Program Characteristics and Enrollees' Outcomes in the Program of All-Inclusive Care for the Elderly (PACE)

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The Program of All-Inclusive Care for the Elderly (PACE) is a unique program providing a full spectrum of health care services, from primary to acute to long-term care for frail elderly individuals certified to require nursing home care. The objective of this article is to identify program characteristics associated with better risk-adjusted health outcomes: mortality, functional status, and self-assessed health. The article examines statistical analyses of information combining DataPACE (individual-level clinical data), a survey of direct care staff about team performance, and interviews with management in twenty-three PACE programs. Several program characteristics were associated with better functional outcomes. Fewer were associated with long-term self-assessed health, and only one with mortality. These findings offer strategies that may lead to better care.

Keywords: PACE, long-term care, quality, risk-adjusted health outcomes.

One of the critical challenges facing the health care system is delivering care to the growing population of elderly, particularly those who are disabled and need long-term care. The spectrum of services available to them is often fragmented and difficult for both patients and physicians to navigate and coordinate (Binstock, Cluff, and Von Mering 1996; Stone 2000). The

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Program of All-Inclusive Care for the Elderly (PACE), a unique model of care, was developed to address the needs of this population (Vladeck 1996).

PACE is a managed care program that covers the spectrum of health care needs, from primary to acute to long-term care (Bodenheimer 1999; Chatterji et al. 2003; Eng et al. 1997; Gross et al. 2004). It is designed for persons fifty-five years or older and whose disability level makes them eligible for nursing home care. The average PACE enrollee is eighty years old, with 7.9 diagnoses and limitations in 3.6 activities of daily living (ADLs) and 7.2 instrumental activities of daily living (IADLs). Seventy-three percent are women. The program receives capitated funding from Medicare and Medicaid, and because it is exempt from the regular benefits rules, PACE providers can tailor their services to the needs of each enrollee. This financial structure allows PACE programs to offer a seamless service environment and to avoid the fragmentation of the usual system of care.

The objective of PACE is to enable its enrollees to live independently in the community. To this end, PACE provides a comprehensive set of services, including a day center, home care, and meals at home. Care is provided by interdisciplinary teams (Temkin-Greener et al. 2004), which include all individuals who interact with enrollees, professionals and paraprofessionals. The teams meet regularly to evaluate each enrollee's needs and design a care plan.

Currently, thirty-five PACE and five pre-PACE programs are serving approximately fifteen thousand persons in twenty-four states, and twenty-one rural programs are being developed as well. A number of studies have suggested that PACE may be an important and effective model of care for an old and frail population (Chatterji et al. 2003; Eng et al. 1997).

In this article we examine the associations between the programs' characteristics and the patients' risk-adjusted health outcomes. This information can inform quality improvement efforts by PACE as well as other models of care for frail, elderly individuals requiring long-term care.

We investigated the associations between PACE program characteristics and risk-adjusted mortality, risk-adjusted decline in functional status at three months after enrollment, risk-adjusted decline in functional status at twelve months after enrollment, and risk-adjusted self-assessed health (SAH) at both three and twelve months after enrollment.

We looked at both short-term (three months) and long-term (twelve months) outcomes because they may be influenced by different care processes. We theorized that the outcomes at three months would reflect the programs' ability to address their enrollees' care issues that were not met before enrollment, when they were in the regular care system, and that long-term outcomes (twelve months) would reflect the programs' ability to maintain enrollees in the best possible health for extended periods.

Methods

Sample and Data Sources

Our study investigated 3,042 newly enrolled persons in twenty-three PACE programs across the United States between January 1, 1997, and June 29, 2001. We combined individual data on health outcomes and risk factors at enrollment with the characteristics of each PACE program. Individual enrollee data were obtained from DataPACE, which includes a consistent set of variables collected by these PACE programs using the same guidelines and definitions (Mukamel, Temkin-Greener, and Clark 1998). This information includes the enrollees' demographics, socioeconomics, health status and disability, medical history, utilization of health services, and date of death. It was obtained from several sources, including self-reports (e.g., self-assessed health), clinical assessments by the programs' nurses (e.g., ability to perform activities of daily living [ADLs], medical conditions), and encounter data (e.g., utilization of day center, hospital and nursing home stays).

