

Utilization and Cost Effects of the VHA Caring for Older Adults and Caregivers at Home (COACH) Program

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Abstract

Since 2010, the Veterans Health Administration has initiated a home-based Caring for Older Adults and Caregivers at Home (COACH) program to provide clinical support to dementia patients and family caregivers. But its impact on health care utilization and costs is unknown. We compared 354 COACH care recipients with a propensity score weighted comparison group of 9,857 community-dwelling Veterans during fiscal years 2010-2015. In 1-year follow-up, COACH program was associated with a lower rate of long-term nursing home placement (average treatment effect on the treated [ATT] -3%; $p = .01$). The program increased utilization of emergency services (ATT 6%; $p = .01$), hospitals (ATT 10%; $p < .001$), and personal care services (ATT 31%; $p < .001$). Health care costs were also significantly increased. Improved access to services may have enabled COACH Veterans to stay at home longer. As one of Veterans Health Administration's top priorities to expand caregiver assistance programs, COACH seems to be a promising model for a nationwide implementation.

Keywords

dementia, caregiver support, home-based program, health care utilization and costs, Veterans Health Administration

Introduction

In 2018, approximately 5.5 million Americans older than age 65 had dementia (Hebert et al., 2013). It is estimated that 70% to 80% of persons live with dementia at home, with about three quarters receiving care from families and friends (Brodaty & Donkin, 2009). Nearly half of all familial care for older Americans is given to persons with dementia (Friedman et al., 2015). Family caregivers of persons with dementia experience elevated rates of physical, emotional, social, and financial burden, as well as ill health (Alzheimers Association, 2018; Brodaty & Donkin, 2009; Feast et al., 2016; Goren et al., 2016; Jones et al., 2017; Kasper et al., 2015; Liu & Gallagher-Thompson, 2009; Sörensen et al., 2006; Vick et al., 2019). These burdens—and the paucity of formal supports and assistance to dementia patients and their caregivers—may increase the risk of institutionalization of persons living with dementia, as well as overall costs of care for these patients and their caregivers (Alzheimers Association, 2016; Gilden et al., 2014; Guterman et al., 2019; Zhu et al., 2015).

In 2013, 7.4% of over 1.9 million U.S. armed services Veterans aged 65 years or older and with dementia diagnoses were dually enrolled in Medicare and the Veterans

Health Administration (VHA) with estimated dementia-attributable costs of \$1 billion for VHA and \$1.6 billion for both federal programs (Lei et al., 2018). U.S. Veterans may enroll and receive VHA services under a priority system based on service-connect disabilities and income; some eligible Veterans may have copayments associated with the services provided based on priority groups, income, and disability (VHA, 2018). Evidence exists that caregiver well-being and consequent outcomes for recipients of care may be improved with

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caregiver education and training (Hepburn et al., 2001; Nichols et al., 2011). Given the scope of needs, VHA has begun specific community-based programming for Veterans living with dementia and their caregivers (i.e., dementia caregiver-recipient “dyads”) to address both the health burdens and costs. In addition to appropriate patient-centered assessment and management, this programming adds caregiver education, support and behavioral intervention to improve caregivers’ coping skills and care-recipient management.

The earliest and most extensive effort of this type is a VHA adaptation of the Resources for Enhancing Alzheimer’s Caregivers Health (REACH II) model, developed in the early 2000’s by the National Institutes of Health (Nichols et al., 2017). In its initial phase, the REACH VA program was undertaken at 24 VA Medical Centers (VAMCs). As part of usual clinical care, REACH VA patients and their caregivers were identified from patients enrolled in Home-Based Primary Care (HBPC)—interdisciplinary longitudinal home care for individuals with complex chronic diseases (Edes et al., 2014)—using existing HBPC staff. Caregivers reported significantly decreased burden, depressive symptoms, impact of these symptoms on daily life, and dementia-related behavioral disruptions after 6 months (Nichols et al., 2011). REACH VA was observed to have a statistically nonsignificant lower total VHA cost (-25%) compared with propensity matched controls in the year following intervention compared with the prior year (Nichols et al., 2017). The program’s structure and evolution has been described elsewhere (Nichols et al., 2016).

