Association Between Cognitive Decline in Older Adults and Utilization of Primary Care Physician Services in Pennsylvania

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Abstract

OBJECTIVE—To assess the relationship between cognitive decline of older patients (65 years) and utilization of primary care physician (PCP) services over 24-months.

DESIGN—Retrospective analysis of prospectively collected data from a cluster randomized trial that took place from 2006 to 2010 and investigated the relationship between formal neuropsychological evaluation and patient outcomes in primary care.

SETTING—Twenty-four PCPs in 11 practices in southwestern Pennsylvania. Most practices were suburban and included more than 5 PCPs.

PARTICIPANTS—A sample of 423 primary care patients 65 years or older.

MEASUREMENTS—The association between the number of PCP visits and a decline in cognitive status, as determined by multivariable analyses that controlled for patient-level, physician-level, and practice-level factors (e.g., patient age, comorbidities, and symptoms of depression; practice location and size; PCP age and sex) and used a linear mixed model with a random intercept to adjust for clustering.

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RESULTS—Over a two year follow-up, 199 patients (47.0%) experienced a decline in cognitive status. Patients with a cognitive decline had a mean of 0.69 more PCP visits than did patients without a cognitive decline ($P<0.05$).

CONCLUSIONS—Early signs of cognitive decline may be an indicator of greater utilization of primary care. Given the demographic trends, more PCPs are likely to be needed to meet the increasing needs of the older population.

Keywords

INTRODUCTION

With the aging of the baby boom generation and increases in life expectancy, 1 in 5 persons will be over the age of 65 years by 2030.[1] This demographic shift will be accompanied by an increase in the number of older adults with dementia and complex age-related comorbidities.[2] Currently, dementia affects up to 10% of the population over age 65 and almost half of those over age 85.[3] Mild cognitive impairment (MCI) has been shown to be a strong correlate for the development of dementia and it is estimated that as many as 25% of adults over age 65 have MCI.[4] Given these estimates, the expected growth among older adults will be accompanied by an increase in the number of visits to primary care physicians (PCPs), who frequently serve as the first point of contact for older adults when memory loss or early signs of dementia are suspected.[5,6]

The factors that influence utilization of primary care services among older adults have been examined within the framework of complex age –related co-morbidities, such as depression, psychological distress, and multi-morbidity.[7] A recent systematic review by Weber et al[8] found seven studies that investigated the frequency of older adults with dementia visiting a physician in the outpatient setting. The range of visits during a 12 -month period across all studies was 2.94–10.18. In each of these studies, the presence of dementia was known and identified by a diagnosis in either the medical chart or an insurance claim. The vast majority of older adults who experience cognitive decline or have cognitive impairment never receive a diagnosis and if they do it is late in the disease.[9,10] Despite the estimated prevalence of cognitive decline and undocumented cognitive impairment among older adults in primary care, no study has investigated the relationship between cognitive decline and use of primary care services among a sample with undocumented MCI or dementia.

Cognitive impairment is becoming a common presentation in primary care and it is important to understand the role of PCPs in caring for patients with dementia. Research indicates that PCPs offer higher-quality care and lower costs per Medicare beneficiary than do specialists,[11] yet outpatient services provided in the PCP setting account for only about 9% of total Medicare spending.[12,13] Although there have been studies of increased inpatient and outpatient medical service utilization among elderly patients with dementia and comorbid illnesses, the relationship between cognitive decline and the utilization of PCP services has not been fully studied.[14–16]

The purpose of our study was to explore factors driving the utilization of outpatient PCP services by older patients with cognitive decline. In designing the analysis, we used the Andersen[17] and Fortinsky[6] behavioral models of health service utilization to guide our selection of factors that are potentially associated with these services. The Andersen model[17] was developed as a conceptual framework to predict and explain different types of health services used by older adults. The model indicates that the health care needs of a patient precipitate the use of services and that patient-related characteristics and conditions

(e.g., gender, age, and specific needs) contribute to the type and volume of services that a patient uses. The model also acknowledges the importance of external environmental factors (e.g., the economic structure of health care or supply-driven variation). In 2001, Fortinsky expanded the Andersen model to address the utilization of health care by older individuals with cognitive impairment.[6] Fortinsky's triad model indicates that the level and quality of PCP services used by these individuals could be affected by the ability of PCP practices to recognize psychological and cognitive symptoms in older patients, to treat and manage these symptoms, and to link social and emotional support services for patients and their families.[6]

For our study, we hypothesized that patients with a greater decline in cognitive status and more self-reported symptoms of depression over a 24-month study period would have significantly higher utilization of PCP services, as indicated by the number of PCP visits.

