Medicaid-Funded Home Care for the Frail Elderly and Disabled: Evaluating the Cost Savings and Outcomes of a Service Delivery Reform

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Objectives. In response to rising demand and increased costs for home care services for frail elderly and disabled Medicaid clients, New York City implemented cluster care, a shared-aide model of home care. Our objective: to evaluate the effects of cluster care on home care hours and costs, client functioning, depressive symptoms, and satisfaction.

Data Sources. Client interviews, conducted prior to implementation and again 16 months later; Medicaid claims records; home attendant payroll files; and vendor agency records.

Study Design. The study employed a pretest/posttest design, comparing 229 clients at the first seven demonstration sites to 175 clients at four comparison sites before and after cluster care implementation. Regression methods were used to analyze pre- and post-intervention data.

Principal Findings. Cluster care reduced costs by about 10 percent. Most savings occurred among the more vulnerable clients (those with five or more ADL/IADL limitations). Clients at cluster care sites who started out with fewer than five limitations appeared to decline somewhat more slowly than similarly impaired clients at comparison sites, while those with more than five ADL/IADLs tended to decline more rapidly. This difference was small–less than one limitation per year. Cluster care is associated with a significant decline in satisfaction but appears unrelated to depressive symptoms.

Conclusions. Cluster care appears benign for home care clients with fewer limitations. For the more vulnerable, we recommend experimentation with low-cost interventions that might augment service and improve outcomes without reverting to traditional one-on-one care.

Key Words. Home care, shared-aide services, cluster care, cost effectiveness, home care delivery reform

The recent rise in home health expenditures and the ongoing debate over expansion of federally funded long-term care benefits have intensified concern over home care costs and outcomes. Proposed cost-control strategies include instituting prospective payment, improving case management, increasing cost sharing, and restricting eligibility to the severely disabled (Weissert 1991). Relatively little attention has focused on improving operational efficiency by reorganizing care (Joffe 1989). This article reports on the evaluation of New York City's Cluster Care Demonstration, an initiative designed to yield savings in the city's billion-dollar Medicaid home care program by reorganizing care at public and private senior housing sites throughout the city.

Cluster care introduced shared-aide services as an alternative to the city's traditional one-on-one attendant care system. Under traditional care, workers typically spend blocks of 4, 8, or 12 hours a day in the client's residence, some of which is "downtime." A hundred or more home attendants, employed by as many as ten different vendor agencies, may be working more or less in isolation in any one apartment building. Three major changes occurred under cluster care: (1) Medicaid consolidated attendant services at selected housing sites so that a single vendor agency provided care at each site; (2) the vendor agencies deployed teams of attendants instead of individual workers to serve clients whose apartments were in close proximity; and (3) nurses, caseworkers, and agency managers reassessed clients' needs and redesigned clients' service schedules, basing assignments on tasks to be accomplished rather than on blocks of time.

For logistic and political reasons, the city implemented cluster care site by site. To be eligible for clustering, a site had to have a minimum client Medicaid population, and an on-site social worker or senior center. Within sites, not all clients were judged eligible for the program. Clients were excluded–and continued to receive traditional one-on-one care–if their physical health made it unsafe for them to be left alone, if they could not provide access to their apartment, or if they were diagnosed as psychotic. For eligibles, cluster care entailed a reduction in service hours; changes in home

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attendants, because fewer workers were required to serve a given population; and movement of the home attendant in and out of the client's apartment during the course of a day or evening.

Advocates of cluster care cited cost savings arising from increased worker productivity as its principal advantage. In addition, they asserted that cluster care would benefit clients by fostering greater independence. Skeptics, on the other hand, expressed concern over the potential loss of attention, security, control, and companionship that clients might experience if their service hours were reduced and their care became more routinized. Although shared-aide programs were introduced in several New York counties, they were not subject to independent evaluation employing rigorous research methods or sophisticated analytic techniques (Monroe County Department of Social Services 1983).

In this article we examine the impact of New York City's cluster care demonstration on home care costs and selected client outcomes. We address two main questions: (1) Can savings in hours and costs of home care service be attributed to cluster care? and (2) Is cluster care associated with improvement or deterioration in client well-being, as measured by functional status, mortality, depressive symptoms, and satisfaction with care?

METHODS

EVALUATION DESIGN

The study employed a pretest/posttest design, comparing 229 clients at the first seven demonstration sites to 175 clients at four comparison sites before and after cluster care implementation. The sites were distributed across four of the city's five boroughs and included clients from diverse racial and ethnic backgrounds. All sites had at least 19 Medicaid clients and had an on-site social worker. Because we could not assume that the demonstration and comparison groups were equivalent, we used multiple regression methods to control for baseline differences between individuals in the respective groups.

