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Variations in Costs of a Collaborative Care Model for Dementia

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Abstract

Background/Objectives: Care coordination programs can improve patient outcomes and decrease health care expenditures; however, implementation costs are poorly understood. We evaluate the direct costs of implementing a collaborative dementia care program.

Design: We applied a micro-costing analysis to calculate operational costs per-participant-month between March 2015 and May 2017.

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Conflicts of Interest: All authors report no conflicts of interest.

Setting: The University of California San Francisco (UCSF) and the University of Nebraska Medical Center (UNMC).

Participants: Participants diagnosed with dementia, enrolled in Medicare or Medicaid, 45 years of age, residents of California, Nebraska or Iowa, and having a caregiver. The sample was 272 (UCSF) and 192 (UNMC).

Intervention: A collaborative dementia care program provided by care team navigators (CTNs), advanced practice nurses, a social worker and a pharmacist, focusing on caregiver support and education, medications, advance care planning, and behavior symptom management.

Measurements: We measured costs (personnel, supplies, equipment, and training costs) during three program periods: start-up, early operations, and continuing operations, and estimated the effects of caseload variation on costs.

Results: Start-up and early operations costs were respectively \$581 and \$328 (California), and \$501 and \$219 (Nebraska) per-participant-month. Average costs decreased across phases to \$241 (California) and \$142 (Nebraska) per-participant-month during continuing operations. We estimated that costs would range between \$75 (UNMC) and \$92 (UCSF) per-participant-month with the highest projected caseloads (90).

Conclusion: We found that CTN caseload is an important driver of service cost. We provide strategies for maximizing caseload without sacrificing quality of care, and discuss current barriers to broad implementation that can inform new reimbursement policies.

Keywords

Collaborative Dementia Care; Dementia Care Coordination; care navigation; cost analysis

Introduction

Dementia-associated loss of functional independence and healthcare needs impose significant social and economic burdens on patients, family members, and society. Compared with costs for people of the same age without dementia, payments for Medicare and Medicaid beneficiaries with dementia were respectively 3 and 19 times higher in 2015¹. The total cost attributable to dementia in 2010 was between 157 and 215 billion². The most substantial drivers of these costs are formal and informal long-term care, which results in significant burden on family caregivers². In addition to out-of-pocket payments for long term care, caregivers often have to take time off from or quit their jobs to care for family members¹. When foregone wages of caregivers are considered, informal care has been estimated to represent 31% of the total cost of dementia².

Acute care utilization also contributes substantially to dementia costs³. Patients with dementia are at increased risk of hospitalizations, including avoidable admissions due to injuries and accidents, infections, and complications from other chronic conditions, as compared to patients without dementia.^{4,5} In addition, patients with dementia experience longer hospital stays and are more likely to require intensive care.⁶

Collaborative dementia care programs aim to improve patient care coordination, consistency, and quality of patient care through a collaborative multidisciplinary approach centered on patients and caregivers^{3,5}. Depending on patient caseload and type of services being offered, the costs of such programs varied from \$ 624 to \$ 1,416 dollars per participant/year.⁶⁻⁹ Some of these programs result in cost savings for healthcare systems through targeted care management that reduces acute care utilization.⁶⁻⁹ However, due to fragmented health care systems in the United States, organizations that implement collaborative care models may not realize the cost savings themselves. For example, Medicare would save money when hospital use is reduced, while a fee-for-service outpatient system would not. Thus, while collaborative care programs may improve quality of care and increase value for patients and caregivers, many health systems in the US lack financial incentive to implement them.^{1,3,10}

Recent policy reform aims to incentivize the provision of chronic care management programs by increasing reimbursements through Medicare and Medicaid. Yet, it remains unclear if current reimbursement provides an adequate incentive for service implementation, or if new reimbursement models should be enforced in its place.^{9,11-13} This study estimates the costs of implementing a telephone-based collaborative dementia care program, Care Ecosystem. Furthermore, we discuss aspects of the implementation mechanisms that can affect efficiency, quality and costs of similar programs, and policy implications for reimbursement mechanisms.¹⁴