Most program-level variables were collected from programs during a site visit, and interviews were conducted with the chief administrative officer, chief financial officer, and medical director. We calculated the variable measuring team performance from a survey of all team members (all staff providing direct patient care), with a 65 percent response rate. We tested and validated the survey instrument (Temkin-Greener et al. 2004) and have described its properties in detail elsewhere (Mukamel et al. 2006; Temkin-Greener et al. 2004).

Variables

Dependent Variables. We estimated five models with five dependent variables. The dependent variable for the mortality outcome was defined as time until death within one year after enrollment. The short- and long-term functional outcomes were defined as a change in functional status at three and twelve months after enrollment, respectively. The change was measured as the number of ADL limitations (ranging from 0 to 7) at three and twelve months after enrollment minus the number of ADL limitations at enrollment, yielding fifteen possible values, ranging from −7 to 7. We also defined self-assessed health outcomes for the short term, at three months of enrollment, and for the long term, at twelve months of enrollment. But because self-assessed health values were missing nonrandomly, as later discussed further, we did not define the outcome variable as the change in self-assessed health levels. Rather, we defined the outcome variable as the level of self-assessed health after enrollment, with values ranging from 1 (excellent) to 4 (poor), omitting observations with missing values after enrollment and adjusting for baseline self-assessed health via indicator variables for each level, treating "missingness" as a distinct level.

Independent Variables. The independent variables were both individual-level risk factors and program-level variables. Table 1 lists all the program variables, their definitions, and the hypotheses regarding their impact on enrollees' health outcomes. Table 2 lists all the variables, including the dependent variables and the individual- and program-level independent variables and their descriptive statistics. Next we provide more details of some of the dependent variables.

The ADL limitations recorded in DataPACE are bathing, dressing, grooming, toileting, transfer, walking, and feeding. The instrumental activities of daily living (IADLs) are meal preparation, shopping, housework, laundry, heavy chores, management of money, management of medications, and transportation. Cognitive status is measured by the number of errors in responding to the Short Portable Mental Status Questionnaire (Pfeiffer 1975), which can range from 0 to 10. The measurement of self-assessed health was based on enrollees' responses to whether they were in excellent, good, fair, or poor health. When modeled as the outcome, we discarded observations missing self-assessed health at three or twelve months, since it is unclear how we should interpret "missingness" relative to the "nonmissing" states. When included as a predictor, however, we treated missing self-assessed health as a distinct level of self-assessed health at enrollment rather than imputing values or discarding these observations. For the mortality analysis, we were able to simplify the functional form of self-assessed health to a dichotomy

TABLE 1
Program Characteristics Included in the Analyses

Program Characteristics	Definition	Hypothesis
I. Financial factors		
1. Percentage of participants' time under full capitation	Percentage of enrollment duration of the PACE enrollee under both Medicare and Medicaid capitation. Typically PACE programs start with Medicaid capitation and fee-for-service Medicare payment. The programs move into full capitation by both payers within a year or two. Individuals who enroll during the early period of the program receive some (or all) of their care while the program is capitated only by Medicaid.	The program's services may change as the financial incentives change when the programs move from Medicare fee-for-service to dual capitation.
2. Profitability of the program	Dichotomous variable indicating whether the program was operating in the red.	Financially strained programs may not be able to provide all services needed by their enrollees, which in turn may lead to worse outcomes.
3. Freestanding site	Dichotomous variable indicating whether or not the PACE site was part of a larger organization (such as an integrated delivery system).	Freestanding sites may have more freedom to follow their own policies but may also have less financial backing and smaller reserves.
4. Community-based site	Dichotomous variable indicating whether the PACE site was part of a community-based network.	A community-based network might provide additional support that may not be available to freestanding sites but may differ from a hospital-based network.