DATA SOURCES

The three main data sources were face-to-face interviews with clients, agency billing and payroll data, and Medicaid claims data. In addition, agency records were used to determine outcomes of clients who were not available for follow-up.

Interview Data. We obtained information on client characteristics from face-to-face interviews conducted by the National Opinion Research Center (NORC). Interviews were administered in English and in Spanish, at baseline and again approximately 16 months later.

The survey instrument was adapted from the *Long Term Care Supplement* and the *Home Health Care Booklet* of the 1987 National Medical Expenditure Survey (NMES). In addition to questions about demographic and family characteristics, it asked about general health status and need for assistance with activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Questions on ADLs asked the client to report if, because of a mental or physical problem, she had difficulty bathing, dressing, toileting, getting in and out of bed or a chair, walking, or feeding herself. Questions on IADLs asked if the client had difficulty with meal preparation, light housework, going outside, or shopping. The questionnaire also included the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff 1977), and questions about satisfaction with home attendant care and use of community-based resources such as senior centers and adult day care.

All Medicaid home care clients residing at the designated demonstration and comparison sites were eligible for the study. NORC achieved a 93 percent response rate for the baseline client survey, yielding data for 404 clients. Follow-up interviews were completed for 70 percent of the baseline sample, yielding data on 284 individuals. The remaining 30 percent (n = 120) had entered a nursing home or hospital, had moved, or were deceased at the time of follow-up. Because the missing values were few in number, and because they appeared to be missing at random, we made no imputations for them.

Payroll, Billing, and Claims Data. We collected weekly payroll and billing data from the vendor agencies' data processing subcontractor, and cost and utilization data from Medicaid claims files. The payroll and billing data show weekly hours of home care use for 364 of the original sample of 404 clients. For these 364 clients, we obtained an average of 102 weeks of data, usually extending before and after the period between the baseline and follow-up interviews. The Medicaid claims files contain data on home care and other medical costs, as well as prescription drug use by drug category. We obtained up to four years of data extending, again, before and after the period between the baseline and follow-up interviews. We also constructed a measure of severity of illness from drug use data, as described below. Cost data were available for 335 of the 404 clients in the study sample, drug use data for 345.

CONSTRUCTION OF DEPENDENT AND INDEPENDENT VARIABLES

Post-Intervention Hours of Care per Week. For each cluster care client we calculated the mean number of service hours for each week after intervention during which at least one hour of service occurred. We did the same for clients at comparison sites, using imputed intervention dates. We imputed intervention dates for clients at comparison sites in such a way that the distribution of durations between baseline interviews and intervention dates was similar between cluster and comparison sites. Except for this distributional constraint, the assignment of intervention dates to comparison clients was random. We obtained for each client an average of 66 weeks of data after (actual or imputed) implementation.

Post-Intervention Home Health Costs per Quarter. To assess the impact of cluster care on costs, we averaged quarterly Medicaid expenditures for home health services. Using the same imputed intervention dates as for hours of care, we averaged up to eight quarters (two years) of data post-intervention for each client. Each cost value used as a dependent variable in the analysis represents 5.4 quarters of data on average.

Mortality. We contacted home attendant agencies to find out what had happened to each of the 120 clients lost to follow-up–whether they had changed residence, entered a nursing home, been admitted to an acute care hospital, or died.

Functional Status. To assess change in clients' functional status between baseline and follow-up, we first combined the ADL and IADL scales into a single 10-point scale, by summing together the numbers of ADL and IADL limitations. We did this for three reasons: (1) the scales were hierarchical, with the most difficult activity on the ADL scale, bathing, being more commonly done independently than the least difficult activity on the IADL scale (preparing meals) (Spector et al. 1987); (2) regression analyses using the 4-point IADL scores alone exhibited highly skewed residuals, whereas analyses using the 6-point ADL scores alone, as well as the combined scale, did not; moreover, analyses using the combined scale yielded similar results to those using the ADL scale alone; (3) although 40 percent of clients had minimum or maximum scores on the ADL scale at either baseline or follow-up, and 84 percent on the IADL scale, only 15 percent had maximum or minimum combined ADL/IADL scores at either baseline or follow-up. The combined scale therefore measures differences in functional status in our sample with more sensitivity than either component scale by itself.