More recently, the Caring for Older Adults and Caregivers at Home (COACH) Program was begun in 2010 at the Durham (North Carolina) VAMC, with satellite programs later added at facilities in Greenville and Morehead City, NC (Department of Veterans Affairs, 2016). COACH’s chief goals are to provide high-quality dementia care and caregiver support, enabling the older adults to live at home as long as possible. While—like REACH VA—COACH is targeted to Veterans with dementia living in the community with familial or coresident caregivers, the program differs in being organized as a service predominantly for patients receiving care in ambulatory clinics or from VA’s Patient-Aligned Care Teams (PACTs)—a primary-care medical home model for all (otherwise unselected) ambulatory VHA-enrolled Veterans; the service is not provided to HBPC patients or those receiving other multidisciplinary home-based care. COACH addresses Veterans with dementia and their caregivers referred from the PACTs and other outpatient clinics, providing additional assessment, care management, as well as caregiver-focused education, support, and behavioral training with its own staff (rather than redirection of

PACT personnel to these tasks). Prior evaluation has shown that COACH program was strongly aligned with Dementia Management Quality Measures, improved quality of life, reduced caregiver burden and home safety hazards, and increased access to dementia-related services; effects such as nursing home placement delay and program-associated costs could not be addressed lacking a control group (Department of Veterans Affairs, 2016; D’Souza et al., 2015).

The objective of this article is to evaluate the impact of COACH on institutional and noninstitutional health care utilization and spending in both VHA and Medicare.

New Contributions

Our study is a part of an effort to examine effects of the COACH program. Compared with a previous report on the COACH program (D’Souza et al., 2015), this study identified a comparable control group using propensity score methods. The study is the first to comprehensively evaluate policy relevant outcomes, such as utilization and costs of various services in both VHA and Medicare systems. The goals of the COACH program are to increase access for the Veterans and caregiver to needed services and enable Veterans to live at home for as long as possible. It was able to evaluate the program effect on health care utilization and long-term nursing-home placement based on the Residential History File (RHF; Intrator et al., 2011). The study provides new evidence for VHA’s expanding programs of comprehensive assistance to family caregivers.

Conceptual Framework

The framework in Figure 1 posits that the COACH program affects health care utilization and costs of Veterans living with dementia through three pathways. First, the COACH clinical team provides training on communication techniques, counseling regarding dementia-related home safety concerns, and assistance in advance care planning. These practices may redirect Veterans living with dementia from reliance on some health care sources (e.g., institutional care), while trained and activated caregivers may become more effective users of other services (e.g., noninstitutional care). Second, the COACH team conducts comprehensive assessments of cognitive and physical functions and communicates with primary care physicians about Veterans’ need for care, which may increase Veterans’ utilization and costs of home-based services (e.g., personal care) and other noninstitutional care (e.g., Adult Day Health Care, respite, and outpatient visits to primary care physicians or specialists). Third, COACH clinicians provide training on symptom management, stress assessment and

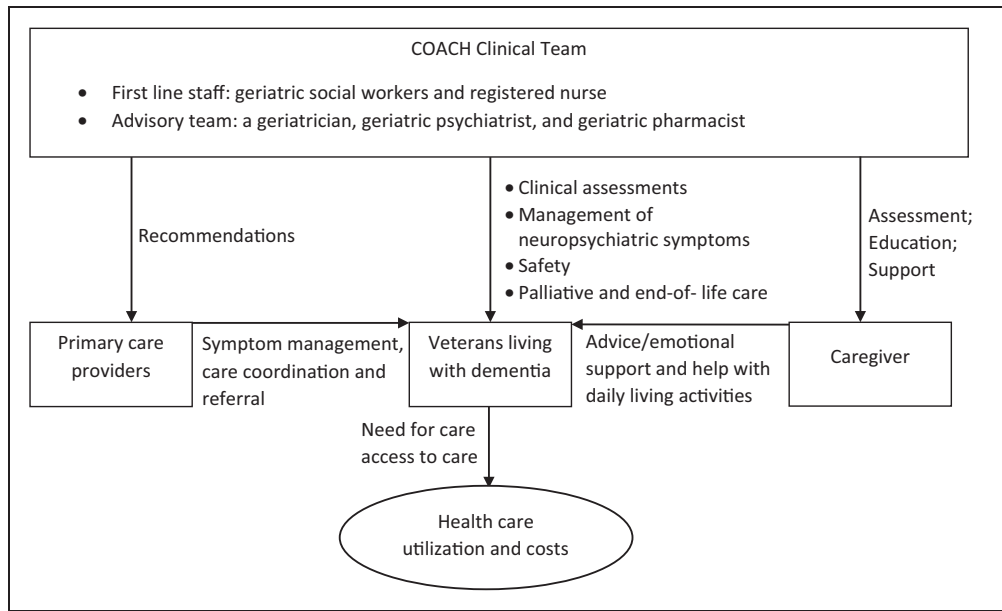


Figure 1. Conceptual framework of the COACH program's impact on Veterans' health care utilization and costs.
 Note. COACH = Caring for Older Adults and Caregivers at Home.

techniques of self-care to caregivers. Supports for caregivers may indirectly enable Veterans to live at home as long as possible, thus reducing Veterans' long-term nursing-home placement. Based on the framework, we hypothesize that the COACH program is associated with higher utilization and costs of noninstitutional care (in particular) and a lower rate of long-term nursing home placement.

