

# Cost Evaluation of a Coordinated Care Management Intervention for Dementia

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**D**ementia, defined as an acquired persistent impairment in 2 or more cognitive areas (eg, language and memory), is a leading cause of disability in older adults.<sup>1,2</sup> Dementia of the Alzheimer type, the most common variant, affects more than 4 million Americans.<sup>3</sup> Dementia care represents a substantial expense for healthcare organizations and society, with the combined costs for formal services (inpatient and outpatient medical care) and informal caregiving exceeding \$25,000 per-patient per year in most studies.<sup>4-8</sup> The overall cost burden will escalate significantly over the coming decades as the American population ages and the prevalence of dementia increases.<sup>3</sup>

Existing practice guidelines for dementia care reflect evidence from randomized controlled trials (RCTs) showing that assistance to caregivers can reduce the severity of patients' symptoms, decrease the use of acute care services, and delay institutionalization, potentially lowering costs over time.<sup>2,9-12</sup> Unfortunately, adherence to these guidelines is variable across health systems.<sup>13-15</sup> Collaborative care management programs emphasize coordinated and comprehensive approaches to improving quality of care. These programs are most effective for diseases such as dementia that are high-volume conditions primarily managed in the outpatient setting, have substantial variability in treatment, and rely on coordination with community agencies for recommended social services.<sup>16-19</sup> Large healthcare organizations, particularly managed care systems, have an opportunity to implement care management programs for patients with dementia that improve quality of care, reduce the burden on caregivers, and potentially have long-term cost offsets.<sup>16,17,20,21</sup>

In a recent evaluation of an RCT of a care management intervention for dementia, it was found that patient health-related quality of life, caregiving quality, social support, level of unmet caregiving assistance needs, and adherence to published dementia care guidelines were better for intervention patients compared with patients receiving usual care.<sup>12</sup> Although this intervention substantially and broadly improved the

quality of dementia care, health plan administrators need data on start-up costs and cost offsets to weigh the value of such programs. Some or all of the initial financial expenses may be recovered over time if the intervention

**Objective:** To calculate intervention costs and the potential cost offset of a care management intervention that substantially improved the quality of dementia care.

**Study Design:** From both a payer perspective and a social planner perspective, we analyzed data from a cluster randomized controlled trial (RCT) evaluating this intervention versus usual care. The RCT included 408 pairs of older adults with dementia and their caregivers. Caregivers were surveyed at baseline, at 12 months, and at 18 months to assess patient healthcare utilization and out-of-pocket costs.

**Methods:** We calculated fixed and per-patient intervention costs from RCT records. We combined the monthly per-patient costs of healthcare services, informal caregiving, and out-of-pocket costs, and we conducted multivariate analyses comparing this sum (potential cost offset) for intervention versus usual care patients. Covariates included patient age, sex, and baseline costs. We limited the main analysis to patients who survived until the 12-month survey or the 18-month survey.

**Results:** The intervention required a start-up cost of \$70,256 and mean intervention per-patient per-month costs of \$118. There were no significant differences in the mean monthly cost of healthcare and caregiving services for intervention versus usual care patients using the societal perspective (difference of -\$555 per month,  $P = .28$ ) or the payer perspective (difference of -\$219 per month [including nursing home costs],  $P = .55$ ; difference of -\$256 per month [excluding nursing home costs],  $P = .47$ ).

**Conclusion:** Although this analysis of a dementia care management intervention did not demonstrate a significant cost offset, the intervention may represent a worthwhile approach to improving the quality of care and health outcomes for patients with dementia and their caregivers.

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For author information and disclosures, see end of text.

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### Take-Away Points

This cost analysis of a dementia care management program proven to improve quality and outcomes did not show a definitive cost offset over 18 months but may represent a cost-effective approach to providing high-quality dementia care in managed care settings.