Our analyses of the 10-point combined ADL/IADL scale included raw and transformed change scores. The raw change scores (number of limitations at follow-up minus number of limitations at baseline) have the disadvantage of being influenced by the floor (0 limitations) and ceiling (10 limitations) on the combined scale. The combined scale can register only a decline or no change in functional status for an individual starting with no limitations; it can register only an improvement or no change for a person starting with ten limitations; and the range of changes it can register for individuals near either end of the scale at baseline is limited as well. To remedy this, we transformed the raw change scores using Jacobsen's normal scores transformation (Smith 1990). This transformation is accomplished by ranking the raw change scores within each baseline limitations category, converting the raw scores into percentiles, and then converting the percentiles into scores from a standard normal distribution. The normalized change score reflects the degree to which a client has experienced a decline or improvement in her functional status *relative to other clients with the same number of limitations at baseline.* Thus, a client with three limitations at baseline, who experienced an increase of two limitations, would get a normalized score of 0 if the median change among all clients with three limitations at baseline was also an increase of two limitations. A score of 1.96, for example, can then be interpreted in the same way regardless of the client's baseline limitations: it means that the client has gained more limitations than 97.5 percent of the clients with the same number of baseline limitations.

The disadvantage of the normalized change score is that the estimated coefficients in a multiple regression analysis give no indication of the absolute level of decline or improvement associated with change in a predictor variable. Therefore, we relied on regressions using the normalized change scores to determine the significance levels of the variables of interest, and on regressions using the raw change scores, to gain a rough indication of the magnitude of decline or improvement associated with changes in predictor variables. Because the intervals between baseline and follow-up interviews varied, ranging from one year to one year and nine months, we expressed all change scores on a per-year basis.

Depressive Symptoms. We assessed depressive symptoms with the 20-item CES-D Scale (Radloff 1977). This measure has been widely used in general populations and has been found to be a valid measure of depressive symptoms among the frail elderly (Davidson, Feldman, and Crawford 1994). Items are answered on a 4-point scale, giving a possible range of 0–60.

Satisfaction with Care. For each ADL and IADL activity for which they required assistance we asked clients to respond on a 4-point scale to the question, "How satisfied are you with the help you are getting?" Our measure of satisfaction with care is the average of the scores for each activity for which assistance was needed. The individual scores are integers ranging from 1 to 4, so that the mean is a (virtually) continuous variable bounded by 1 and 4. This variable was converted to a categorical variable with three levels.

Mean Hours of Home Care prior to Intervention. Mean hours of home care per week prior to intervention were computed in the same way as mean hours of home care per week after intervention. This independent variable is based on an average of 36 weeks of pre-intervention data.

Mean Cost of Home Care prior to Intervention. Mean quarterly costs of home care prior to intervention were computed in the same way as mean quarterly costs of home care after intervention. The variable is based on an average of 1.5 quarters of pre-intervention data.

Drug Category–Based Measure of Severity of Illness. The number of classes of drugs for which two or more claims were filed in the last quarter before intervention was used as a measure of severity of illness (Soumerai et al. 1987).

Client Need Trajectory. Prior to the intervention, some clients may have been experiencing a gradual reduction in use of home care services, while others may have been experiencing an increase. Such trends might well persist beyond the intervention date, and could help explain changes in functional status, home care hours, or costs. To measure such trends, we regressed weekly home care hours prior to intervention on time. The time coefficient is a measure of the rate of change in the client's need for home care services prior to intervention.

Table 1 shows descriptive statistics for all independent variables used in our analyses.

STATISTICAL METHODS

We estimated the effects of cluster care on functional status, depression, hours, and costs using linear regression. The models estimated took the general form:

$$Y_i = \beta_0 + \beta_1 C_i + \beta_2 D_i + \varepsilon_i$$

where Y_i is the dependent variable, C_i is a vector of covariates, D_i is a vector of dummy variables representing sample subgroups, such as residents of cluster care sites (see tables further on for details), the βs are parameters to be estimated, and ϵ_i is the random error term.

Independent variables were included in a model if they met one or more of four criteria: (1) theoretical plausibility (age, sex, baseline functional status); (2) statistically significant difference, at the .05 level, between the

Table 1: Baseline Characteristics of Home Care Clients at Cluster and Comparison Sites (N = 404)