Method

Design and Study Population

Propensity score analysis was employed to estimate average 1-year effects of COACH on health care utilization and costs using archival information (Imbens, 2004). All COACH enrollees were followed for 1 year, including those not surviving the year or discharged from COACH for other reasons (e.g., nursing home, assisted living or hospice placement, moving out of area). We performed two sensitivity analyses evaluating the effect of COACH program between the 91st day, and the 181st day and the end of 1-year follow-up, to determine whether any COACH intervention effects to develop lagged the shorter assessment-stabilization period following enrollment. The COACH cohort selected was enrolled from fiscal year 2010-2015, as records were most complete for this time period.

Because referrals to COACH typically arise from ambulatory care, a comparison group was selected from non-COACH Veterans with dementia associated

with an outpatient visit for primary care (usually PACTs) during the 2010-2015 recruitment period in COACH's regional Veterans Integrated Service Network (VISN6; Virginia and North Carolina). Since there were no "enrollment dates" as such for comparisons, we indexed the dates of the first yearly outpatient encounters in which not-previously enrolled controls qualified for 1-year follow-up.

As noted, the COACH target population is comprised of dyads of community-dwelling Veterans living with dementia and their caregivers. The program accepts enrolled Veterans who are at least 65 years old, diagnosed with dementia, living within 50 miles of Durham Veterans Affairs Medicare Center or its satellite centers, having an unpaid live-in familial or coresident caregiver, and are not enrolled in other home-based programs such as HBPC or Hospice (D'Souza et al., 2015). In order to further facilitate propensity balance with controls, we excluded from the COACH cohort (1) 9 female Veterans with dementia due to the difficulty in finding corresponding comparisons, (2) 3 Veterans in Hospice on the COACH enrollment date, and (3) 19 enrollees who did not have primary-care visits (a condition necessary for propensity score weighting as the comparison group was selected among Veterans with primary care visits). The final COACH cohort composed of 354 enrollees eligible for evaluation.

Based on COACH eligibility criteria, as well as a preliminary description of COACH enrollees, community-dwelling Veterans were selected into the comparison group at their first primary-care outpatient visit during

fiscal years 2010-2015 in which they met most of the same criteria, that is, (1) were aged 65 or older, (2) were male, (3) had at least one dementia diagnosis, (4) had a driving distance from home to their primary-care site within 64 miles (the actual maximum distance found among COACH enrollees), (5) were not receiving care from HBPC or nursing home on the date of the index outpatient visit, and (6) did not use hospice in the 90 days prior to the primary care visit. Because of the lack of archival information, we did not require controls to have an identifiable familial or coresident caregiver, although we assume that most veterans with dementia living in the community have caregivers and receive care. A cohort of 9,857 VISN6 Veterans was identified for comparison.

Data Sources

COACH enrollee information (e.g., identifier and enrollment date) was obtained from the COACH program. The Geriatrics & Extended Care Data Analysis Center (GECDAC) Core File developed by the (GECDAC; Dally et al., 2018) was used to extract demographics, including age, marital status, race, and priority group, and driving time from Veterans' residency to the closest primary care site. Both VHA Corporate Data Warehouse data and Medicare claims data were used to extract diagnoses of chronic diseases as well as service and utilization cost information. The RHF (Intrator et al., 2011) applied by GECDAC to VHA and Medicare data was used to track Veterans' daily location (e.g., community, inpatient stay, emergency department visit or nursing home stay) and aggregate health care utilization in both VHA and Medicare systems during follow-up.

Outcomes

Health care utilization and total costs were aggregated during the follow-up periods (1-365 days, 91-365 days, and 181-365 days) and were also classified into subcategories based on service type (institutional vs. noninstitutional care) and source (VHA vs. Medicare). Analysis of service types resulting from COACH assignment facilitates understanding the impact of COACH on the use of related services in VHA as well as components of associated costs. Because most Veterans in COACH and their controls were eligible to receive care from both VHA and Medicare systems, our tracking of service types and costs allows assessment of care shifting across systems.