METHODS

Our study was a retrospective secondary analysis of data that were prospectively collected during a cluster randomized trial of the relationship between formal neuropsychological evaluation and outcomes of PCP services. The trial was approved by the University of Pittsburgh Institutional Review Board, and all patients provided written informed consent. The details of the trial have been reported previously.[18,19]

Study Population

The study population of the parent trial consisted of patients who received care from 24 PCPs in 11 PCP practices in southwestern Pennsylvania.[18,19] Patients were eligible to participate if they were 65 years or older, did not have a documented diagnosis of dementia, were not acutely ill, and were referred by their PCP. They were excluded if screening by telephone revealed the presence of sensory deficits that would preclude their subsequent testing for cognitive impairment consistent with dementia. Specifically, they were excluded if screening revealed a score of 18 or less on the Mini–Mental State Examination.[20,21]

As part of the parent trial, which took place from 2006 to 2010, enrolled patients were assigned to a randomization group based on their PCP practice. Of the 11 practices, 6 were randomized to the intervention group, which received a detailed cognitive report of each patient's performance on a battery of standardized neuropsychological tests, and the remaining 5 were randomized to the usual care group, which did not receive a detailed report.

Of the 533 participants in the parent trial, 423 received a battery of neuropsychological tests at baseline and again at 24-month follow-up. Our study sample consisted of these 423 participants.

Data Collection

From public information sources and data supplied by the office practices, we collected information about office practice location (urban, suburban, or rural) and size (number of physicians). From questionnaires completed by physicians, we gathered data about their age, sex, race, and number of years of practice.

Via patient self-report, we collected sociodemographic information about each participant. This information included age, sex, race, education level, and marital status. At baseline, a registered nurse used a structured chart abstraction procedure to review the medical records of each participant and collect a complete medical problem list that began 2 years before the start of the study. From the outpatient PCP medical records, we collected health insurance information. During the study, we reviewed the outpatient records after each outpatient PCP

visit and collected data at 6, 12, and 24 months after baseline. We also collected data about prescription and over-the-counter medications from the medication list in the outpatient medical records, and we confirmed this information by checking the inventory of medication bottles brought by patients to their study appointments. In addition to determining the number of outpatient visits for each patient, we determined the number of emergency department visits and hospital admissions during the 24-month period.

Each patient completed a comprehensive neuropsychological test battery consisting of 14 standard cognitive tests in the domains of memory, executive function, spatial ability, attention/psychomotor speed, and language. The memory tests were the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Word List Learning Test with delayed recall,[22] the Wechsler Memory Scale–Revised Logical Memory I and II,[23] and the modified Rey-Osterrieth figure for immediate and delayed recall.[24] The tests of executive function were the Wechsler Adult Intelligence Scale–Revised (WAIS-R) Backward Digit Span,[25] the controlled oral word association test (FAS),[26] Part B of the Trail-Making Test,[27] the WAIS-R Digit Symbol,[25] and the Clock Drawing Test.[26] The tests of spatial ability were the modified Rey-Osterrieth Copy and the modified WAIS-R Block Design.[24,25] The tests of attention/psychomotor speed were the WAIS-R Digit Span Forward[25] and Part A of the Trail-Making Test.[27] And the language tests were the Boston Naming Test[28] and semantic fluency (animals) test.[26]

To aid in analysis of the findings on neuropsychological tests, we transformed raw test scores to standardized z scores, with negative scores indicating worse performance when compared with the mean. We determined a change (improvement or decline) in cognitive score by subtracting the baseline z score from the 24-month follow-up score.

Of the 423 participants in the sample, 3 had fewer than 3 missing test scores, and there was no pattern to the missing scores. For these participants, we imputed the mean test score of the group that had the same clinically adjudicated diagnosis: normal findings, mild cognitive impairment, or dementia.