	Cluster Care Site		*Comparison Site*	
Variable	%	(n)	%	(n)
Age				
<65	13	(30)	13	(23)
65–85	62	(140)	58	(101)
85+	25	(56)	29	(50)
Gender				
Female	82	(186)	83	(145)
Race****				
African American	38	(84)	62	(108)
Ethnicity****				
Hispanic	28	(64)	14	(25)
Marital status				
Never married	17	(40)	15	(26)
Currently married	15	(34)	20	(35)
Widowed or divorced	68	(155)	65	(112)
Depressive symptoms*				
High levels (≥ 16)	57	(113)	47	(71)
Living with someone***				
Yes	28	(65)	17	(30)
Children				
1 child nearby	31	(71)	32	(56)
>1 child nearby	18	(40)	11	(19)
Health status				
Excellent	5	(12)	4	(8)
Good	19	(42)	24	(41)
Fair	34	(77)	36	(62)
Poor	42	(96)	36	(62)
Total paralysis				
Yes	3	(7)	3	(5)
Missing/Weakened limb(s)***				
Yes	58	(132)	74	(129)
Walker***				
Yes	62	(143)	78	(136)
Wheelchair				
Yes	45	(104)	44	(76)
Senior center***				
Uses center	32	(73)	47	(83)

Continued

Table 1: Continued

	Cluster Care Site		Comparison Site	
Variable	%	(n)	%	(n)
Client satisfaction				
Very satisfied	82	(182)	79	(138)
Less satisfied	18	(40)	21	(36)
Close to home attendant				
Usually	83	(182)	88	(150)
Somewhat	11	(25)	9	(15)
Hardly ever	5	(12)	4	(6)
	Mean	*(s.d.)*	*Mean*	*(s.d.)*
ADL/IADL limitations**	6.09	(2.78)	6.62	(2.27)
Drug categories used****	1.46	(1.37)	0.95	(0.91)
Weekly per-client hours home care used before cluster care**	57.56	(35.22)	50.32	(27.84)
Quarterly home care costs per client before cluster care*	$6,783	(4,551)	$5,993	(3,891)

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

cluster care and comparison groups (African American, Hispanic, living with someone else, using a walker, drug-based severity-of-illness index, mean cost per quarter prior to intervention, number of limitations at baseline); (3) single measure of a given construct (excludes weekly hours of care, which is highly correlated with quarterly home care cost, and alternative drug-based severity-of-illness indexes); (4) significant explanatory power ($p < .01$) in the model, combined with theoretical plausibility (wheelchair use, rehabilitative trajectory in the hours regression). We also included, in the functional status regressions with the normalized change score, an interaction term between the combined ADL/IADL score at baseline and age. This interaction term is necessary to keep the combined ADL/IADL score from being highly significant statistically. (It should not be highly significant by virtue of the way in which the normalized score is constructed.)

We explored two alternative specifications of the costs and hours regressions: (1) with the costs and hours variables (both the dependent and the preintervention independent variable) in their original form; and (2) with the same variables in logs. The log specification has the advantages of reducing the skewness of the residuals as well as reducing heteroskedasticity. However, using two separate split-sample validations, we found that the unlogged specification yields a smaller mean-squared error of prediction in the validation sample for both costs and hours. Therefore, we report results with the variables in their original form.

Due to substantial differences across clients in baseline levels of costs and hours, however, we expected the disturbances in the costs and hours regressions to be heteroskedastic, with the variance of the disturbance rising with predicted costs or hours. We confirmed this using a Park test, which has a more specific null hypothesis than White's test (Judge, Griffiths, Hill, et al. 1985). However, we could not find a satisfactory specific model of the variance of the error term. Rather than using weighted least squares, we simply adjusted the standard errors using White's method (White 1980). We also computed asymptotic standard errors assuming the presence of intra-site or intra-agency correlations.

Preliminary analyses of the satisfaction with care variable using ordinary least squares produced highly skewed residuals. Therefore, we transformed the satisfaction with care variable into a three-level categorical variable corresponding to mean levels of 4, 3 to 4, and less than 3. We then estimated the relationship between cluster care and satisfaction using ordered logit.

To examine the effect and relative importance of study variables on mortality outcomes, we used survival analysis methods. After estimating survival distributions using Kaplan-Meier techniques, equality of these distributions grouped by variables of interest was tested by two non-parametric linear rank tests: the logrank and Peto-Peto-Wilcoxon statistics (Kalbfleisch and Prentice 1980). Before entering study variables into proportional hazards regression models, we employed graph methods to examine model assumptions. Relative risks were estimated by exponentiating regression coefficients.

RESULTS

In the discussion that follows, we compare all clients at cluster care sites (those who were clustered and those who were not) with clients at traditional care sites. We also present two types of subgroup analysis. First, we identify site-level effects of cluster care for clients with more functional limitations at baseline and for those with fewer. Second, we divide the clients at cluster care sites into those who actually received cluster care services and those who, because of their health or other impediments, continued to receive traditional care. We focus primarily on site-level comparisons, however, because in practice some clients will virtually always be excluded from cluster care for health or other reasons. Therefore, cluster care sites will almost always consist of clients who are receiving services under a cluster care model and others still receiving them under the traditional model.