Health Care Utilization

Noninstitutional Care. Personal Care Services: We measured whether Veterans received any VHA personal

care services in 1-year follow-up. Personal care services are defined as provision of homemaker/home health aide services, adult day health care, or respite care. Those were identified in the VA data using appropriate codes.

Home Health Care: We measured whether Veterans received any home health care in VHA or Medicare identified as VHA purchased skilled home care or Medicare home health services.

Institutional Care. Long-term nursing home placement: A long-term nursing home placement was defined as a continuous nursing home stay of more than 90 days. Nursing home refers to VHA community living centers, State Veterans Homes and community nursing homes. For each Veteran, we accumulated their days in nursing homes as long as they were not interrupted by >7 days in community. Inpatient stays, outpatient emergency department (ED) visits or observation stays did not restart the clock regardless of length of stays in those acute care settings, but those days were not counted toward long-term stay. Transfers between nursing homes were allowed. The beginning of a long-term nursing home placement was the 91st day of a continuous nursing home stay. We constructed a binary variable to measure whether Veterans had a long-term nursing home placement by the end of follow-up period.

Under institutional care, we also measured whether Veterans had any hospitalizations, emergency room visits, and nursing home stays.

Costs

Total costs were aggregated VHA costs and Medicare reimbursements of all health care services (e.g., inpatient, outpatient, and home-based services). VHA institutional costs included costs of VHA inpatient care (e.g., hospitalization and community living center), VHA-purchased inpatient care and VHA-purchased institutional postacute and long-term care. VHA noninstitutional costs included costs of VHA outpatient care (e.g., medical/surgical, diagnostic and behavioral, and contract care), VHA outpatient pharmacy, and VHA-purchased outpatient care and pharmacy. VHA noninstitutional costs of personal care services were computed separately as an important component of community-based services potentially related to the COACH program. All VHA costs were outlier cleaned, wage and consumer price index adjusted (2014). Medicare costs of inpatient care and skilled nursing facility were considered as institutional costs while Medicare costs of outpatient care, services of health care professionals, home health agencies, hospice and durable medical equipment were considered as noninstitutional. All Medicare costs were consumer price index adjusted (2014).

Table 1. Baseline Characteristics of COACH and Comparison Groups Before and After Kernel Weighting.

Characteristics	Unweighted cohort			Kernel weighted cohort		
	COACH (n = 354)	Comparison (N = 9,857)	% Bias	COACH (n = 350)	Comparison (n = 350)	% Bias
<i>Index year</i>						
2010	3.1	24.4	-65	3.1	4.1	-3
2011	20.3	17.9	6.2	20.3	18.9	3.4
2012	14.4	15.4	-2.8	14.6	11.9	7.4
2013	14.4	14.5	-0.3	14.6	13.0	4.4
2014	22.3	14.8	19.5	22.0	21.5	1.4
2015	25.4	13.0	31.9	25.4	30.5	-13
<i>Sociodemographic</i>						
Age 65–74 years	15.5	23.2	-19.5	15.1	16.8	-4.1
Age 75–84 years	41.2	43.0	-3.5	41.4	38.8	5.4
Age 85+ years	43.2	33.8	19.5	43.4	44.5	-2.1
Married	78.0	63.7	31.8	77.7	75.5	5.0
Rural/Very Rural	46.6	48.5	-3.7	46.9	47.1	-0.5
White	66.1	69.4	-7.1	66.3	65.8	1.0
Priority Group 1a	19.2	20.6	-3.4	18.6	15.9	6.7
Priority Group 4	23.7	7.9	44.5	22.9	24.3	-4.0
Priority Group 6–8	17.8	21.5	-9.3	18.0	15.8	5.7
GerIPACT	16.1	6.1	32.4	15.4	16.6	-3.8
Medical Center is Closest Primary Care Site	79.1	40.8	84.8	78.9	77.2	3.6
Medicare reliance (% of total costs paid by Medicare), mean	63.6	64.7	-2.4	63.7	65.7	-4.2
Drive Time to Closest Primary Care Site <=30 mins	19.3	34.5	-50	19.4	19.3	0.2
<i>Comorbidities</i>						
Elixhauser, mean	3.6	4.8	-51.0	3.6	3.5	2.1
Total CC score, mean	2.2	1.7	35.0	2.2	2.1	6.3
VHA NOSOS score, mean	2.3	2.5	-4.8	2.3	2.4	-1.9
JEN Frailty Index Score 0–3	19.5	8.4	32.3	19.7	21.7	-5.7
JEN Frailty Index Score 4–5	26.6	20.3	14.7	26.6	26.0	1.2
JEN Frailty Index Score 6–7	30.5	29.0	3.2	30.6	29.8	1.7
JEN Frailty Index Score 8+	23.4	42.2	-40.7	23.1	22.5	1.4
<i>HCC categories</i>						
Dementia complication	8.2	6.4	6.8	8.0	6.9	4.2
Cognitive	90.4	73.1	45.9	90.3	90.3	0.0
Infection	5.1	1.9	17.3	5.1	3.5	9.0
Heart diseases	30.8	25.7	11.2	30.6	28.8	4.0
Cerebrovascular disease	20.9	14.6	16.6	20.6	18.9	4.4
Vascular	17.5	13.5	11.0	17.4	15.3	5.9
Kidney	26.6	19.4	16.9	25.7	25.2	1.2
Injury	9.3	3.2	25.5	8.9	11.0	-9.1
Skin	7.6	5.5	8.7	7.7	8.0	-1.0
Eye	4.2	2.1	12.1	4.3	3.4	4.9
Blood	6.2	3.9	10.5	6.3	5.0	5.9
Diabetes	36.2	37.4	-2.6	35.7	36.0	-0.7
Psychiatric	8.8	9.8	-3.6	8.6	7.3	4.2
Neurological	23.7	20.2	8.5	23.4	23.1	0.8
Lung	20.9	21.0	-0.3	21.1	20.5	1.6
Neoplasm	15.3	16.5	-3.4	15.4	14.5	2.5
Metabolic	7.3	5.9	5.9	7.4	6.8	2.6
Arrest	3.7	2.4	7.7	3.7	2.4	7.4
<i>Prior year utilization/cost</i>						
Any hospitalization	31.9	43.2	-23.5	31.4	31.3	0.2
Any emergency room	20.6	30.4	-22.6	20.3	21.1	-2.0
Any nursing home	13.6	21.0	-19.7	13.7	16.4	-7.2