To measure depressive symptoms in our sample, each patient completed a modified version of the Center for Epidemiological Studies–Depression (CES-D) Scale[29] during the baseline visit and again at the 24-month follow-up. This instrument asked participants about whether they experienced any of 20 symptoms during the past 2 weeks. They were considered to have depression if they experienced 4 or more of the symptoms at baseline and follow-up or at follow-up alone. The cutoff of 4 was chosen because nearly everyone in the 75th percentile reported experiencing at least 4 symptoms on the CES-D.

Statistical Analyses

First, to summarize the characteristics of the 3 categories of variables (office practices, PCPs, and patients), we used descriptive statistics.

Second, to test which variables in the 3 categories were independently predictive of PCP visits, we performed bivariable analyses. In subsequent multivariable analyses, we included all variables that were significant at the level of $P<0.05$ plus variables that previous studies have shown to be relevant to the number of PCP visits.[30]

Third, to test whether the number of PCP visits was associated with a decline in cognitive status or the presence of depressive symptoms, we used a linear mixed multivariable model with a random intercept to adjust for the clustering of patients with physicians and for the clustering of physicians within practices.

Fourth, to test whether the number of PCP visits was associated with the number of medical comorbidities, we stratified visit frequency by quartile and assessed the distribution of clinical covariates in the upper quartile versus the lower quartile.

Finally, to test whether the number of PCP visits was associated with greater overall contact with the health care system, we performed secondary analyses in which we stratified patients by visits to the emergency department (0 vs ≥1 visit) and by hospital admissions (0 vs ≥1 hospitalization) during the 24-month period.

For all multivariable analyses, we used SAS procedure PROC MIXED (SAS/STAT 9.2 software SAS Institute Inc., Cary, NC) and considered P values of <0.05 to be significant.

RESULTS

Of the patients in the sample, most were seen in suburban office practices that employed more than 5 physicians, and most were seen by male physicians aged 55–69 years old (Table 1). The mean number of study patients per PCP was 17.6 (range, 1–56), and the median number of study patients per office practice was 29.5.

Of the 423 patients, the majority were 65–74 years old, female, and married, and most had at least a high school education and were Medicare beneficiaries. From baseline to follow-up, 224 patients (53.0%) experienced an improvement in cognitive status and 199 (47.0%) experienced a decline in cognitive status. A total of 129 (30.5%) had depressive symptoms (Table 1).

In primary multivariable analyses (Table 2), the number of PCP visits was associated with 1 practice-level variable (rural practice location) but no physician-level variables. The number of PCP visits was also associated with all of the following patient-level variables: age; education level; history of chronic obstructive pulmonary disease (COPD), stroke, or hypertension; mean number of prescription medicines; cognitive change; and depressive symptoms. On average, patients who had a decline in cognitive status had 0.69 more visits than patients who did not (P<0.05), and patients with depressive symptoms had 0.76 more visits than those who did not (P<0.05). Similarly, patients who had a history of COPD, stroke, or hypertension had 1.70 more visits (P<0.0001), 1.43 more visits (P<0.01), and 1.21 more visits (P<0.01), respectively, than patients who did not.

The stratification of visit frequency (not shown) indicated that patients in the upper quartile of comorbidities had a mean of 12.33 PCP visits (SD, 3.74), whereas those in the lower quartile had a mean of 2.85 PCP visits (SD, 1.14). Patients in the upper quartile had a mean number of medical problems of 8.70 (SD, 3.93) and patients in the lower quartile had a mean of 5.87 (SD, 2.59). There was no overall change in the number of medical problems across time. That is, at baseline and 24-month follow-up, patients in the upper quartile had 8.9 and 8.5 medical problems, respectively, while those in the lower quartile had 6.4 and 5.3 medical problems, respectively. Thus, a higher frequency of PCP visits was not associated with comorbidities across the 2-year period.

Secondary multivariable analyses (Table 3) indicated that although patients who experienced a cognitive decline had more PCP visits than those who did not experience a cognitive decline, the difference in number of visits was statistically significant only in those who had at least 1 visit to the emergency department during the 24-month period.