REDUCTION IN HOME CARE HOURS

As expected, clients at cluster care sites used fewer hours of home care during the follow-up period than clients at comparison sites. In Table 2, as in subsequent tables reporting regression results, coefficients of covariates have plausible signs and magnitudes. Overall, controlling for covariates as described earlier, a client at a cluster care site used on average six fewer hours per week (about 300 fewer hours per year) during the follow-up period than a client at a traditional care site. For clients who had more functional limitations at baseline, the savings in home care hours were even greater. They used on average seven fewer hours per week (about 350 hours per year). In contrast, cluster site clients with four or fewer baseline limitations were not significantly different in use of hours during the follow-up period than were similar clients at traditional care sites.

COST SAVINGS

The coefficients reported in Table 3 imply that, controlling for differences in client characteristics, clients at cluster care sites cost on average $720 less per quarter, or about $2,900 less per year, than clients at comparison sites.

Virtually all of the savings at the cluster care sites were achieved among clients with five to ten limitations at baseline. Their costs were lower by an average of $4,600 per client per year than those of similar clients at traditional sites. Among those clients with five to ten limitations at baseline, those at cluster sites *receiving cluster services* had significantly lower costs on average (by $8,700 per client per year) than similar clients at the comparison sites. In contrast, costs for the group of clients with five to ten limitations at baseline who were excluded from cluster care were not significantly different from those of similar clients at comparison sites.

Looking at this finding another way, average annual home care costs at the cluster care sites hardly budged after the intervention, while at the traditional sites they rose by $2,431 per client on average. The average annual home care cost for a client at a cluster care site was $27,219 once cluster care was implemented. Our results imply that this cost would have been $30,100 had cluster care not been implemented. Thus, cluster care yielded

Table 2: Post-Intervention Home Care Hours per Week and Cluster Care (CC)

	Clients at CC Sites		*Clients at CC Sites with <4 and ≥5 ADL/IADL Limitations*		*CC and Non-CC Clients at CC Sites with <4 and ≥5 ADL/IADL Limitations*	
Variable	*b*†	*(SE)*‡	*b*†	*(SE)*‡	*b*†	*(SE)*‡
Age	0.30	(0.11)***	0.30	(0.11)***	0.27	(0.10)***
Male	−3.09	(3.53)	−3.34	(3.55)	−5.46	(3.38)
African American	−3.27	(3.26)	−3.50	(3.28)	−1.84	(3.09)
Hispanic	−1.97	(4.09)	−2.38	(4.13)	−2.73	(3.87)
Living with someone	−5.45	(3.43)	−5.51	(3.45)	−4.09	(3.25)
ADL/IADL limits	1.60	(0.59)***	2.01	(0.92)**	1.44	(0.87)*
Uses walker	−1.97	(3.26)	−1.83	(3.28)	−0.41	(3.11)
Missing/Weakened limb	0.47	(2.93)	0.43	(2.95)	0.87	(2.76)
Trajectory	51.28	(20.42)***	51.34	(20.47)***	50.87	(19.20)***
Drug categories used	−1.35	(1.13)	−1.27	(1.14)	−2.11	(1.08)**
Use of center	−5.71	(2.81)**	−5.83	(2.83)**	−3.99	(2.67)
Mean hours home care pre-intervention	0.92	(0.05)****	0.92	(0.05)****	0.86	(0.05)****
Cluster care site	−5.96	(2.94)**				
Cluster care site (1–4 ADL/IADL)			−2.36	(5.84)		
Cluster care site (5–10 ADL/IADL)			−7.29	(3.38)**		
Traditional sites (1–4 ADL/IADL)			0.41	(5.59)	−2.10	(5.27)
CC clients at CC site (1–4 ADL/IADL)					−9.09	(5.70)
CC clients at CC site (5–10 ADL/IADL)					−17.92	(3.82)****
Non-CC clients at CC site (1–4 ADL/IADL)					9.83	(7.93)
Non-CC clients at CC site (5–10 ADL/IADL)					5.50	(3.93)
	$R^2 = .74$	$n = 227$	$R^2 = .74$	$n = 225$	$R^2 = .78$	$n = 223$

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

† Unstandardized regression coefficient.