(continued)

Table 1. Continued.

Characteristics	Unweighted cohort			Kernel weighted cohort		
	COACH (n = 354)	Comparison (N = 9,857)	% Bias	COACH (n = 350)	Comparison (n = 350)	% Bias
Any Medicare home health	26.3	28.9	-5.9	25.7	24.3	3.1
Any VHA PCS ^a	30.8	23.3	17	30.9	32.9	-4.7
Any VHA skilled home services ^b	20.1	21.1	-2.6	20.3	19.4	2.1
Log of total VHA plus Medicare Costs, mean	9.5	9.7	-8.6	9.5	9.6	-6.7

Note. COACH = Caring for Older Adults and Caregivers at Home; GeriPACT Geriatric Patient Aligned Care Team; VHA = Veterans Health Administration; PCS = personal care service.

^aVHA PCSs were identified as services with treating specialty codes 47 (Respite Care, Nursing Home Care Unit) and 83 (Respite Care, Medicine) in VHA Decision Support System (DSS) Treatment specialty files, or primary stop codes 190, 191 (Adult Day Health Care, VA-Based, primary or secondary), 658 (State Home Adult Day Health Care) in VHA DSS outpatient files, or Fee Purpose of Visit (FPOV) codes 06 (Aid and Attendance/HB Benefits), 27 (Veteran-Directed Home and Community Services), 71, (Home Health), 72 (Respite Care in Home/Home HAS), 73 (Respite Care in ADHC), 76 (Adult Day Health Care), and 79 (Respite Care, Other) in VHA-purchased outpatient files, or FPOV code 44 (Respite Care in Community Nursing Home) in VHA-purchased inpatient and ancillary files.

^bVHA skilled home services were identified as services with primary stop codes 680 and 681 or secondary stop code 680 in DSS outpatient files, and FPOV codes 70 and 74 in VHA-purchased outpatient files.

Propensity Score Analysis with Kernel Weighting

As enrollment to COACH depended on physician referral and COACH screening, and was not randomly assigned, there might be a selection bias wherein Veteran characteristics were associated with both the likelihood of COACH enrollment and outcomes. To account for the potential imbalance in Veteran characteristics between COACH and comparison groups, we employed a propensity score analysis with Kernel weighting (Garrido et al., 2014). Propensity score analysis can translate a set of Veteran characteristics into a single score and then compare outcomes among Veterans with similar propensity scores. We started with all available Veteran characteristics that were theoretically associated with outcomes, including sociodemographics (e.g., age, race, marital status, rurality, and drive time to closest primary care site), enrollment priority groups, Medicare reliance, and risk index scores. These latter included the Elixhauser Comorbidity Score (Elixhauser et al., 1998), JEN Frailty index (a validated claims-based cumulative geriatric health deficit measure; Edes et al., 2014; Kinoshian et al., 2018), NOSOS (a validated VHA cost-prediction model based on the CMS V21/V22 risk score; Wagner et al., 2016), and mental illness score and selected Hierarchical Condition Categories (Pope et al., 2004, Centers for Medicare and Medicaid Services, 2013), prior year health care utilization (e.g., hospitalization, emergency room, nursing home, home health, personal care services, skilled home services) and prior year total VHA plus Medicare costs.