- Few programs that demonstrably improved quality of dementia care have been reported.
- This program successfully connected patients and caregivers to existing community services, as recommended in guidelines.
- This detailed cost analysis from the payer and social planner perspectives provides managed care decision makers with data on fixed and ongoing program costs, as well as on potential reductions in other healthcare and caregiving costs.

descriptions can be accessed at the Alzheimer's Disease Coordinated Care for San Diego Seniors Web site (<http://www.adc.ucla.edu/access/access.swf>). Patients, caregivers, and providers in the usual care group did not receive any of the intervention protocol, and patients received care as usual.

provides an ongoing net savings (eg, by reducing the need for costly services such as hospitalizations).

To understand the economics of this intervention, we calculated the associated start-up and annual fixed costs and projected the per-patient variable costs of the intervention operating at full capacity. We hypothesized that, among patients who survived for the entire study period, the costs of healthcare and caregiving services would be lower for patients in the intervention arm compared with patients receiving usual care from both payer and societal perspectives. We also hypothesized that savings associated with the intervention would represent a complete offset of the associated start-up and annual fixed costs, such that budget neutrality would be achieved within several years.

## METHODS

The components of the care management intervention, as well as specific study-related outcomes that included adherence to each of 23 dementia guideline recommendations, have been described previously.<sup>12</sup> In brief, patients with dementia receiving services in 18 primary care clinics within 3 healthcare organizations in the San Diego, California, area, together with their informal caregivers, were enrolled in a cluster RCT with an 18-month follow-up. Patient-caregiver dyads in the intervention arm were assigned a care manager, who was trained in the use of Internet-based care management software. The care managers performed a structured home assessment, identified problems, initiated care plan actions, and sent a summary to the primary care physician and other designated providers. Care managers provided ongoing follow-up as needed, with in-home reassessments every 6 months.

Three community agencies collaborated with the participating healthcare organizations to provide specific care services (eg, access to respite care). A physician champion was established within each healthcare organization. At each of the intervention clinics, providers received standardized interactive educational seminars on relevant care issues such as the evaluation of acute behavior changes. Selected intervention tools and documents with more detailed

### Study Design and Participants

Institutional review boards at the University of California, Los Angeles, and all participating sites approved the study, and informed consent was obtained from all study subjects (or from their proxies). Patients were eligible for the intervention if they were at least 65 years of age, enrolled in Medicare (either fee-for-service or managed care plans), had a dementia diagnosis, and had an informal caregiver at least 18 years of age. Potentially eligible patients were identified by a dementia diagnosis code or a cholinesterase inhibitor prescription recorded in administrative claims data. Clinic providers were contacted to confirm each diagnosis and to suggest additional patients as potential participants. Patient-caregiver dyads were enrolled between August 2001 and November 2002. After enrollment, caregivers were surveyed at baseline, at 12 months, and at 18 months. The surveys collected detailed information about patient healthcare utilization, paid and unpaid caregiving hours, costs of paid nonprofessional caregivers, and out-of-pocket expenses in the 6 months before enrollment through 18 months after enrollment.

Within each healthcare organization, clinics were matched by patient volume and subsequently were randomized to either the intervention (9 clinics) or usual care (9 clinics). By the end of the enrollment period, each full-time care manager was managing approximately 50 patient-caregiver dyads. We used this figure to calculate the per-patient variable costs of the intervention, which depended on the scale of the intervention. We used an intent-to-treat framework based on the initial randomization and limited the main analyses to patients with complete utilization data at baseline who survived for the entire study period and had follow-up data at 12 months, 18 months, or both. Patients who were institutionalized during the study period were included in the analyses. We excluded from the main analyses patients who died, as the substantial costs associated with end-of-life care<sup>22,23</sup> might overshadow any cost differences related to the intervention. Although mortality rates did not differ significantly between the intervention and usual care groups at any point during the study,<sup>12</sup> we performed sensitivity analyses that included patients who died before the study ended.