‡ Standard error.

savings on home care costs of approximately 10 percent. These results, as well as those for hours and the results of other linear regression analyses reported below, were not affected by the assumption of intra-site or intra-agency correlations.[1]

Table 3: Post-Intervention Home Care Costs per Quarter and Cluster Care (CC)

	Overall Effect of Cluster Care		*Effect of Cluster Care by # of Limitations at Baseline*		*Effect of Cluster Care by # of Limitations at Baseline and Whether Selected into Cluster Care*	
Variable	*b*†	*(SE)*‡	*b*†	*(SE)*‡	*b*†	*(SE)*‡
Age	42.49	(15.37)***	43.33	(15.30)***	37.90	(14.89)***
Male	−203.42	(310.27)	−306.42	(307.62)	−534.80	(331.81)
African American	−478.65	(483.57)	−594.76	(465.13)	−567.93	(430.27)
Hispanic	−131.35	(484.37)	−283.95	(480.3)	−630.07	(460.69)
Lives with someone	−459.50	(392.67)	−463.63	(379.38)	−406.40	(348.57)
Uses senior center	−1023.10	(375.58)***	−1075.67	(367.29)***	−983.24	(336.00)***
Number of ADL/IADL limitations	197.16	(87.03)**	353.02	(138.15)***	303.69	(130.68)**
Uses walker	−363.45	(404.84)	−269.42	(408.75)	−119.73	(438.10)
Missing/Weakened limb	345.92	(406.04)	333.44	(406.50)	398.66	(384.41)
Pre-Intervention hours trajectory	2921.75	(5812.86)	2816.35	(5708.66)	3084.06	(5298.75)
Number of drug categories	−70.65	(162.86)	−56.35	(162.59)	−163.58	(150.68)
Home care costs pre-intervention	0.89	(0.05)****	0.89	(0.05)****	0.80	(0.05)****
Cluster care site	−720.40	(395.35)*				
Cluster care site (1–4 ADL/IADL)			577.92	(928.82)		
Cluster care site (5–10 ADL/IADL)			−1153.55	(448.21)***		
CC clients at CC site (1–4 ADL/IADL)					−641.71	(699.78)
CC clients at CC site (5–10 ADL/IADL)					−2203.25	(496.06)****
Non-CC clients at CC site (1–4 ADL/IADL)					3042.61	(1492.77)**
Non-CC clients at CC site (5–10 ADL/IADL)					423.30	(609.08)
Comparison site (1–4 ADL/IADL)			158.65	(621.22)	−137.31	(585.21)
	$R^2 = .67$	$n = 262$	$R^2 = .67$	$n = 262$	$R^2 = .71$	$n = 262$

Note: Intercepts not shown.

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

† Unstandardized regression coefficient.

‡ White (heteroskedasticity-consistent) standard error.

MORTALITY AMONG CLIENTS

In the time that passed between the baseline and follow-up interviews, a total of 58 clients died: 15 percent of clients who had been living at cluster care sites and 14 percent of those at the traditional care sites. Controlling for covariates using survival-analytic methods, we were unable to detect any difference in mortality rates between clients at cluster sites and those at traditional sites. It should be noted, however, that the power of this test is low: assuming exponentially distributed survival times, cluster care would have to more than double or more than halve mortality for the effect to be detected with a power of 0.8 at the .05 level. The similarity of the percentages who died in both groups suggests that, if cluster care has an effect on mortality, it is much smaller than that.

CHANGES IN FUNCTIONAL STATUS

In the aggregate, and controlling for baseline differences, the normalized scores analysis revealed no association between being at a cluster care site and change in functional status (Table 4). However, we found that clients at cluster care sites with one to four limitations at baseline did better at follow-up than similarly impaired clients at traditional care sites; cluster care clients who started out with five or more limitations did worse than their counterparts at traditional sites.

Because the coefficients in the equation using normalized scores do not indicate the magnitude of the change in functional limitations associated with being in cluster care, we ran the same regressions using raw change scores rather than normalized ones (results not shown). If we use raw change scores, the coefficients on the cluster care variables suggest that the changes in functional status associated with cluster care, for persons with fewer as well as with more limitations, are less than one limitation per year.

DEPRESSIVE SYMPTOMS

Cluster care does not appear to have affected the level of depressive symptoms, regardless of the client's level of baseline limitations (results not shown).

SATISFACTION WITH HOME CARE SERVICES

Table 5 shows the odds ratios estimated from the ordered logistic regression. Clients at cluster care sites, whether in cluster care or excluded from it, were significantly less satisfied with their care than clients at traditional sites. This result holds true for clients with fewer as well as with more limitations.