The propensity scores (the probability of being enrolled to COACH program) were estimated in a logistic regression of COACH enrollment status on the above Veterans characteristics. Veterans would be dropped from the analysis if his propensity scores were not in

the overlapping range of propensity scores between COACH and comparison groups (common support).

Among Veterans having common support, Kernel weighting assigned each COACH enrollee with a weight of one. A match was created for each COACH enrollee as a weighted composite of Veterans in comparison group who were weighted by their distance in propensity score from the COACH enrollee if their propensity scores were in a range (bandwidth) of that COACH enrollee's. We tested different bandwidths and chose the one that produced best balance of Veteran characteristics (lower percentage of standardized bias and similar variance of continuous variables) between COACH and comparison groups.

Statistical Analysis

We performed logistic regressions for health care utilization and linear regressions for costs on the weighted cohorts, controlling for the index year and all Veteran characteristics to risk adjust any remaining differences in Veteran characteristics, especially characteristics that were not successfully included in the propensity score model due to the issue of imbalance. The average treatment effects on the treated (ATT) were estimated. Given that the distributions of cost variables were often skewed, we tested whether ATTs were statistically significant at the 0.05 level in log transformed costs.

This study estimated propensity scores and ATTs in two separate steps. The uncertainty from propensity score estimation in the first step affects the standard errors for ATTs estimates (Garrido et al., 2014). To obtain reliable estimates, standard errors of ATTs were estimated by bootstrapping outcome regressions for 1,000 replications.

Table 2. Health Care Utilization and Costs of COACH enrollees (Treated Versus Untreated) in Follow-up Periods.

Follow-up Outcomes	365 Days			91-365 Days			181-365 Days			
	COACH (Treated)	COACH (Untreated)	ATT	COACH (Treated)	COACH (Untreated)	ATT	COACH (Treated)	COACH (Untreated)	ATT	p
Death	23%	24%	.2%	20%	17%	2%	12%	11%	1%	.54
Health care utilization (%)										
Any long-term NH placement	4%	7%	-.3%	4%	7%	-.3%	3%	4%	-.1%	.39
Any emergency room	25%	19%	6%	19%	16%	3%	14%	11%	3%	.14
Any hospitalization	49%	39%	10%	38%	30%	8%	28%	22%	6%	.03
Any nursing home	29%	28%	2%	25%	22%	3%	21%	17%	4%	.13
Any PCS ^a	70%	39%	31%	63%	34%	29%	53%	29%	24%	<.001
Any home health	38%	36%	1%	29%	27%	2%	19%	21%	-.2%	.38
VHA skilled home	24%	25%	-.2%	17%	19%	-.2%	11%	15%	-.4%	.04
Medicare Home Health ^b	22%	18%	4%	16%	12%	4%	11%	8%	2%	.17
Costs (\$)										
Total costs	43,560	33,999	9,562	30,643	25,228	5,415	20,736	16,852	3,884	<.001
VHA	33,020	25,489	7,531	22,551	18,437	4,114	15,032	12,142	2,890	<.001
PCSs ^a	4,780	3,048	1,732	3,754	2,207	1,547	2,515	1,415	1,101	<.001
Non-PCSs ^a	28,240	22,441	5,799	18,797	16,230	2,567	12,517	10,727	1,789	<.001
Medicare	10,540	8,510	2,031	8,092	6,791	1,301	5,704	4,710	994	.001
Noninstitutional costs	23,218	17,967	5,251	15,066	12,800	2,266	9,558	8,445	1,113	<.001
VHA	18,754	13,889	4,865	11,561	9,698	1,863	7,207	6,347	860	<.001
Medicare	4,464	4,078	386	3,505	3,102	403	2,351	2,098	253	.002
Institutional costs	20,342	16,032	4,310	15,577	12,428	3,149	11,178	8,407	2,771	.003
VHA	14,266	11,600	2,666	10,991	8,740	2,251	7,825	5,795	2,030	.02
Medicare	6,077	4,432	1,645	4,587	3,689	898	3,352	2,612	741	.03

Note. COACH = Caring for Older Adults and Caregivers at Home; ATT = average treatment effect on the treated; VHA = Veterans Health Administration; PCS = personal care service; VHA = Veterans Health Administration; NH = nursing home.