### Intervention Cost and Potential Cost Offset

In brief, we estimated the cost of the intervention by summing fixed 1-time start-up costs, annual fixed costs, and per-patient variable costs (eAppendix A available at [www.ajmc.com](http://www.ajmc.com)). We did not have true cost data for healthcare and caregiving services not directly attributable to the intervention (ie, potential cost offset), but we estimated this information using expenditure data (eAppendix B available at [www.ajmc.com](http://www.ajmc.com)). We determined the units of each service utilized by each patient and applied standard unit costs from sources such as the Medical Expenditure Panel Survey and the Centers for Medicare & Medicaid Services. Although we did not include pharmacy costs because sufficiently detailed information was unavailable to us, we performed an ancillary analysis examining the effect of the intervention on the rates of cholinesterase inhibitor use.

We considered 2 different perspectives in calculating the potential cost offset, a “payer” perspective and a “social planner” perspective (eAppendix C available at [www.ajmc.com](http://www.ajmc.com)). The payer perspective is limited to the formal costs of care borne by the health plan. We calculated estimates for this perspective under 2 different assumptions with and without the cost of nursing home stays included. The social planner perspective implies that costs and benefits accruing to all members of society are measured.<sup>24</sup> This perspective includes not only the formal costs of care but also the opportunity costs associated with informal caregiving, which represent a substantial proportion of the costs of dementia care.<sup>25,26</sup>

### Statistical Analysis

In unadjusted analyses, we compared baseline characteristics and costs of healthcare for the intervention and usual care arms. We used the  $\chi^2$  test for categorical variables and the Wilcoxon 2-sample rank sum test or 2-sample *t* test for continuous variables, depending on their distributions. In ordinary least squares regression analyses, we compared the mean monthly costs of healthcare and caregiving services for intervention and usual care patients who survived the entire 18-month study period and had follow-up data available at 12 months, 18 months, or both. The estimated intervention effect was similar when using square root and log transformations of the dependent variable, so for ease of interpretation we report the results when using the original (nontransformed) cost variable.

To account for the complex sample design, including the clustering of patient-caregiver dyads within clinics, we used generalized estimating equations and adjusted for clinic as the clustering variable using statistical software (STATA 8.2; StataCorp LP, College Station, TX). In addition to the indicator variable for the intervention group versus the con-

trol group, we included as covariates patient age and sex, indicators for the healthcare organizations, an indicator of managed care versus fee-for-service insurance, and the patient’s mean monthly costs of healthcare and caregiving services during the 6 months before baseline. The analyses were weighted based on the number of months of follow-up data (maximum, 18 months) available for each subject to increase the influence of data from patients with longer study enrollment and to produce more reliable monthly cost means.<sup>27</sup> We conducted 2 sensitivity analyses that included (1) patients with at least 1 follow-up survey regardless of whether they died during the study and (2) patients who survived for the entire study period and had follow-up data at both 12 months and 18 months.

## RESULTS

Of 1043 patients initially identified from claims data and contacted about enrollment through their provider, 91 were ineligible, 308 declined to participate, and 236 did not respond, comparable to other quality improvement trials that used registries or claims data to identify potentially eligible subjects for recruitment.<sup>28,29</sup> Four hundred eight patient-caregiver dyads were enrolled (238 in the intervention group and 170 in the usual care group), and all but 1 had complete utilization data at baseline. Survey response rates were 88% at 12 months and 82% at 18 months, excluding 32 deaths in the intervention group and 26 deaths in the usual care group. There were no significant differences in patient or caregiver characteristics (including age, sex, living status, education, marital status, race/ethnicity, dementia severity and duration, and comorbidity) between follow-up survey respondents and nonrespondents. For the main analyses, data were available for 296 of 408 enrolled patients who survived for the entire study period and completed at least 1 follow-up survey. For the sensitivity analyses, data were available for 354 patients who completed at least 1 follow-up survey and for 260 patients who survived for the entire study period and completed surveys at both 12 months and 18 months.

At baseline, the intervention and usual care groups did not differ with regard to demographic and clinical characteristics (Table 1). The mean age was approximately 80 years, and more than half of the patients were female. Approximately three-quarters had dementia of the Alzheimer type, and patients had received a dementia diagnosis on average between 2 and 3 years before study onset. Approximately 77% were in Medicare managed care settings, with the remainder in Medicare fee-for-service arrangements.