(Continued)

TABLE 1—*Continued*

Program Characteristics	Definition	Hypothesis
5. County Medicare payment level	Sum of part A and part B of the county's adjusted average per capita costs (AAPCC).	A measure of the generosity of the area's Medicare payment system, which may also be related to local practice styles.
II. Personnel		
1. Number of disciplines at care meetings	The number of distinct professional and nonprofessional disciplines present at weekly team meetings.	A larger number of disciplines present at the care-planning meeting may enable the team to address more of the enrollees' diverse needs.
2. Ethnic overlap between enrollees and nonprofessional staff	Index $= -1/2 \sum_{i=ethnicity} P_i^{enrol}(P_i^{enrol} - P_i^{staff})$, where P_i is the percentage of enrollees or staff in a given ethnicity group. This measure ranges between 0 and 0.5, with the higher numbers indicating more overlap.	If aides have the same ethnic background as their patients, they may communicate more effectively and provide better care.
3. Ethnic overlap between enrollees and professional staff	Index $= -1/2 \sum_{i=ethnicity} P_i^{enrol}(P_i^{enrol} - P_i^{staff})$, where P_i is the percentage of enrollees or staff in a given ethnicity group. This measure ranges between 0 and 0.5, with the higher numbers indicating more overlap.	If professional staff have the same ethnic background as their patients, they may communicate more effectively and provide better care.
4. A medical director trained in geriatrics	Dichotomous variable set to 1 if the medical director is a geriatrician, 0 otherwise.	A medical director with specialized training may offer better care.

5. A medical director with only administrative responsibilities	Dichotomous variable set to 1 if the medical director does not provide direct patient care, 0 otherwise.	Medical directors without direct patient care responsibilities may be farther removed from enrollees and less aware of their needs and of effective practices.
6. Medical director's FTE	Variable indicating proportion of time that the medical director has been employed by the PACE program. This variable ranges from 0 to 1.	The more time that medical directors spend in PACE, the better the care they may be able to provide.
7. Administrator with clinical training	Dichotomous variable set to 1 if the administrator has clinical training, 0 otherwise.	Clinically trained administrators may be able to communicate better with staff, leading to better care.
8. Personnel belong to union	Dichotomous variable set to 1 if any of the staff belong to a union, 0 otherwise.	Management may have less control over work organization and practices, and wages may be higher. If revenues are fixed, programs facing higher wages will have fewer resources for services.
III. Practice variables		
1. Total number of FTEs per 100 enrollees	Number of full-time equivalents employed by the program per 100 enrollees, summed over all employee categories.	More staff per enrollee should lead to better care and outcomes.
2. Ratio of professional FTEs to nonprofessional FTEs		A more medically oriented staff may emphasize different outcomes, for example, survival over functional status.

(Continued)

TABLE 1—*Continued*

Program Characteristics	Definition	Hypothesis
3. Specialty concentration	Defined as $\sum_i S_i^2$, where S_i is the FTE's share of specialty i among all FTEs. Ranges are from 0 to 1, with higher numbers indicating greater concentration.	Programs with more diverse specialties may be able to offer more diverse services.
4. Service concentration	Defined as $\sum_i S_i^2$, where S_i is the share of service i among all services provided by the program. Ranges are from 0 to 1, with higher numbers indicating greater concentration.	More diverse services may improve the program's ability to meet enrollees' diverse needs.
5. Separate dementia program	Dichotomous variable is set to 1 if the program has a specialized program for enrollees with dementia, 0 otherwise.	A specialized dementia program may lead to better outcomes for all enrollees.
6. Propensity to hospitalize	A continuous variable measuring the program's risk-adjusted propensity to hospitalize enrollees based on fixed program effects in a regression model predicting individual hospitalization and controlling for individual risk factors (Mukamel et al. 2006).	Hospitalizations are expensive. If revenues are fixed (capitated), programs that rely more on hospital care will have fewer resources available for other services.
7. Team's effectiveness	Scores range from 1 to 5, with higher numbers indicating greater effectiveness. Calculated from PACE team members' response to a survey (Temkin-Greener et al. 2004).	Enrollees cared for by more effective teams should have better health outcomes.