^aVHA PCSs were identified as services with treating specialty codes 47 (Respite Care, Nursing Home Care Unit) and 83 (Respite Care, Medicine) in VHA Decision Support System (DSS) Treatment specialty files, or primary stop codes 190, 191 (Adult Day Health Care, VA-Based, primary or secondary), 658 (State Home Adult day Health Care) in VHA DSS outpatient files, or Fee Purpose of Visit (FPOV) codes 06 (Aid and Attendance/HB Benefits), 27 (Veteran-Directed Home and Community Services), 71, (Home Health), 72 (Respite Care in Home/Home HAS), 73 (Respite Care in ADHC), 76 (Adult Day Health Care), and 79 (Respite Care, Other) in VHA-purchased outpatient files, or FPOV code 44 (Respite Care in Community Nursing Home) in VHA-purchased inpatient and ancillary files.

^bVHA skilled home services were identified as services with primary stop codes 680 and 681 or secondary stop code 680 in DSS outpatient files, and FPOV codes 70 and 74 in VHA-purchased outpatient files.

In the sensitivity analyses, we ran the same models but on outcomes observed in 91 to 365 and 181 to 365 days instead of the whole year after index dates to test for lagged utilization/cost effects, allowing for different periods in which COACH could fully assess, stabilize, and obtain services for the Veterans and their caregivers.

Results

Baseline Characteristics and Propensity Score Kernel Weighting

Table 1 presents baseline characteristics of Veterans in COACH and comparison groups before and after propensity score weighting. Before Kernel weighting, Veterans in COACH program were different from those in comparison group as evidenced by greater than 10% standardized percentage bias in many baseline characteristics (Austin, 2009). COACH Veterans were older, more likely to be married, less frail but more likely to participate in GeriPACT (a PACT specifically for older Veterans; Sullivan et al., 2018), and have fewer comorbidities but more mental health problems (CC scores). COACH Veterans were more likely to have the Durham VA Medical Center as their closest primary-care site but less likely to have sub-30-minute drive-times to their primary-care provider.

Table 1 also shows the results from Kernel weighting with a bandwidth of 0.02. Four COACH enrollees were dropped from the analysis because their propensity scores were outside of the common support. After Kernel weighting (bandwidth = 0.02), all baseline characteristics had less than 10 standardized percentage biases. The overall median standard percentage bias was 3.8 and the ratio of variance of propensity scores between COACH enrollees and comparisons was 1.2, indicative of a balance between COACH and comparison.

Impact of COACH Program on Health Care Utilization and Costs

Table 2 presents health care utilization and costs of COACH treated and untreated groups during follow-up periods.

Health Care Utilization. In the 1-year follow-up, COACH program was associated with a lower rate (ATT = -3%; $p = .01$) of long-term nursing home placement, and 31% increased rate of use of VHA personal care services ($p < .001$). Significantly higher rates of ED visits and hospitalizations were observed in COACH treated versus untreated groups (6%, $p = .01$; and 10%, $p < .001$, respectively). There were minimal differences in use of nursing homes for any purpose (COACH

often uses NHs for respite care) or home-based services between treated and untreated groups. One-year mortality was nearly equivalent between groups, but a higher proportion of controls died in the first 90-day period (data not reported).

In the sensitivity analysis of the 91 to 365 days' follow-up, COACH program was associated with a 29% higher rate of personal care services use ($p < .001$), but the differences in ER and hospital use were no longer significant.

In the second half year of follow-up, the COACH program continued to be strongly associated with increased PCS use (ATT = 24%, $p < .001$), increased hospital use (ATT = 6%, $p = .03$), and decreased use of VHA skilled home health (ATT = -4%, $p = .04$).

Costs. In the 1-year follow-up, COACH program was associated with \$9,562 higher total costs ($p < .001$ —an overall increase of 28%). Decomposing the costs, we found that cost rose significantly in all categories. The percentage increase in costs were particularly large for VHA PCS (+57%; ATT = \$1,732, $p < .001$) and VHA noninstitutional costs (35%; ATT = \$4,865, $p < .001$).

In the sensitivity analyses, the COACH program was consistently associated with higher total costs and costs in all utilization and payer categories. In particular, COACH increased the costs of VHA PCS by 70% in the 91- to 365-day period (ATT = \$1,547, $p < .001$), and by 78% in the 181- to 365-day interval (ATT = \$1,101, $p < .001$).