There were no significant differences in inpatient or outpatient utilization between the 2 study groups at baseline or at

■ **Table 1.** Baseline Characteristics of the Study Cohort

Characteristic	Intervention (n = 170)	Usual Care (n = 126)	Group Difference P Value <sup>a</sup>
<b>Total healthcare and caregiving costs per patient per month at baseline based on the prior 6 mo, mean (SD), \$</b>	5275 (8935)	5245 (5201)	.97
<b>Patient characteristics</b>			
Female sex, No. (%)	94 (55.3)	71 (56.3)	.86
Age, mean (SD), y	79.4 (6.1)	79.6 (6.6)	.80
Married or living with someone, No. (%)	108 (63.5)	76 (60.3)	.57
Ethnic minority, No. (%)	22 (12.9)	22 (17.5)	.30
≥High school graduate, No. (%)	144 (84.7)	99 (78.6)	.17
Managed care Medicare, No. (%)	133 (78.2)	94 (74.6)	.43
Duration of diagnosis of dementia, mean (SD), y	2.4 (2.9)	2.9 (2.6)	.16
Duration of symptoms of dementia, mean (SD), y	4.1 (3.8)	4.6 (3.3)	.21
Dementia severity score, mean (SD) <sup>b</sup>	5.3 (3.4)	5.9 (4.2)	.19
Taking cholinesterase inhibitor, donepezil hydrochloride, tacrine hydrochloride, or rivastigmine, No. (%)	97 (57.1)	74 (58.7)	.78
Type of dementia, No. (%)			
Alzheimer	130 (76.5)	95 (75.4)	.75
Vascular dementia or multi-infarct dementia	12 (7.1)	12 (9.5)	
All others	28 (16.5)	19 (15.1)	
Caregiver reports that the patient had behavioral problem in past year, No. (%)	83 (48.8)	69 (54.8)	.31
Charlson Comorbidity Index, mean (SD) <sup>c</sup>	2.6 (1.8)	2.6 (1.8)	.91

<sup>a</sup>Wilcoxon signed rank test was used for the mean total costs per patient per month and Charlson Comorbidity Index. Two-sample *t* test was used for all other continuous variables (age, duration of diagnosis and symptoms of dementia, and dementia severity score).  $\chi^2$  Test was used for all categorical variables.

<sup>b</sup>Blessed-Roth Dementia Scale score range, 0-17 (higher scores indicate more severe dementia).

<sup>c</sup>Score range, 1-21 (higher scores indicate more severe comorbidity).

follow-up (Table 2 and Table 3). At baseline, less than 20% of patients in either group had been hospitalized, and less than 5% of patients overall had been admitted to a nursing home. During the course of follow-up, approximately 30% of patients in each group were hospitalized, and less than 15% were admitted to a nursing home. Although (as previously noted) we could not include medication costs in the cost analyses, there was an increase of approximately 10 percentage points in the use of cholinesterase inhibitors among patients in the intervention group at follow-up versus no change among patients in the usual care group.<sup>12</sup>

The intervention had a fixed start-up cost of \$70,256 and annual fixed costs of \$24,162 to each of the healthcare organizations regardless of the number of patient-caregiver dyads enrolled (eAppendix A). Assuming that the intervention enrolled 200 patient-caregiver dyads, the variable cost to the healthcare organizations would be \$98 per patient per month. Examining the payer perspective with the cost of nursing home stays

included, the mean monthly adjusted costs of healthcare and caregiving services during the follow-up period were \$219 less for the intervention group compared with the usual care group (\$1402 vs \$1621 per patient per month), although the difference was not statistically significant ( $P = .55$ ) (Table 4). Results were similar if the cost of nursing home stays was excluded, with a nonsignificant reduction of \$256 in costs for the intervention group (\$1119 vs \$1375 per patient per month,  $P = .47$ ).

