic models examining the association between practice style and ADL disability. No provider characteristics were associated with ADL disability at 2 years of follow-up (Table 4), although odds ratios for training in family medicine and having obtained a CAQ-G both went in the postulated direction. Results at 4 years of follow-up were not materially different from those at 2 years (data not shown).

Association of Practice Style and ADL Disability

Associations between provider practices and ADL disability at 2 and 4 years of follow-up are presented in Table 5. None of the provider practices were associated with ADL disability at 2 or 4 years of follow-up.

DISCUSSION

The present study was conducted to investigate the relationship between provider factors, namely, experience, training, and practice style, and patient functional out-

comes. To the authors' knowledge, this is the first study to examine these relationships. Regarding the first hypothesis (that patients cared for by a PCP who has a high degree of experience caring for elderly patients or a CAQ-G will be less likely to develop ADL disability), it was found that neither experience nor CAQ-G was associated with reduced ADL disability at 2 or 4 years of follow-up.

Regarding the second hypothesis (that patients cared for by a PCP who has a practice style that embodies geriatric principles will be less likely to develop ADL disability), it was found that such a practice style was not associated with a reduced likelihood of ADL disability over 4 years of follow-up. Referral to allied health professions was associated with an increased risk of ADL disability at both follow-up points, although point estimates were unstable. In a logistic regression model examining associations with (nutrition or physical therapy) referrals for the period from 2 to 4 years of follow-up, ADL disability at 2 years was significantly associated with being referred (odds ratio = 3.57, 95% confidence interval = 1.52–8.40), which suggests that referrals were occurring in response to disability rather than before its onset.

The information obtained from the analyses has important implications for the design of care for older adults. First, the structural aspects of practice examined herein do not appear to influence the functional status of older adults. Specifically, there was no support in the findings for the hypothesis that seeing greater numbers of elderly patients or becoming board certified in geriatrics through the grandfathering route translated into a reduced risk of ADL disability. It is important to note that it was not possible to examine whether becoming board certified upon completion of geriatric fellowship training was associated with a reduced risk of ADL disability, because there were no fellowship-trained geriatricians in the provider sample. Second, the process measures of care that were examined did not appear to influence the functional status of older adults.

Table 3. Association Between Significant Patient Characteristics from Family Models and Activity of Daily Living (ADL) Disability at 2 Years of Follow-Up

Patient Characteristic	ADL Disability Odds Ratio (95% Confidence Interval)	P-value
Income	0.81 (0.66–1.00)	.053
Low physical activity	0.96 (0.81–1.13)	.602
Hypertension	2.05 (1.22–3.45)	.007
Low or high body mass index	1.48 (1.03–2.12)	.035

Note: Analysis included only patients with no ADL disability at enrollment (n = 549). Model controlled for age, sex, and race.

Table 4. Association Between Provider Characteristics and Activity of Daily Living (ADL) Disability at 2 Years of Follow-Up

Provider Characteristic	n	ADL Disability at 2 Years of Follow-Up	
		Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
Board certification			
Family medicine	41	0.69 (0.46–1.04)	0.76 (0.49–1.19)
Internal medicine	8	1.22 (0.70–2.14)	1.15 (0.61–2.14)
Experience [†]			
Low (referent)	34	1.0	1.0
High	22	1.19 (0.75–1.89)	1.29 (0.81–2.05)
Certificate of added qualifications in geriatrics			
No (referent)	44	1.0	1.0
Yes	12	0.64 (0.35–1.16)	0.72 (0.38–1.39)

Note: Analysis included only patients with no ADL disability at enrollment (n = 549).

* Models controlled for age, sex, race, and clustering by provider.

[†] Having seen ≤1,000 patients aged 75 and older over a 5-year period.

OR = odds ratio; CI = confidence interval.

This suggests that these areas of traditional emphasis in the care of older adults may have little value in reducing the likelihood of ADL disability. It implies that alternative emphases may be important in reducing the development of ADL disability.