Conclusion

Our retrospective, archival study of the COACH program's 1-year effects on Veterans' VHA and Medicare health-services utilization and associated health-care costs found that—compared with a propensity balanced contrast group—COACH reduced the rate of long-term institutionalization (from 7% to 4%) for the full year, and increased the use of personal care services by 31%. The program was associated with significant increases in total health-care costs and costs in all service and payer categories. Specifically, total COACH expenditures were estimated to be \$9,562 per capita greater than control. Disaggregation of expenditures showed that the greatest rates of cost increase occurred in VHA personal care services (57%) and VHA noninstitutional care (35%). Sensitivity analyses of lagged effects were generally consistent with the full year results, except that the difference in long-term nursing-home placement between COACH and controls was no longer significant in the last half-year, and COACH's increased its VHA PCS expenditure relative to controls in the lagged periods.

Limitations

Our evaluation of COACH was limited by several design and data factors. Only a quasi-experimental approach could be applied, using a retrospective design, propensity methods, and available Veteran, caregiver, program, service utilization and cost information, which leaves the possibility of unknown and uncontrolled selection biases. Furthermore, important components of potential COACH-program value, such as Veteran and caregiver health and quality of life, and caregiver services utilization/cost, could not be assessed; other previously cited VHA research on efforts to support dementia caregivers suggests that such programs can have meaningful effects. Also, while COACH maintains fulsome records on Veteran and caregiver characteristics including strengths and risks, such information is not available for potential controls, for whom we could not identify caregivers nor be certain they had caregivers. Nevertheless, the main analysis included all COACH Veterans and comparisons controlling for marital status (78% of COACH Veterans were married). Finally, while fewer than 8% of COACH Veterans had established Medicaid eligibility at admission, the unavailability of Medicaid claims files during the study period means that we have missed Medicaid utilization and costs as needs for long-term services and supports (LTSS) increase and Veterans apply for Medicaid; higher rates of Medicaid eligibility (as well as private out-of-pocket and LTC insurance payment for assisted living facilities), coupled with differential use of Medicaid LTSS by COACH versus controls may have additional important impact on unobserved cost outcomes. However, MDS data were available on all nursing home users which allowed identification of nursing home use including Medicaid-paid stays.

Contrast With REACH VA Results

We found a surprising difference between the cost/utilization findings for REACH VA and COACH. First, while not statistically significant, REACH VA was observed to have 25% lower costs compared with its controls; in contrast, COACH was significantly more expensive than control (1-year total VHA costs; Nichols et al., 2017). This is striking in the first instance because the interventions, goals of treatment and targeted Veteran-caregiver dyads would appear similar; and, second, because it is commonly understood that—on average—PACT and VHA ambulatory primary care (the source of the COACH service population) are less resource-intensive and expensive than HBPC (of which REACH VA patients were a subgroup). One might with reason conclude that HBPCs in which REACH VA is based may already be providing needed service access, whereas COACH's Veterans may start from a lower

seemed to have lower costs overall than Veterans in COACH. There may various reasons for this: REACH VA's cost outcomes were observed in an earlier period (2007-9) than COACH's outcomes (FY2010-15); further, and REACH VA's results were observed over a larger number of sites than COACH, most of whose results were observed in a single, relatively high-service, high-cost site (Durham VA Medical Center). Future research will have to examine and compare the costs and benefits of different emerging approaches with targeting and supporting these Veterans and their caregivers.

Future Directions

Our findings suggest that COACH supported, educated, and activated caregivers of Veterans with dementia and related dependency needs. While the program reduced long-term institutionalization, it appeared to open access to a full range of VHA and Medicare services, particularly VHA personal care services, but also hospital and emergency department use. The finding that COACH's enhancement of primary care services did not reduce hospitalizations of Veterans living with dementia but increased utilization of most service categories and costs was also registered in a trial of a systematic VHA primary-care intervention for chronically ill Veterans (Weinberger et al., 1996). With specific reference to caregiver support, broadly increased access and costs were also observed in a major national VHA caregiver support program first targeted to post-9/11 Veterans (Shepherd-Banigan et al., 2018, van Houtven et al., 2019). Caregiver support in the VHA has become an important strategy to help high-needs Veterans of all ages and conditions remain in their homes and community. Additional work is needed to improve caregiver assessments and information to better define and evaluate core supports, and to improve targeting of noninstitutional services in order to achieve longer-term, cost-effective benefits for Veterans and their caregivers.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: The content and views expressed in this article are those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs or the United States government.

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