Methods

Setting: The Care Ecosystem Program development and implementation

The Care Ecosystem trial, funded by a Centers of Medicare & Medicaid HealthCare Innovation Award Round Two, was designed and implemented in three different settings: in California, through the University of California San Francisco (UCSF), and in Nebraska and Iowa through the University of Nebraska Medical Center (UNMC). The care model included a team composed of care team navigators (CTNs), advanced practice nurses, a social worker and a pharmacist. CTNs are unlicensed dementia care guides trained to serve as the primary point of contact for patient-caregiver dyads. Complex issues that are beyond CTNs' training were triaged to licensed team members through phone-calls and/or the Salesforce dashboard. (Figure 1). The care model was delivered remotely to the dyads home through phone calls, mail and/or emails. Weekly in-person staff meetings were held for case revision and supervision. Care protocols emphasized caregiver support and education, medications, advance care planning, and behavior symptom management.¹⁴ The frequency of contact was needs-based, and the identification of dyad needs was at the core of the CTN role. Contact frequency was typically monthly, and the duration of the intervention was one year. Further details on the protocols delivered were previously described.¹⁴ Patients were included if diagnosed with dementia, enrolled in Medicare or Medicaid, 45 years of age, residents of California, Nebraska or Iowa, and existence of a caregiver willing to participate in the program.¹⁴ The program enrolled 780 dyads between March 2015 and February 2017. Participants were randomized into either the intervention or a control arm in a rate of 2:1. Approval by the institutional review boards of UCSF and UNMC were obtained for this study.

Cost Approach

At each institution, we estimated the service implementation costs over a 26-month period, between March 2015 and May 2017, for the three time periods when different designs were being developed and implemented: Program Start-up, Early Operations, and Continuing Operations. Program Start-up referred to the time between March and August of 2015, when participants were first being recruited, and the first version of the intervention was being developed and implemented (Care Model 1.0). Enrollment ranged from 2 to 60 dyads across both sites. Early Operations referred to September 2015 and August 2016, when enrollment ranged from 60 to 225, and the Care Model 2.0 was iteratively developed based on user input and program revisions.¹⁴ Continuing Operations included the period between September 2016 and May 2017. It started with implementation of the intervention final design (Care Model 2.0), and continued throughout that period. The Care Models development process have been previously described.¹⁴

At each site, we included program costs in the following categories: personnel, supplies, equipment, and training. Full details were listed in Supplementary Text S1. Facility costs were included in sensitivity analyses. We excluded healthcare utilization outside of the program (e.g. hospitalization, outpatient visits), household costs, and research. We applied a micro-costing method of measuring resources and associated prices, using monthly budget reports, meeting reports, clinical protocols, and work contract information to quantify resources.^{15,16} We conducted informal semi-structured interviews and focus groups to estimate time spent on clinical activities, and conducted a time and motion study during the Continuing Operations period.¹⁷ We calculated the proportion of time spent with discrete clinical-related activities for each staff type, including time on the phone or email with dyads, preparing and reviewing cases, documenting the encounters, and consulting other providers or supervising/being supervised. For information on the Time and Motion methodology and clinical time distribution see Supplementary Text S2 and Supplementary Tables S1–S2. The analysis of the care model clinical outcomes is being published elsewhere.

Sensitivity Analysis

1. Facility costs—At UNMC, we estimated the facility space by using the median square foot space (103.2) required for call center workers in the United States.¹⁸ Due to the limited available space at UCSF, the staff shared desks and fit extra desks into small spaces. For that reason, we considered UCSF's usable space as half the required space for call centers (51.6 square feet). We estimated cost per square feet by using the average office rent in San Francisco for UCSF, and average office rent in Omaha for UNMC.^{19,20}

2. Projected Operation

UCSF: We projected UCSF Continuing Operation costs based on the more stable UNMC caseloads (specifically their average CTN caseload per month of 49.4, and highest average CTN caseload of 79.0), and the maximum caseload provided by a Care Ecosystem CTN to date (90.0).

UNMC: We projected UNMC's Continuing Operations costs based on UNMC's highest average CTN caseload (79.0), and the maximum caseload provided by a CTN to date (90.0).

Results

Total enrollment was 272 dyads in the UCSF intervention group and 192 in the UNMC intervention group. The number of CTNs varied by site and study period, averaging 5.6 at UCSF (range 1–8), and 2.9 at UNMC (range 1–4). Each site had one pharmacist and one social worker during most of the program implementation. In addition, UCSF had two advanced practice nurses, while UNMC had one.

Program Implementation Costs

Costs by study setting and study period, standard deviation, and cost ranges are shown in Table 1 (*Detailed cost distribution can be found on Supplementary Table S3*). Standard deviation values were derived from variations in staff costs per month alone, as the remaining variables (supplies, equipment, and training) monthly costs did not vary within the same study period.

Start Up and Early Operations Costs—At UCSF, CTNs caseloads ranged from 12.1 patients per month during the 'Start-up' period, to 22.4 patients per month during the 'Early Operations' period. At UNMC, CTNs caseloads ranged from 7.6 patients per month for the 'Start-up' period, to 29.8 patients per month during 'Early Operations'.