DISCUSSION

In our study of community-dwelling older adults who completed comprehensive neuropsychological testing as part of a clinical trial, we found that a higher number of PCP visits was associated with being in a rural practice, having more medical co-morbidity, depression and cognitive decline over a 24-month period. Moreover, the association between cognitive decline and PCP visits was independent of the burden of depressive symptoms and medical comorbidities. This finding is similar to what Grober et al found regarding Medicare beneficiaries with documented dementia and use of emergency department and inpatient hospitalization.[31]

With the focus of US health policy both on improving access and quality of care and on controlling costs, it is important to understand the factors that are associated with PCP utilization among older adults. Previous work has demonstrated that patterns of PCP utilization are influenced by characteristics of PCP practices, physicians, and patients,[32,33] and many of our findings are in keeping with this. Although most older adults in the United States receive health care from a PCP,[32] studies indicate that the current PCP health system is poorly designed to match the needs of older adults with a diagnosis of dementia.[34] Our results indicate that prior to a diagnosis of dementia, when patients are beginning to show signs of cognitive decline, they increase the number of PCP visits. It is possible that in practice PCPs may be aware of a patient's changing cognitive status and are using the more frequent PCP encounters as periods of "watchful waiting" with regard to suspicious cognitive symptoms.[4,34] In the face of the changing demographics the expected increase of older adults with dementia, it is necessary for PCPs to have the tools and resources to identify patients with cognitive decline.

The Institute of Medicine recognizes that the patient-clinician relationship is "central to primary care" and "occurs within the context of a personal relationship between a patient and clinician that extends beyond an episode of illness."[35(p.15)] Our finding that older adults in rural practices tended to have more PCP visits than patients in urban and suburban practices may stem from this type of personal relationship between the physician and the older patient or even the relationship between the physician and the patient's caregivers. In contrast to this finding, Mobley and colleagues[36] found that older adults in rural settings tended to have higher rates of hospital admissions for conditions that could have been easily addressed in the outpatient setting. In our study, however, there was a smaller number of patients within the rural subset (42 vs 118 in urban and 263 in suburban subsets) and there were only 2 practices in the rural setting. The fact that the patients in the rural setting had almost twice as many visits as the patients in the other settings is in keeping with the observation of Baldwin and colleagues[37] that rural patients have fewer alternatives for care and utilize PCP services for both routine and specialized care.

Some investigators have found that a higher number of comorbid medical problems in people of all ages increases the number of visits to specialty care physicians but not to PCPs.[38] In contrast, others have found that a higher number of comorbid medical problems in older adults increases their number of visits to PCPs[39] and that chronic problems are the most frequent reason for older adults to see a PCP.[40] In our sample, we found that several comorbidities (COPD, stroke, and hypertension) were associated with a higher frequency of visits and that the upper quartile of patients with multiple comorbidities had a mean of 8.7 visits over a 24-month period, or roughly 1 visit to a PCP every 3 months. We do not know whether these patients sought additional care from specialty practitioners. We did not find that older adults with a higher number of PCP visits over the 24-month period had any reduction in the overall number of comorbidities recorded in their medical records.

Research concerning educational attainment and health service utilization has yielded somewhat contradictory results. The majority of older adults in our study sample had at least a high school education, making them more highly educated than the general population of older adults. We found that those with a lower educational status had more frequent visits to their PCP. Although this finding is consistent with studies showing that older adults with a lower educational status are more likely to utilize community services, such as senior centers,[41] it contradicts previous research showing that more highly educated older adults tend to visit physicians more often.[37] In our sample, the educational level of patients in rural practices was 2 years lower than that of patients in urban and suburban settings, so there may have been some confounding between the level of education and the PCP practice setting.

Depression is known to be both common in older adults and associated with co-existing medical disorders and increased health care utilization. Baune and colleagues found that depression was associated with a 24–42% increase in physician visits after taking into account co-morbid medical disorders.[42] In our sample, both depression and cognitive decline were predictive of a higher number of PCP visits. Consideration of clinical assessment for both cognition and depression and management would likely help to reduce doctor visits.