IV. Case mix		
1. Median ADL	Median number of ADL limitations for existing enrollees.	A program with sicker enrollees may have worse outcomes when its revenues are fixed (capitated).
2. Variation in ADLs	Variance in number of ADL limitations for existing enrollees.	A more heterogeneous patient population may be more difficult and costly to care for, possibly leading to worse outcomes.
3. Percentage of participants with middle-loss ADLs	Middle-loss ADLs (Morris, Fries, and Morris 1999) for existing enrollees include dressing, toileting, transferring, and walking.	A program with sicker enrollees may have worse outcomes when revenues are fixed (capitated).
4. Percentage of participants with late-loss ADLs	Late-loss ADLs for existing enrollees (Morris, Fries, and Morris 1999) include eating.	A program with sicker enrollees may have worse outcomes when revenues are fixed (capitated).
5. Number of diagnoses	Average number of diagnoses recorded for all existing enrollees.	A program with sicker enrollees may have worse outcomes when revenues are fixed (capitated).
6. Concentration in diagnoses	Defined as $\sum_i S_i^2$, where S_i is the share of diagnosis i among all diagnoses. Ranges are from 0 to 1, with higher numbers indicating greater concentration.	A more heterogeneous patient population may be more difficult and costly to care for, possibly leading to worse outcomes.
7. Percentage of participants with dementia	Based on existing enrollees.	A program with sicker enrollees may have worse outcomes when revenues are fixed (capitated).

(Continued)

TABLE 1—*Continued*

Program Characteristics	Definition	Hypothesis
8. Percentage of participants living alone		A higher percentage of enrollees living alone may require the program to provide more home care and may increase the burden on its resources.
V. Program size		
1. Enrollees (in 100s)		PACE programs may exhibit scale efficiencies.
2. Number of the site's day centers		PACE programs may exhibit scale efficiencies.
VI. Program age		
1. At time of enrollment	The program's age (from date of Medicare/Medicaid capitation) at the time the enrollee is admitted.	If there is a learning curve, older programs may have better outcomes than newer programs do.
VII. Contract staffing	Dichotomous variables = 1 if any contract aides are employed, 0 otherwise.	Programs may improve outcomes by having more flexibility but may have worse outcomes if contract aides are not familiar with PACE and do not identify with the PACE team.

TABLE 2
Descriptive Statistics for All Variables Included in Initial and Subsequent Analyses

	Mean	Standard Deviation (Reported Only for Nondichotomous Variables)
Outcomes		
Mortality rate within 1 year of enrollment	11.9%	
Percentage of enrollees with ADLs decline within 3 months of enrollment	17.9%	
Percentage of enrollees with no change in ADLs within 3 months of enrollment	61.0%	
Percentage of enrollees with ADLs decline within 12 months of enrollment	25.4%	
Percentage of enrollees with no change in ADLs within 12 months of enrollment	43.3%	
Percentage of enrollees with decline in self-assessed health within 3 months of enrollment[a]	28.6%	
Percentage of enrollees with no change in self-assessed health within 3 months of enrollment[a]	52.5%	
Percentage of enrollees with decline in self-assessed health within 12 months of enrollment[a]	30.9%	
Percentage of enrollees with no change in self-assessed health within 12 months of enrollment[a]	47.8%	
Individual risk factors at enrollment		
Age	77.2	9.6
Percentage females	73.0%	
Percentage whites	42.5%	
Percentage blacks	35.2%	
Percentage Hispanics	17.7%	
Percentage Asians	3.4%	
Number of errors on the MSQ (1–10)	4.3	3.2
Sum of ADLs	3.6	2.5
Percentage with walking ADL	44.2%	
Percentage with grooming ADL	67.9%	
Percentage with toileting ADL	42.6%	
Percentage with bathing ADL	76.2%	
Percentage with feeding ADL	26.6%	
Percentage with transfer ADL	39.3%	

(Continued)