At UCSF, the global mean cost per-participant-month was \$581 during the 'Start-up' period, and \$328 during the 'Early Operations' period. At UNMC, the overall mean cost per-participant-month was \$501 during 'Start-up', and \$219 during 'Early Operations'. In both settings, personnel costs accounted for 68% and 82% of global costs for the 'Start-up' and 'Early Operations' periods at UCSF, respectively, and for 71% and 82% of global costs for the 'Start-up' and 'Early Operations' periods at UNMC.

Continuing Operation Costs—During 'Continuing Operations', the number of patients per month ranged from 205 to 272 at UCSF, and from 158 and 192 at UNMC. At UCSF, the average monthly caseload for CTNs was 34.8, ranging from 28 to 41. At UNMC, the average monthly CTNs caseload was 49.4, ranging from 43.5 to 79.0. The global average costs-per-participant-month during the 'Continuing operation' period was \$241 and \$142, respectively. Personnel costs represented 84% of global costs at UCSF and 86% at UNMC.

Sensitivity analyses

If including facility costs, we found an average costs per-participant-month at UCSF of \$762 during 'Start-up', \$476 during 'Early Operations', and \$359 during 'Continuing Operations' (Table 1), representing facility-associated cost increases of 31%, 45%, and 49%, respectively. At UNMC, we found an average cost per-participant-month of \$697 (39% increase) during 'Start-up', \$321 (47% increase) during 'Early Operations', and \$202 (42% increase) during 'Continuing Operations'.

At UCSF, we found the estimated projected costs of the ‘Continuing Operations’ period to be U\$169, U\$105, and U\$92 per patient/month for an average caseload of respectively 49.4, 79.0, and 90.0 dyads per CTN (Table 2). At UNMC, projected costs varied from U\$86 to U\$75 per patient/month based on the average caseloads of respectively 79.0 and 90.0 dyads per CTN.

Discussion

There is growing evidence that collaborative care programs can improve patient outcomes and decrease health care expenditures^{6–8}. Our study found that the average cost for a typical 12-month duration of program participation was \$2,892 per participant/year at UCSF, and \$1,704 at UNMC. We found that costs were highly dependent on patient caseload.

During Continuing Operations, the total costs per-participant-month varied from \$241 (UCSF) to \$142 (UNMC) when excluding rent, and considering an average caseload of 35 and 49.4 dyads per CTN, respectively. This cost is consistent with similar studies in dementia. In a program implemented in San Diego with dyads of people with dementia, the mean per-patient-month costs was \$118 for a caseload of 50 dyads per CTN.⁶ Their team consisted of four CTNs and one coordinator.⁶ The Partners in Dementia Care (PDC) provided care coordination services for veterans with dementia.⁷ PDC showed an intervention cost of \$65–80 per dyad-month at a caseload of 100–120 dyads per CTN.⁷ The program included one coordinator and one care consultant who was either a nurse or social worker.⁷ The Healthy Aging Brain Center (HABC) reported operational costs of \$52 per dyads-month for a caseload of 101.5 dyads per care coordinator, including only staff-related costs.⁸ The HABC consisted of in-person and remote care management of older adults with dementia, mild cognitive impairment or depression.⁸ The team was composed of a physician, two care coordinators (nurse and social worker), a medical assistant and one technician. In a subsequent expansion of the HABC, unlicensed assistants delivered the majority of care.²¹ The Maximizing Independence at Home (MIND) was a coordination program for persons with memory impairment provided by three unlicensed coordinators, a nurse and a geriatrician through a mix of home-visits and remote care provision.²² They reported an estimated cost of U\$ 95 per dyad/month considering a caseload of 75.²² Another program implemented by the University of California Los Angeles reported a per dyad/month cost of U\$106.²³ A team of five dementia care managers (with a caseload of 250 dyads), managed by nurse practitioners and physicians, provided in-person and remote care coordination.²³ In comparison to the Care Ecosystem, lower expenditures in some of these programs can be explained by less access to licensed dementia specialist providers (eg, pharmacists or advanced practice nurses) and higher caseloads. Neither program considered facility costs in their analysis.

The care navigator’s caseload meaningfully influenced the per-patient-month expenditures. At UNMC during Continuing Operations, the average CTN caseload was 49.4, and the maximum monthly CTN average was 79.0. At both UNMC and UCSF, caseload increased throughout all study periods. A caseload of 79 and possibly greater is feasible for experienced CTNs with established dyads. As evidence of this, as of January 2019, UCSF is provisioning the Care Ecosystem in clinical settings with an average CTN caseload of 78.5

and maximum caseload of 90.²⁴ To maintain high quality care, CTNs with less experience, new caseloads, and/or high needs cases may require smaller caseloads.