Our study has at least 3 limitations that deserve mention. First, we did not have, as part of our study, access to a variable that measured patients general propensity to use physician services or any health care service in general. Some studies have shown that psychological distress,[43] somatization,[43] and patient personality traits may play significant roles in the use of health care services.[44]

Second, our sample of PCPs and patients were drawn from southwestern Pennsylvania and may not be generalizable to other regions, especially given the documented geographical variation in care.[45] Third, the study did not determine the use of specialty care physicians. The data for our analyses were from a larger randomized trial in which all clinical information was collected from the outpatient chart, which does not consistently note care provided by specialists. Because our study was a secondary data analysis of data from a larger trial were not ideally powered, although power calculations revealed that we did have a high probability of observing significant differences between our group with cognitive decline and those without decline. Future work should be directed at teasing out the reasons for visits of the older population who experience a decline to PCPs as well as specialists.

In summary, our study indicates that there is an association between a number of factors and the utilization of PCP services among older adults: rural practices, certain medical comorbidities, depression and cognitive decline. Given the demographic trends, more PCPs are likely to be needed to meet the increasing demands of the older population.

Acknowledgments

REFERENCES

1. Federal Interagency Forum on Aging-Related Statistics. Older Americans 2008: key indicators of well-being. Available at: http://www.aoa.gov/agingstatsdotnet/Main_Site/Data/2008_Documents/Population.aspx.

2. Alzheimer's Association. 2009 Alzheimer's Disease Facts and Figures. http://www.alz.org/national/documents/report_alzfactsfigures2009.pdf.

3. Cummings JL, Cole G. Alzheimer's disease. JAMA. 2002; 287:2335–2338. [PubMed: 11988038]

4. Petersen RC, Smith GE, Waring SC, Ivnik RJ, Tangalos EG, Kokmen E. Mild cognitive impairment: clinical characterization and outcome. Archives of Neurology. 1999; 56(3):303–308. [PubMed: 10190820]

5. Boustani M, Sachs G, Callahan CM. Can primary care meet the needs of older adults with dementia? J Gen Intern Med. 2007; 22:1625–1627. [PubMed: 17882498]

6. Fortinsky RH. Health care triads and dementia care: integrative framework and future directions. Aging Ment Health. 2001; 5:35–48.

7. Naessens JM, Baird MA, Van Houten HK, Vanness DJ, Campbell CR. Predicting persistently high primary care use. Annals of Family Medicine. 2005; 3(4):324–330. [PubMed: 16046565]

8. Weber SR, Pirraglia PA, Kunik ME. Use of services by community -dwelling patients with dementia: A systematic review. Am J of Alzheimer's Dis Other Dementias. 2011; 26:195–204.

9. Bynum JP, Rabins PV, Weller W, Niefield M, Anderson GF, Wu AW. The relationship between a dementia diagnosis, chronic illness, Medicare expenditures and hospital use. JAGS. 2004; 52(2): 187–194.

10. Newcomer R, Clay T, Luxemberg JS, et al. Misclassification and selection bias when identifying Alzheimer's disease solely from Medicare claims records. J Am Geriatr Soc. 1999; 47:215–219. [PubMed: 9988293]

11. Baicker K, Chandra A. Medicare spending, the physician workforce, and beneficiaries' quality of care. Health Aff (Millwood). 2004 Suppl Web Exclusives:W4-184-97.

12. MedPac Medicare Payment and Advisory Committee. [Accessed May 9, 2011] June 2010 Healthcare Spending and the Medicare Program. Available at: http://www.medpac.gov/documents/jun10databookentirereport.pdf.

13. Congressional Budget Office. [Accessed May 9, 2011] 2002 Testimony on Projections of Medicare Spending under Current Law. Available at: http://www.cbo.gov/doc.cfm?index=3294.