To examine the social planner perspective, we combined the costs accrued by the community agencies with those of the healthcare organizations and included out-of-pocket costs. The fixed start-up cost for each of the 3 community agencies was \$1240, with annual fixed costs varying from \$4042 to \$10,812 across the agencies (eAppendix A). The ongoing mean cost of the intervention was approximately \$118 per patient per month for the healthcare organizations and community organizations together. The mean monthly adjusted costs of healthcare and caregiving services during the follow-up period, representing

**Table 2.** Baseline Utilization in the Previous 6 Months

Variable	Intervention (n = 170)		Usual Care (n = 126)		Wilcoxon P Value
	Mean (SD)	No. (%) With Any Stays or Visits	Mean (SD)	No. (%) With Any Stays or Visits	
<b>Inpatient utilization in past 6 mo, No. of nights</b>					
Hospitalizations	1.1 (3.3)	27 (15.9)	1.2 (7.3)	17 (13.5)	.74
Nursing home stays	2.5 (14.7)	9 (5.3)	4.9 (28.1)	5 (4.0)	.63
Hospice stays	0.2 (2.5)	1 (0.1)	0.0 (0.0)	0	.39
Stays in assisted living facilities	12.1 (42.7)	15 (8.8)	15.1 (48.8)	15 (11.9)	.39
<b>Outpatient utilization in past 6 mo</b>					
Physician visits, including geriatricians, family physicians or general internal medicine physicians, neurologists, psychiatrists, and other specialty physicians	3.9 (4.1)	158 (92.9)	3.7 (3.7)	110 (87.3)	.65
Other healthcare professional visits, not physicians	2.4 (9.9)	84 (49.4)	1.4 (2.4)	64 (50.8)	.41
Podiatrist visits	0.4 (1.0)	27 (15.9)	0.2 (0.7)	16 (12.7)	.40
Emergency department visits	0.6 (1.0)	58 (34.1)	0.5 (1.0)	29 (23.0)	.07
<b>Healthcare in the home in past 6 mo</b>					
Home nurse visits	0.5 (2.3)	16 (9.4)	0.8 (3.4)	11 (8.7)	.91
Home health aide visits	1.5 (7.8)	10 (5.9)	2.4 (15.7)	9 (7.1)	.68
Home physical therapy, occupational therapy, or speech therapy visits	0.4 (1.6)	11 (6.5)	0.3 (1.9)	6 (4.8)	.53
<b>Informal caregiving hours in past 6 mo</b>					
Paid unskilled	100.9 (511.9)	23 (13.5)	106.8 (447.2)	20 (15.9)	.56
Unpaid unskilled	1811.8 (1778.9)	166 (97.6)	1781.1 (1845.4)	125 (99.2)	.63

the potential cost offset, were \$555 less for the intervention group compared with the usual care group (\$5332 vs \$5887 per patient per month), although the difference was again not statistically significant ( $P = .28$ ) (Table 4). Sensitivity analyses using different inclusion criteria also found no difference in costs between the 2 study arms regardless of whether the social planner perspective or the payer perspective was used. In a 1-sided hypothesis test, we found no evidence that the intervention costs would be less than the cost offset to healthcare organizations as calculated over an 18-month period ( $P = .72$ ) (data not shown). Finally, total costs did not differ for patients enrolled in managed Medicare versus fee-for-service Medicare using either analytic perspective.

## DISCUSSION

In this cost evaluation of a dementia care management intervention, we found no evidence of lower costs compared

with the costs of usual care at 18 months' follow-up. However, this intervention has been shown to significantly improve multiple measures of dementia care quality, as well as patient and caregiver outcomes, and may represent a cost-effective approach to improving quality of care even if it is not cost saving.<sup>12</sup> The American Academy of Neurology,<sup>30</sup> the American Geriatrics Society,<sup>31</sup> and the American Association for Geriatric Psychiatry<sup>32</sup> have published guidelines advocating the increased use of comprehensive dementia care strategies. The intervention may be attractive to healthcare organizations that prioritize improving adherence to these guidelines.