The primary reason for differing caseloads was that the continuity of the CTN-dyad relationships at UNMC allowed for higher efficiency. UCSF hired recent graduates who sought employment for an average of 2 years prior to pursuing advanced degrees, whereas UNMC hired career employees who sought longer term employment and, in most cases, remained for the duration of the project. CTN turnover requires new CTNs to complete the training and to develop new relationships with an unfamiliar caseload. An additional challenge at UCSF was that the team provided care in three languages (English, Cantonese, and Spanish), which required more staffing and was often more time intensive.

Our findings provide lessons about how to minimize costs when implementing a new program. UNMC costs were lower than UCSF costs across all study periods for several reasons. First, UCSF served as the primary site for program development: the intervention underwent protocol refinements during the initial periods, which impeded efficiency. At UNMC, the intervention underwent a slower release cycle of protocol improvements. To the extent that a new implementation can adopt and adapt existing care navigation protocols, versus developing them anew, costs during Start Up and Early Operations should be lower. Similarly, the trainings were developed and delivered from UCSF. The use of prepared training materials from established programs can reduce training costs. Third, we found that lower average CTN caseloads at UCSF explained most of the higher costs. Finally, costs were reduced in the Care Ecosystem by relying on unlicensed workers who are under the supervision of licensed dementia specialists. The implementation of the program in two different settings shows that collaborative dementia care programs can likely be implemented with similar costs in different regions of the country that are diverse in terms of population densities.

The Complex Chronic Care Management (CCM) codes, introduced in 2015 by the Centers for Medicare and Medicaid Services (CMS), offer promising reimbursements for dementia care navigation, though there are significant challenges to their implementation. CCM codes can be used to bill for care management services for patients with multiple chronic conditions, including non-face-to-face visits and services provided by clinical staff supervised by licensed health professionals.¹² For complex patients, the average reimbursement for CCM services per month is \$94 (CPT 99487) for an hour of clinical staff time and 26 minutes of provider supervision involving moderate to highly complex medical decision making.¹² An additional \$47 can be billed (CPT 99489) for every additional 30 minutes of service per month.¹² Although offering potential to support collaborative dementia care programs, the capacity of the CCM reimbursements to sustain such programs depends on a relatively high caseload of patients per CTN and, as demonstrated in a microsimulation model study using CCM payment in primary practice, services can expect financial net revenues only if delivered by nonphysician staff.¹¹

Based in our study's projected costs, in order to be adequately compensated by CCM payments, programs would need to maintain a minimum of 50 patients per CTN in regions similar to Nebraska, and a higher number in regions similar to California. In addition, CCM

does not account for costs associated with staff turnover, adapting electronic medical systems to document non-face-to-face care management activities, and multiple providers (only one provider can bill for services in a month).²⁵ Finally, the requirement of 24/7 access to providers and the cost-sharing required of patients may be significant barriers for some health systems.¹³ Some have suggested that payments for collaborative dementia programs need to be restructured altogether, by moving away from fee-for-service toward a per beneficiary monthly payment that would include a comprehensive range of reimbursable services.¹³ It is also important to note that at least two collaborative dementia care programs were shown to either be cost neutral or provide cost savings by means of reducing healthcare utilization costs.^{8,23} That alone should elicit the need to provide better incentives for increasing the uptake of collaborative dementia care models.

Our study has several limitations. First, we assumed that the data collected during a one- or two-week time and motion study represents typical staff time needed for the implementation of the nine-month ‘Continuing Operations’ study period. Secondly, for the ‘Start-up’ and ‘Early Operation’ periods, only interview and focus group data were used to estimate staff time. Lastly, we used discrete activities to represent an iterative complex intervention. That possibly underestimated the clinical time needed for staff members to provide the intervention. Future studies could use recurring time and motion data collection periods throughout project implementation.