14. Richards KM, Shepherd MD, Crismon ML, Snyder EH, Jermain DM. Medical services utilization and charge comparisons between elderly patients with and without Alzheimer's disease in a managed care organization. Clin Ther. 2000; 22:775–791. [PubMed: 10929924]

15. Kales HC, Blow FC, Copeland LA, Bingham RC, Kammerer EE, Mellow AM. Health care utilization by older patients with coexisting dementia and depression. Am J Psychiatry. 1999; 156:550–556. [PubMed: 10200733]

16. Kunik ME, Snow AL, Molinari VA, et al. Health care utilization in dementia patients with psychiatric comorbidity. Gerontologist. 2003; 43:86–91. [PubMed: 12604749]

17. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? J Health Soc Behav. 1995; 36:1–10. [PubMed: 7738325]

18. Snitz BE, Morrow LA, Rodriquez EG, Huber KA, Saxton JA. Subjective memory complaints and concurrent memory performance in older patients of primary care providers. J Int Neuropsychol Soc. 2008; 14:1004–1013. [PubMed: 18954480]

19. Morrow LA, Snitz BE, Rodriguez EG, Huber KA, Saxton JA. High medical co-morbidity and family history of dementia is associated with lower cognitive function in older patients. Fam Pract. 2009; 26:339–343. [PubMed: 19584123]

20. Lopez OL, Kuller LH, Fitzpatrick A, Ives D, Becker JT, Beauchamp N. Evaluation of dementia in the cardiovascular health cognition study. Neuroepidemiology. 2003; 22:1–12. [PubMed: 12566948]

21. Lopez OL, Jagust WJ, DeKosky ST, et al. Prevalence and classification of mild cognitive impairment in the Cardiovascular Health Study Cognition Study: part 1. Arch Neurol. 2003; 60:1385–1389. [PubMed: 14568808]

22. Morris JC, Heyman A, Mohs RC, et al. The Consortium to Establish a Registry for Alzheimer's Disease (CERAD). Part. I. Clinical and neuropsychological assessment of Alzheimer's disease. Neurology. 1989; 39:1159–1165. [PubMed: 2771064]

23. Wechsler, D. Wechsler Memory Scale–Revised. New York: The Psychological Corporation; 1987.

24. Shin MS, Park SY, Park SR, Seol SH, Kwon JS. Clinical and empirical applications of the Rey-Osterrieth Complex Figure Test. Nat Protoc. 2006; 1(2):892–899. [PubMed: 17406322]

25. Wechsler, D. Wechsler Adult Intelligence Scale–Revised Manual. New York: The Psychological Corporation; 1981.

26. Spreen, O.; Strauss, E. A Compendium of Neuropsychological Tests. New York: Oxford University Press; 1998.

27. Reitan RM. Validity of the Trail-Making Tests as an indication of organic brain damage. Percept Mot Skills. 1958; 8:271–276.

28. Kaplan, E.; Goodglass, H.; Weintraub, S. Boston Naming Test. 2nd ed.. Philadelphia: Lippincott Williams and Wilkins; 2001.

29. Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. Appl Psychol Measurement. 1977; 1:385–401.

30. Kales HC, Blow FC, Copeland LA, et al. Health care utilization by older patients with coexisting dementia and depression. Am J of Psych. 1999; 156(4):550–556.

31. Grober E, Sanders A, Hall CB, et al. Very mild dementia and medical comorbidity independently predict health care use in the elderly. J of Primary Care & Comm Health. 2011 Sep 7.

32. Landefeld CS, Callahan CM, Woolard N. General internal medicine and geriatrics: building a foundation to improve the training of general internists in the care of older adults. Ann Intern Med. 2003; 139:609. [PubMed: 14530244]

33. Mutran E, Ferraro KF. Medical need and use of services among older men and women. J Gerontol. 1988; 43:162–171.

34. Callahan CM, Boustani MA, Unverzagt FW, et al. Effectiveness of collaborative care for older adults with Alzheimer disease in primary care: a randomized controlled trial. JAMA. 2006; 295:2148–2157. [PubMed: 16684985]

35. Institute of Medicine. [Accessed May 9, 2011] Primary Care: America's Health in a New Era. 1996. Available at: http://www.iom.edu/Reports/1996/Primary-Care-Americas-Health-in-a-New_Eraaspx.

36. Mobley LR, Root E, Anselin L, Lazano-Grazia N, Koschinsky J. Spatial analysis of elderly access to primary care services. Int J Health Geogr. 2006; 15:19. [PubMed: 16700904]

37. Baldwin LM, Rosenblatt RA, Schneeweiss R, Lishner DM, Hart LG. Rural and urban physicians: does the content of their Medicare practices differ? 1999; 15:240–251.