Table 4: Change in Functional Status and Cluster Care Using Normalized ADL/IADL Change Score

	Mean Effect of Cluster Care		*Effect of Cluster Care by # of Limitations at Baseline*	
Variable	*b*†	*(SE)*‡	*b*†	*(SE)*‡
Age	0.02	(0.01)	0.02	(0.01)
Male	−0.06	(0.16)	−0.03	(0.15)
African American	−0.11	(0.14)	−0.07	(0.14)
Hispanic	0.25	(0.18)	0.27	(0.18)
Lives with someone	−0.01	(0.15)	0.01	(0.15)
Uses senior center	−0.25	(0.12)**	−0.23	(0.12)*
Number of ADL/IADL limitations	0.04	(0.15)	−0.02	(0.15)
ADL/IADL limitations * age	−0.00	(0.00)	−0.00	(0.00)
Uses wheelchair	0.70	(0.14)****	0.68	(0.13)****
Uses walker	0.06	(0.15)	0.02	(0.14)
Missing/Weakened limb	0.03	(0.13)	0.04	(0.13)
Number of drug categories	−0.00	(0.05)	−0.01	(0.05)
Mean hours of home care pre-intervention	0.01	(0.00)***	0.01	(0.00)***
Cluster care site	0.13	(0.13)		
Cluster care site (1–4 ADL/IADL)			−0.24	(0.25)
Cluster care site (5–10 ADL/IADL)			0.33	(0.14)**
Comparison site (1–4 ADL/IADL)			0.16	(0.25)
	$R^2 = .21$	$n = 233$	$R^2 = .24$	$n = 233$

Note: Intercepts not shown.

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

† Unstandardized regression coefficient.

‡ Standard error.

DISCUSSION

This evaluation generated several important findings. First, we found that cluster care yielded overall home care savings of approximately 10 percent at the sites where it was implemented, even taking into account the substantial proportion of clients who could not be clustered and continued to receive traditional care. Second, we found that the cost savings at cluster care sites were primarily among the clients with more limitations (five to ten) at baseline. Third, the impact of cluster care on functional status varied according to clients' baseline ADL/IADL limitations. Clients with one to four limitations at baseline did somewhat better at follow-up than similar clients at traditional sites. Clients with five to ten limitations at baseline, however, tended to decline more than similar clients receiving care at traditional sites.

Table 5: Satisfaction with Home Care Services and Cluster Care

Variable	*Overall Effect of Cluster Care* *Odds Ratio (95% CI)*	*Effect of Cluster Care by # of Limitations at Baseline* *Odds Ratio (95% CI)*
Age	0.99 (0.97, 1.02)	0.99 (0.97, 1.02)
Male	1.67 (0.75, 3.74)	1.65 (0.73, 3.70)
African American	0.84 (0.42, 1.65)	0.84 (0.42, 1.66)
Hispanic	0.45 (0.20, 1.04)*	0.45 (0.20, 1.03)*
Lives with someone	0.71 (0.33, 1.50)	0.72 (0.34, 1.53)
Uses senior center	0.84 (0.47, 1.51)	0.85 (0.48, 1.52)
Number of ADL/IADL limits	0.93 (0.80, 1.07)	0.92 (0.80, 1.07)
Missing or Weakened limb	0.90 (0.48, 1.67)	0.91 (0.49, 1.68)
Uses walker	0.87 (0.44, 1.72)	0.88 (0.44, 1.74)
Number of drug categories	0.98 (0.78, 1.22)	0.97 (0.78, 1.22)
Mean hours home care pre-intervention	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)
Child nearby	1.39 (1.00, 1.93)**	1.39 (1.00, 1.93)*
Uses wheelchair	1.67 (0.86, 3.22)	1.66 (0.86, 3.21)
Satisfaction with help at baseline	2.10 (1.20, 3.68)***	2.09 (1.19, 3.66)***
Cluster care site	0.29 (0.15, 0.56)****	
CC clients at CC site		0.28 (0.14, 0.56)****
Non-CC clients at CC site		0.32 (0.14, 0.74)***
$n = 226$	$\chi^2(15) = 14.41$****	$\chi^2(16) = 41.52$****

Note: Intercepts not shown.

*$p < .10$; **$p < .05$; ***$p < .01$; ****$p < .001$.

Two qualifications to our inference about functional status impact should be noted. First, our measures of ADL and IADL limitations rely on self-reported need for assistance rather than on external professional judgment. This may have introduced bias in measuring impact insofar as cluster care clients may have been more likely to perceive and/or report deterioration in functional status than clients who experienced no service change over the study period. However, the fact that cluster care clients with fewer baseline limitations reported *improved* functioning at follow-up, while only cluster care clients with five or more baseline limitations reported deterioration, suggests that clustering per se was not the factor determining their response to the functional status questions. Clustered clients with fewer baseline limitations also expressed reduced satisfaction with services relative to their counterparts at traditional sites.