The findings presented herein can be compared with those of a limited literature examining relationships between practice style and patient outcomes. One study examined the association between provider characteristics and practice patterns on the perceived outcomes of patients with asthma aged 18 to 50 and found that provider factors, including years since medical school graduation, specialty training (pulmonology, allergy/immunology, or family practice), and asthma medication prescribing patterns were not strongly associated with health status or quality of

life.¹⁷ Another study evaluated change in patient outcomes as a function of practice styles of primary care providers (26 physicians, 19 nurse practitioners, and 13 physician assistants) practicing at three U.S. army installations and found that practice style did not affect patient functional outcomes for this relatively small sample (n = 226) of predominantly middle-aged (mean age = 43) group of mostly (72%) female patients,¹⁸ but in this analysis, only interpersonal, not technical, aspects of practice style were assessed. In contrast to these negative studies, some investigators found that primary care physician experience in managing patients with acquired immunodeficiency syndrome (AIDS) was significantly associated with patient survival.⁵ Whereas experience may be important for refining specific competencies in caring for a specialized condition such as AIDS,

Table 5. Odds Ratios (ORs) and 95% Confidence Intervals (CIs) Comparing Patients with and without Activity of Daily Living (ADL) Disability at 2 Years and 4 Years of Follow-Up

Provider Practice Style Characteristic	ADL Disability at 2 Years		ADL Disability at 4 Years	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*	Unadjusted OR (95% CI)	Adjusted OR (95% CI)*
High-risk prescribing				
Yes (referent)	1.0	1.0	1.0	1.0
No	0.64 (0.37–1.13)	0.79 (0.33–1.87)	0.73 (0.36–1.49)	0.56 (0.16–1.94)
Responds to positive screen for syndrome				
No (referent)	1.0	1.0	1.0	1.0
Yes	0.86 (0.45–1.64)	0.58 (0.25–1.32)	1.36 (0.69–2.67)	0.94 (0.40–2.19)
Refers to nutrition or physical therapy				
No (referent)	1.0	1.0	1.0	1.0
Yes	2.17 (1.22–3.88)	1.83 (0.69–4.90)	1.55 (0.99–2.43)	1.35 (0.66–2.75)

Note: Analysis included only patients with no ADL disability at enrollment (n = 549).

* Adjusted for case-mix using the Chronic Disease Score, patient factors found to be significantly ($P \leq .05$) associated with ADL disability in the logistic model shown in Table 3 (income, hypertension, and body mass index), age, sex, race, and clustering by provider.

experience alone may not translate into improved outcomes for a population subgroup that is likely to have multiple chronic and interacting medical conditions.

This study had several limitations. First, the efficacy of the three aspects of practice style of interest herein was not directly tested as a specific set of interventions as would be done in a randomized, controlled trial. Thus, the results were subject to selection bias because it may not have been possible to completely control the tendency of sicker subjects to get more medications, evaluations, and referrals, a phenomenon that has been termed confounding by indication.¹⁹ However, only proactive assessments of geriatric syndromes and provider activity in relation to any syndromes uncovered by those assessments were specifically documented, because patient health status would be less likely to drive this activity. Regarding the aspect of team approach to care, the proxy that was used in this study to capture this concept (referrals) did not, in the authors' estimation, embody what this approach to care actually involves, but because the study made use of existing data, the data sources that were available limited the selection of measures. Second, those with missing ADL data were excluded from the analyses; such individuals were potentially likely to have developed the outcome of interest (ADL disability). Third, the study may have been underpowered to detect associations between provider characteristics and ADL disability. Finally, this study involved providers and patients of one healthcare system in the Pacific northwest—specifically, PCPs practicing in an HMO model of care. It remains uncertain whether these results would be generalizable to other healthcare organizations or other areas of the country. It is possible that findings might vary by care setting. For example, the HMO in this study has a prescription drug formulary and a pharmacy guideline about specific medications to avoid in elderly patients, which may explain why only 11% to 15% of patients were prescribed high-risk medications over the period examined. If this study had been conducted in another setting, there might have been substantially more prescribing of high-risk medications, which might in turn have shown an important association with ADL disability.

These limitations notwithstanding, several strengths of this study merit comment. First, data from a variety of sources were successfully linked, including data obtained through review of medical records, to examine the influence of physician characteristics and their practices on patient outcomes, which obviated the need to rely on self-report. Second, because of the availability of data collected longitudinally, it was possible to examine the questions of interest prospectively. Finally, the data on older adults in this sample were derived from a well-defined population base that is representative of Seattle, Washington, with respect to ethnicity and socioeconomic status.²⁰

This study suggests that, if the healthcare system seeks to preserve functional independence of the community-dwelling older adults for which it provides care, emphases other than those traditionally adhered to in geriatric practice may need to be adopted in primary care settings. Faced

with the prospect of growing numbers of elderly patients in most primary care practices, the importance of understanding where to focus becomes paramount. Additional studies examining provider practices to identify practice-level predictors of functional decline are warranted. Although this study focused on primary care practices with older adults who were free of ADL disability at the outset, many geriatric practices inherit patients with ADL disability and try to prevent or delay further functional decline. Studies that examine the effect of geriatric practice under these conditions should also be undertaken. It is hoped that this study will provide insights and stimulate discussion about the optimal training for primary care providers and organization of care for community dwelling elders.