38. Wolff JL, Starfield B, Anderson G. Prevalence, expenditures, and complications of multiple chronic conditions in the elderly. Arch Intern Med. 2002; 162:2269–2276. [PubMed: 12418941]

39. Glynn LG, Valderas JM, Healy P, et al. The prevalence of multimorbidity in primary care and its effect on health care utilization and cost. Fam Pract. PMID 21436204. In press.

40. Cherry DK, Hing E, Woodwell DA, Rechtsteiner EA. National Ambulatory Medical Care Survey: 2006 summary. Natl Health Stat Report. 2008; 3:1–39. [PubMed: 18972720]

41. Miner S, Logan JR, Spitze G. Predicting the frequency of senior center attendance. Gerontologist. 1993; 33:650–657. [PubMed: 8225010]

42. Baune TB, Adrian I, Jacobi F. Medical disorders affect health outcome and general functioning depending on comorbid major depression in the general population. J. Psychosomatic Research. 2007; 62:109–118.

43. Sheehan B, Bass C, Briggs R, Jacoby R. Somatization among older primary care attenders. Psychological Med. 200; 33:867–877.

44. Westhead JN. Frequent attenders in fgeneral practice: Medical, psychological social characteristics. Journal of the Royal College of General Practitioners. 1985; 35:337–340. [PubMed: 4032365]

45. Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder EL. The implications of regional variations in Medicare spending. Part 2: health outcomes and satisfaction with care. Ann Intern Med. 2003; 138:288–298. [PubMed: 12585826]

Table 1

Characteristics of the Sample of 11 Primary Care Practices, 24 Physicians, and 423 Patients

Characteristic	No. (%)
Primary care practices	
Location	
Urban	2 (18.2)
Suburban	7 (63.6)
Rural	2 (18.2.9)
Size	
1–5 physicians	6 (55)
>5 physicians	5 (45)
Primary care physicians	
Age, years	
<55	8 (33.3)
55–69	16 (66.7)
Male sex	20 (83.3)
Patients	
Age, years	
65–74	257 (60.8)
75–84	140 (33.1)
85	26 (6.1)
Female sex	247 (58.4)
Education level of high school or more	385 (91.0)
Married (not single, widowed, divorced, or separated)	269 (63.6)
Medical history of	
Arrhythmias or coronary artery disease	172 (40.7)
Chronic obstructive pulmonary disease	107 (25.3)
Stroke	55 (13.0)
Diabetes	136 (32.2)
Hypertension	326 (77.1)
Medicare insurance	361 (85.3)
Randomization assignment from parent study	
Treatment as usual	169 (40.0)
Physician receives cognitive report	254 (60.0)
Change in cognitive status from baseline to follow-up	
Improvement in z score	224 (53.0)
Decline in z score	199 (47.0)
Presence of depressive symptoms [*]	129 (30.5)

[*] Defined as a score of 4 in the Center for Epidemiological Studies–Depression (CES-D) Scale at baseline and follow-up or at follow-up alone.

Table 2

Results of Multivariable Analyses to Test the Effect of Cognitive Decline on the Number of PCP Visits Over a 24-Month Period

Variable	Adjusted Mean Number of Visits	P value
Primary care practices		
Location	5.75	0.005
Urban	7.22	
Suburban	10.17	
Rural		
Size		0.646
1–5 physicians	7.97	
>5 physicians	7.46	
Primary care physicians		
Age, years	7.62	0.819
<55	7.82	
55–69		
Male sex	7.74	0.963
Patients		
Age, years		0.027
65–74	6.98	
75–84	7.90	
85	8.27	
Education level		0.018
Less than high school	8.46	
High school or more	6.98	
Married (not single, widowed, divorced, or separated)	7.53	0.304
Medical history of		
Arrhythm ias or coronary artery disease		0.813
Yes	7.67	
No	7.76	
Chronic obstructive pulmonary disease		0.0001
Yes	8.56	
No	6.86	
Stroke		0.005
Yes	8.43	
No	7.00	
Diabetes		0.896
Yes	7.74	
No	7.69	

Variable	Adjusted Mean Number of Visits	P value
Hypertension		0.005
Yes	8.32	
No	7.11	
Randomization assignment from parent study		0.811
Treatment as usual	7.61	
Physician receives cognitive report	7.83	
Change in cognitive status from baseline to follow-up		0.049
Improvement in z score	7.37	
Decline in z score	8.06	
Depressive symptoms [*]		0.049
Yes	8.10	
No	7.33	

[*] Defined as a score of 4 in the Center for Epidemiological Studies–Depression (CES-D) Scale at baseline and follow-up or at follow-up alone.