We are unaware of any prior cost analyses of dementia care management interventions that were designed to simultaneously target both healthcare and community settings. The Medicare Alzheimer's Disease Demonstration and Evaluation project examined the effect of case management and collaboration with community organizations, but not health

■ **Table 3.** Follow-up Utilization per Month

Variable	Intervention (n = 170)		Usual Care (n = 126)		Wilcoxon P Value
	Mean (SD)	No. (%) With Any Stays or Visits	Mean (SD)	No. (%) With Any Stays or Visits	
<b>Inpatient utilization per month, No. of nights</b>					
Hospitalizations	0.10 (0.22)	53 (31.2)	0.15 (0.42)	41 (32.5)	.78
Nursing home stays	1.17 (4.68)	24 (14.1)	1.00 (4.33)	16 (12.7)	.72
Hospice stays	0.01 (0.02)	1 (0.6)	0.03 (0.34)	1 (0.8)	.83
Stays in assisted living facilities	3.19 (8.37)	27 (15.9)	4.05 (9.14)	29 (23.0)	.15
<b>Outpatient utilization per month</b>					
Physician visits, including geriatricians, family physicians or general internal medicine physicians, neurologists, psychiatrists, and other specialty physicians	0.60 (0.51)	166 (97.6)	0.52 (0.47)	118 (93.7)	.10
Other healthcare professional visits, not physicians	0.29 (0.62)	118 (69.4)	0.23 (0.50)	88 (69.8)	.61
Podiatrist visits	0.06 (0.13)	45 (26.5)	0.07 (0.27)	43 (34.1)	.26
Emergency department visits	0.08 (0.11)	96 (56.5)	0.07 (0.10)	66 (52.4)	.63
<b>Healthcare in the home per month</b>					
Home nurse visits	0.10 (0.41)	27 (15.9)	0.28 (1.82)	24 (19.0)	.44
Home health aide visits	1.38 (4.73)	38 (22.4)	0.76 (3.42)	19 (15.1)	.11
Home physical therapy, occupational therapy, or speech therapy visits in past 6 mo	0.04 (0.32)	9 (5.3)	0.03 (0.19)	9 (7.1)	.51
Adult day care hours	3.86 (14.63)	25 (14.7)	1.42 (7.52)	12 (9.5)	.17
Delivered meals	0.89 (5.19)	15 (8.8)	1.56 (7.72)	11 (8.7)	.99
<b>Informal caregiving hours per month</b>					
Paid unskilled	18.4 (62.4)	35 (20.6)	16.5 (42.8)	25 (19.8)	.97
Unpaid unskilled	326.4 (271.8)	170 (100.0)	323.0 (294.1)	126 (100.0)	.64

plans, on formal costs of care.<sup>33</sup> The total cost of the project reached budget neutrality at only 1 of 8 sites. The Resources for Enhancing Alzheimer’s Caregivers Health II home-based intervention reported a cost of \$5 for each hour of informal caregiving time saved by the intervention.<sup>20</sup> The present study adds to the literature by providing cost estimates on a more comprehensive care management intervention that, on average, doubled rates of adherence to 23 indicators of dementia care quality and improved patient and caregiver outcomes.<sup>12</sup>

The likelihood of similar cost estimates if our intervention was replicated in other settings depends on several assumptions, particularly the enrollment of 200 patient-caregiver dyads within a system to achieve full operating capacity. In our study, this enrollment level was reached after 15 months,

but delayed or limited enrollment in other settings would increase the per-patient variable costs. Replicating the recruitment approach used in this randomized trial, in which potential participants were identified based on case-finding strategies such as a registry or an administrative database and were then approached and automatically offered the opportunity to enroll, would help to ensure adequate enrollment rather than relying solely on referrals triggered by “crisis” situations.<sup>34</sup>

Given the intervention start-up cost of approximately \$75,000, whether managed care organizations ultimately adopt this approach will depend on the existing cost structure of dementia care overall, as well as on projected patient turnover and mortality rates. There are several financial obstacles to adopting this type of intervention in managed care,

**Table 4.** Regression-Adjusted Differences in Healthcare and Caregiving Costs per Month Between the Intervention and Usual Care Arms<sup>a</sup>