REFERENCES

1. Wagner EH, LaCroix AZ, Grothaus LC et al. Responsiveness of health status measures to change among older adults. *J Am Geriatr Soc* 1993;41:241–248.
2. Institute of Medicine, Division of Health Promotion and Disease Prevention. Introduction: The second fifty years. Promoting health and preventing disability. Berg RL, Cassells JS, eds. Division of Health Promotion and Disease Prevention. Washington, DC: National Academy Press, 1990, pp 11–21.
3. Leveille SG, LaCroix AZ, Hecht JA et al. The cost of disability in older women and opportunities for prevention. *J Women Health* 1992;1:53–61.
4. Stuck AE, Walthert JM, Nikolaus T et al. Risk factors for functional status decline in community-living elderly people: A systematic literature review. *Soc Sci Med* 1999;48:445–469.
5. Kitahata MM, Koepsell TD, Deyo RA et al. Physicians' experience with the acquired immunodeficiency syndrome as a factor in patients' survival. *N Engl J Med* 1996;334:701–706.
6. Von Korff M, Barlow W, Cherkin D et al. Effects of practice style in managing back pain. *Ann Intern Med* 1994;121:187–195.
7. Laird RD, Studenski SA. Assessment. In: Cobbs EL, Murphy JB, eds. *Geriatrics Review Syllabus: A Core Curriculum in Geriatric Medicine*, 4th Ed. New York: American Geriatrics Society, 1999, pp 75–79.
8. Hirsch CH, Winograd CH. Clinic-based primary care of frail older patients in California. *West J Med* 1992;156:385–391.
9. Coleman EA, Grothaus LC, Sandhu N et al. Chronic care clinics. A randomized controlled trial of a new model of primary care for frail older adults. *J Am Geriatr Soc* 1999;47:775–783.
10. Larson EB, Kukull WA, Teri L et al. University of Washington Alzheimer's Disease Patient Registry (ADPR): 1987–88. *Aging (Milano)* 1990;2:404–408.
11. Kukull WA, Higdon R, Bowen JD et al. Dementia and Alzheimer's disease incidence: A prospective cohort study. *Arch Neurol* 2002;59:1737–1746.
12. Katz S, Ford AB, Moskowitz RW et al. Studies of illness in the aged. The index of ADL. A standardized measure of biological and psychosocial function. *JAMA* 1963;185:914–919.
13. McCurry SM, Edland SD, Teri L et al. The Cognitive Abilities Screening Instrument (CASI). Data from a cohort of 2524 cognitively intact elderly. *Int J Geriatr Psychiatry* 1999;14:882–888.
14. Launer LJ, Harris T, Rumpel C et al. Body mass index, weight change, and risk of mobility disability in middle-aged and older women. The epidemiologic follow-up study of NHANES I. *JAMA* 1994;271:1093–1098.
15. Lawrence RH, Jette AM. Disentangling the disablement process. *J Gerontol B Psychol Sci Soc Sci* 1996;51B:S173–S182.
16. Clark DO, Von Korff M, Saunders K et al. A chronic disease score with empirically derived weights. *Med Care* 1995;33:783–795.
17. Blanc PD, Trupin L, Earnest G et al. Effects of physician-related factors on adult asthma care, health status, and quality of life. *Am J Med* 2003;114:581–587.
18. Mark DD, Byers VL, Mays MZ. Primary care outcomes and provider practice styles. *Mil Med* 2001;166:875–880.
19. Psaty BM, Koepsell TD, Lin D et al. Assessment and control for confounding by indication in observational studies. *J Am Geriatr Soc* 1999;47:749–754.
20. Buist DS, LaCroix AZ, Newton KM et al. Are long-term hormone replacement therapy users different from short-term and never users? *Am J Epidemiol* 1999;149:275–281.