In summary, we provide cost estimates for the Care Ecosystem, a collaborative dementia care program designed to help meet the needs of persons with dementia and their caregivers by extending the reach of licensed dementia specialists through unlicensed and supervised navigators. Costs decreased substantially during the implementation periods, and were dependent on caseload. Future studies are needed to understand the degree to which similar collaborative models are sustainable through the new CCM reimbursement codes, and how variations in CTN caseload impact care outcomes. Finally, future studies should also evaluate the impact of cost-sharing requirements on the enrollment, analyze the cost-effectiveness of programs, and evaluate the populations in which such programs would have the greatest cost-effectiveness in risk-sharing health systems.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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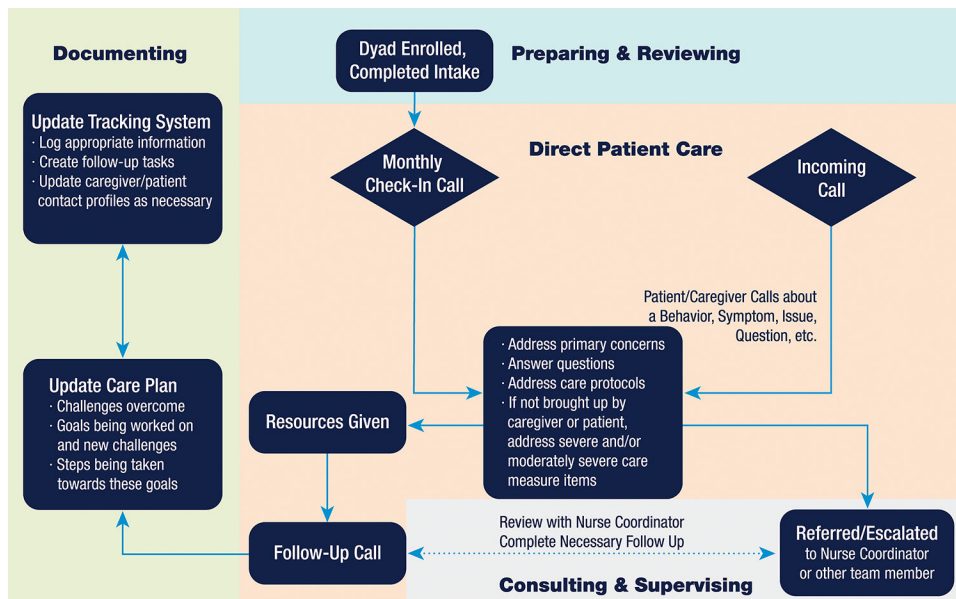


Figure 1. The Care Ecosystem Workflow

Caption: The figure portrays the Care Ecosystem workflow including an overview of activities performed by Care Team Navigators (CTNs).

Table 1.

Estimated Cost of Implementing the Care Ecosystem Program at UCSF and at UNMC by Study Period (USD)

Setting	UCSF			UNMC		
	Period 1* (n=6 months)	Period 2 ^λ (n=12 months)	Period 3 ^Σ (n=9 months)	Period 1* (n=5 months)	Period 2 ^λ (n=12 months)	Period 3 ^Σ (n=9 months)
Personnel	397	268	202	357	180	122
CTN	132	166	128	159	82	60
Nurse	123	37	23	128	34	23
SW	-	28	29	-	49	29
Pharmacist	142	22	13	70	15	9
Supervisor	-	14	9	5	8	2
Supplies	86	27	15	82	11	5
Equipment	15	2	1	11	0.1	-
Training	19	1	1	46	20	13
Overhead	53	30	22	357	180	122
TOTAL (SD)	581 (81)	328 (50)	241 (18)	501 (152)	219 (24)	142 (12)
TOTAL range	533–727	228–379	199–258	358–660	191–252	111–146
TOTAL including 'Facility' (SD)	762 (81)	476 (50)	359 (18)	697 (152)	321 (24)	202 (12)
TOTAL including 'Facility' range	715–909	377–527	317–377	555–857	293–355	171–206

Costs are shown as average costs (USD) per participant enrolled month.

* Period 1: Start-up;

^λ Period 2: Early operations;

^Σ Period 3: Continuing operations

Table 1. The table demonstrates the total average monthly costs, standard deviation (SD), and total cost ranges per patient enrolled for each study period and setting. Total average costs for each of the variables included in the costing analysis studies are also shown. Further details can be found on supplemental material.

Table 2.

Estimated Projected Costs (SD^{*}) at UCSF and at UNMC for higher CTN^λ caseloads

Setting	UCSF		
Caseload per CTN	49	79	90
Mean Cost/Participant/month (SD)	169 (13)	105 (8)	92 (7)
Cost range	140–181	87–112	76–99
Setting	UNMC		
Caseload per CTN	49	79	90
Mean Cost/Participant/month (SD)	-	86 (7)	75 (6)
Cost range	-	67–88	59–77

Costs are shown as average costs (USD) per participant enrolled month.

*SD: Standard Deviation;

^λCTN: Care Team Navigator

Table 2. The table demonstrates the UCSF Continuing Operation projected costs based on UNMC's average CTN caseload per month (49), UNMC's highest average CTN caseload (79), and the maximum caseload provided by a CTN to date (90). It also shows that UNMC's Continuing Operations projected costs based on UNMC's highest average CTN caseload (79.0), and the maximum caseload provided by a CTN to date (90.0).