Variable	Predicted Costs per Patient per Month, Mean, \$			
	Intervention	Usual Care	Between-Group Difference (95% Confidence Interval)	P Value
<b>Sample, excluding those deceased (n = 296)<sup>b</sup></b>	<b>(n = 170)</b>	<b>(n = 126)</b>		
Payer perspective, including nursing home	1402	1621	−219 (−982 to 542)	.55
Payer perspective, excluding nursing home	1119	1375	−256 (−985 to 474)	.47
Societal perspective	5332	5887	−555 (−1615 to 507)	.28
<b>Entire sample (n = 354)<sup>c</sup></b>	<b>(n = 202)</b>	<b>(n = 152)</b>		
Payer perspective, including nursing home	2241	2097	144 (−1092 to 1380)	.81
Payer perspective, excluding nursing home	1868	1772	95 (−1156 to 1345)	.88
Societal perspective	6479	6381	98 (−1216 to 1335)	.89
<b>Sample with complete 18-mo data (n = 260)<sup>d</sup></b>	<b>(n = 152)</b>	<b>(n = 108)</b>		
Payer perspective, including nursing home	1415	1674	−260 (−1178 to 658)	.56
Payer perspective, excluding nursing home	1134	1405	−272 (−1153 to 610)	.53
Societal perspective	5388	5753	−365 (−1291 to 560)	.42

<sup>a</sup>All regression models control for a constant term, baseline costs, patient age and sex, and indicator variables for healthcare organizations and include clustering of subjects within clinics. Costs of the intervention per se are excluded from the dependent variable.  
<sup>b</sup>Sample of 296 patients who had utilization survey data for the baseline survey and at least 1 follow-up survey (12 months or 18 months) and who survived the study period up to the last completed survey. The analysis was weighted for the percentage of patients enrolled in the program for 18 months.  
<sup>c</sup>Sample of 354 patients with utilization survey data for the baseline survey and at least 1 follow-up (12 months or 18 months). The analysis was weighted for the percentage of patients enrolled in the program for 18 months.  
<sup>d</sup>Sample of 260 patients with complete utilization survey data through 18 months (survived the study period and had utilization data for the baseline survey and for both the 12-month and 18-month follow-up surveys).

including the absence of risk sharing for long-term care. Although long-term care is the most costly aspect of dementia care, Medicaid and patient out-of-pocket payments cover two-thirds of the cost.<sup>35</sup> Managed care organizations have little financial incentive to invest in quality improvement strategies that may reduce institutionalization, as they are generally not responsible for expenses related to long-term dementia care.<sup>17</sup>

Another financial barrier to the adoption of care management for dementia is a problematic reimbursement system. Although dementia is a contributing factor to many hospital admissions and increases the cost of inpatient and outpatient care,<sup>7,36</sup> it is rarely recorded as a primary or secondary diagnosis.<sup>37</sup> This is related in part to the Centers for Medicare & Medicaid Services–hierarchical condition category model, which does not include dementia as a condition that upweights risk-adjustment factors to further increase reimbursement.<sup>38</sup> Until the reimbursement system for dementia care is restructured to provide appropriate reimbursement for patient behavior and safety assessments and for caregiver education, managed care organizations may be reluctant to provide these types of comprehensive services.

Our study has several limitations, including the lack of true cost data for healthcare and caregiving services. We used information on self-reported utilization and expenditures and mean benchmark pricing to estimate this information. In addition, patients and caregivers were well educated and predominantly white and had a usual source of care, which may limit generalizability to settings that include large minority populations with less access to care. Enrolled patients were primarily cared for at home, and these cost estimates do not apply to permanently institutionalized patients. Finally, because we did not have data on medication costs other than out-of-pocket expenditures, we were unable to reliably estimate the per-patient cost for prescription medications.

In summary, this cost analysis of a dementia care management intervention did not demonstrate a significant cost offset. However, given its positive effects on outcomes, the intervention may represent a worthwhile approach to improving the quality of dementia care and health outcomes for persons with dementia. Healthcare organizations should evaluate the potential of dementia care management as a means of promoting evidence-based practices and ensuring the best possible outcomes for patients with dementia and their caregivers.

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