Table 3

Results of Multivariable Analyses to Test the Effect of Cognitive Decline on the Number of PCP Visits Stratified by Emergency Department Visits and Hospital Admissions Over a 24-Month Period

Variable	Emergency Department Visits[†]				Hospital Admissions[‡]			
	None		1		None		1	
	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value
Primary care practices								
Location		0.017		0.014		0.003		0.032
Urban	5.77		5.39		6.23		5.48	
Suburban	6.73		7.29		7.42		7.22	
Rural	10.02		10.59		10.47		11.38	
Size		0.912		0.134		0.603		0.446
1–5 physicians	7.57		8.85		8.30		8.71	
>5 physicians	7.44		6.65		7.77		7.34	
Primary care physicians								
Age, years		0.879		0.808		0.927		0.927
<55	7.58		7.90		8.08		7.96	
55–69	7.43		7.62		8.01		8.09	
Male sex	7.87	0.550	7.57	0.763	7.78	0.590	8.43	0.613
Patients								
Age, years		0.097		0.883		0.001		0.580
65–74	6.88		7.51		6.82		7.80	
75–84	7.68		7.98		7.66		8.63	
85	7.96		7.78		9.64		7.65	
Education level		0.019		0.453		0.136		0.225
Less than high school	8.26		8.38		8.52		8.78	

Variable	Emergency Department Visits[†]				Hospital Admissions[‡]			
	None		1		None		1	
	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value
High school or more	6.75		7.13		7.56		7.28	
Married (not single, widowed, divorced, or separated)	7.45	0.77	7.33	0.34	7.85	0.239	7.61	0.330
Medical history of								
Arrhythm ias or coronary artery disease		0.530		0.441		0.665		0.091
Yes	7.63		7.40		8.12		7.32	
No	7.39		8.11		7.96		8.73	
Chronic obstructive pulmonary disease		0.010		0.011		<0.0001		0.210
Yes	8.09		8.86		8.87		8.54	
No	6.93		6.65		7.21		7.51	
Stroke		0.180		0.066		0.034		0.262
Yes	7.90		8.72		8.60		8.60	
No	7.12		6.78		7.48		7.46	
Diabetes		0.272		0.867		0.299		0.750
Yes	7.74		7.68		8.23		7.88	
No	7.28		7.83		7.85		8.17	
Hypertension		0.013		0.161		0.001		0.197
Yes	8.07		8.50		8.66		8.71	
No	6.95		7.00		7.42		7.34	
Randomization assignment from parent study		0.850		0.240		0.471		0.866
Treatment as usual	7.61		7.06		7.74		7.90	
Physician receives cognitive report	7.42		8.45		8.35		8.16	
Change in cognitive status from baseline to follow-up		0.510		0.012		0.301		0.270
Improvement in z score	7.39		8.89		7.88		7.57	
Decline in z score	7.63		6.62		8.20		8.49	
Depressive symptoms [*]		0.344		0.184		0.159		0.139
Yes	7.70		8.39		8.29		8.66	

Variable	Emergency Department Visits[†]					Hospital Admissions[‡]				
	None		1			None		1		
	Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value		Adjusted Mean Number of Visits	P value	Adjusted Mean Number of Visits	P value	
No	7.32		7.12			7.78		7.40		

[†] Of the 423 patients, 312 had no emergency department visits and 111 had ≥1 emergency department visit.

[‡] Of the 423 patients, 269 patients had no hospital admissions and 151 had ≥1 hospital admission.

[*] Defined as a score of ≥4 in the Center for Epidemiological Studies–Depression (CES-D) Scale at baseline and follow-up or at follow-up alone.