Second, because cluster care involved a change in service for clients at the cluster care sites, it is possible that our findings on cluster care reflect not simply the impact of cluster care in and of itself but also the impact of a *change* in service and a reduction in service hours for clients who had previously been receiving home care services. Clients with no previous experience of home care might not be adversely affected by the implementation of shared-aide services. Thus, any estimate of the negative impact of cluster care may be overstated relative to its possible impact on clients entering cluster care without any prior service history. If frailer clients truly are more vulnerable to functional decline under cluster care than under traditional care, what might account for this? Several possible explanations may be advanced. First, it is possible that the client reassessment that occurred when cluster care was first implemented did not identify all of the clients who should have been excluded or all of the tasks that should have been included. This, however, is unlikely. The assessments were done with considerable care by teams of professionals. Furthermore, we verified that the effects of cluster care on functional status were not driven by a small number of influential observations. On the contrary, removing the most influential observations (identified according to any one of three conventional statistical criteria) strengthened rather than weakened the associations between cluster care and functional status (analyses available from the authors). A few large errors in assessment are therefore unlikely to account for the findings. Second, the assessments could have been accurate, but the care plan not implemented as written for vulnerable clients under cluster care. This, too, seems unlikely, inasmuch as the monitoring and supervision of workers at the cluster sites was greater than that of workers at the traditional sites. Third, the care tasks may have been performed, but in a manner that was not equivalent to the way they were performed in traditional care. For example, time pressure on the cluster care workers may have led them to be less patient in helping clients to help themselves (e.g., spoonfeeding rather than letting them feed themselves with minimal intervention). This could have accelerated clients' rate of decline. Fourth, when cluster care was implemented, clients lost the uninterrupted companionship of their care workers and control over the timing of specific tasks. Loss of companionship and control, in turn, may have had negative effects on client functioning (Rodin and Langer 1980).

Of these explanations, the last two seem the most plausible. If they do account for our finding, relatively simple interventions might be found that would augment service for the more vulnerable clients and improve their functional outcomes without reverting to one-on-one traditional care. For example, an intervention involving an escorted lunch at the senior center; a volunteer visit with a defined purpose, such as reading, teaching, or interacting with a client in a defined way; or a series of scheduled phone calls might compensate for the effects of reduced companionship under cluster care. Building on the need for a sense of control among frail elderly, an intervention targeting enhancement of personal efficacy might also improve outcomes.

POLICY IMPLICATIONS

The fact that the cluster care demonstration had a benign impact on the functional status of people with fewer ADL/IADL limitations suggests that the model has applicability in settings such as "naturally occurring retirement communities" (NORCs), or Assisted Living Facilities (ALFs), where the needs of residents may not be very intense, at least at the onset of service. Here, the cost savings will be modest, but individual outcomes will likely not be compromised. (Indeed, outcomes may well improve if clustering results in service provision to individuals who were not previously eligible for care.) Moreover, establishing a shared-aide model as the standard of care would gradually eliminate the need to shift people from one mode to another, thereby avoiding the negative consequences of perceived service reductions and loss of control. Implementing cluster care in NORCs or ALFs, which may include a mix of private pay and Medicaid clients, may be more complex than implementing the model only for individuals subject to Medicaid's administrative controls. Nevertheless, the experience in providing supportive services to elders in private, publicly subsidized housing suggests that it can be done (Lanspery and Callahan 1993).

Assuming that cluster care truly is less beneficial than one-on-one care for frailer individuals, it could still be justified relative to its more costly alternative if it enabled more people to be served within a limited budget. To the extent that the needs of the frail elderly and disabled grow beyond the resources allocated for supportive services, policymakers operating under budget constraints will be confronted with difficult trade-offs such as this, between maximizing the numbers of people served or maximizing beneficial outcomes for a smaller group of eligibles. This study provides quantitative evidence of the cost savings and outcome implications of reducing service hours for a given population. But such quantification provides information on only part of the trade-off. A fully informed choice would require, in addition, measuring the costs and benefits of expanding eligibility to a broader target population that might not otherwise be served.

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NOTE

1. Using the same Medicaid data as for home health costs, we also examined whether cluster care affected other types of costs: inpatient, outpatient, physician, durable medical equipment, and prescription costs. We found that cluster care clients with five to ten limitations at baseline had physician visit costs lower by $27 after cluster care ($p < .001$ adjusting for intra-site correlations, $p > .10$ otherwise). Clients with one to four limitations appeared to have durable medical equipment costs higher by about $15 per quarter ($.01 < p < .15$, depending on how standard errors are calculated). These effects are very small in magnitude, and due to space limitations we report them here only.

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