TABLE 2—*Continued*

	Mean	Standard Deviation (Reported Only for Nondichotomous Variables)
Percentage with dressing ADL	63.4%	
Sum of IADLs	7.2	1.4
Percentage with bladder incontinence	56.5%	
Percentage with bowel incontinence	24.9%	
Percentage diagnosed with cancer	9.5%	
Percentage diagnosed with renal failure	8.5%	
Percentage using oxygen daily	5.3%	
Percentage diagnosed with cerebrovascular disease	28.0%	
Number of diagnoses	8.3	1.7
Percentage living alone	30.3%	
Percentage living with relative	38.9%	
Percentage living with spouse	11.7%	
Percentage living with others	12.4%	
Percentage living in a nursing home	6.7%	
Self-assessed health = excellent	6.2%	
Self-assessed health = good	39.3%	
Self-assessed health = fair	30.4%	
Self-assessed health = poor	10.8%	
Self-assessed health = missing	13.2%	
Program's characteristics		
I. Financial factors		
1. Percentage of enrollees' time under full capitation	79.8%	39.2%
2. Programs losing money	17.2%	
3. Freestanding site	32.4%	
4. Community-based site	14.3%	
5. County-level Medicare payment (AAPCC)	407	110
II. Personnel		
1. Number of disciplines at care meetings	9.0	2.2
2. Ethnic overlap between		
enrollees and nonprofessional staff	0.040	0.057
enrollees and professional staff	0.028	0.045
3. Percentage of medical directors with geriatric training	65.0%	

(*Continued*)

TABLE 2—*Continued*

	Mean	Standard Deviation (Reported Only for Nondichotomous Variables)
4. Percentage of medical directors with only administrative responsibilities	23.2%	
5. Medical director's FTE	0.698	0.332
III. Practice variables		
1. Total number of FTEs per 100 enrollees	34.8	22.2
2. Ratio of professional FTEs to nonprofessional FTEs	0.056	0.024
3. Specialty concentration (0 = low, 1 = high)	0.388	0.161
4. Service concentration (0 = low, 1 = high)	0.284	0.048
5. Percentage of programs with a separate dementia program	56%	
6. Propensity to hospitalize	0.178	0.479
7. Team's effectiveness (1 = low, 5 = high)	4.21	0.21
8. Number of personnel belonging to union	14.5%	
IV. Case mix		
1. Median ADL (1–14)	6.21	1.12
2. Variation in ADLs	5.59	1.35
3. Percentage of participants with middle ADLs	66.6%	13.8%
4. Percentage of participants with late ADLs	42.5%	13.1%
5. Average number of diagnoses	8.3	1.7
6. Concentration in diagnoses (0 = low, 1 = high)	0.041	0.007
7. Percentage of participants with dementia	54.7%	12.4%
8. Percentage of participants living alone	25.1%	12.9%
V. Program size		
1. Enrollees (in 100s)	2.83	1.44
VI. Program age		
1. At time of enrollment	5.95	2.86

Notes: Variables that were not significant at the 0.1 level in the initial models are shown in this table, but not in tables 3 and 5.

[a] Calculated excluding those with missing values at enrollment.

between "excellent" and "nonexcellent" (including missing) because the coefficients for all four of the nonexcellent categories were not significantly different from one another.

We constructed several variables measuring program practice styles (e.g., hospitalizations) and the average disability burden for each program (e.g., percentage of enrollees with late ADLs) from the data on service use reported in DataPACE. To avoid confounding, these variables were based on data for existing enrollees, a sample different from the sample used in the analysis.

We calculated team effectiveness from a survey of all team members (average response rate of 65 percent) regarding their perception of their team's functioning. Team members refer to all staff providing direct care, including physicians, nurses, social workers, and paraprofessionals such as aides. They were asked to rate their agreement on a five-point Likert scale with statements like "My team leader does not make her/his expectations clear to team members" and "Written plans and schedules within our team are very effective" (for more details, see Temkin-Greener et al. 2004). The team effectiveness variable was calculated as the average of all the responses by the team members in each program.

Statistical Analyses

A series of multivariate regression models predicting each of the five outcomes were fit. For all models, the unit of analysis was the enrollee. Mortality was modeled using the semiparametric Cox proportional hazards model. All other outcomes were modeled using linear models. Our analyses had four steps, each applied separately to each outcome.

First Set of Analyses. The first set of analyses was designed to quantify the effect of the PACE program on each outcome while controlling for the effect of a parsimonious set of individual risk factors. We fit models containing all individual risk factors hypothesized to influence the outcome (listed in table 2) as well as twenty-two program indicator variables. The final models included all twenty-two program indicator variables, along with those individual risk factors that were significantly associated with the outcomes at the 0.1 level (the significant individual risk factors are shown in table 3). For each model we calculated the percentage of the total explained variation that could be attributed to the program's effects (first row in table 4, part A).

TABLE 3

Coefficients for Individual Risk Factors Included in Outcome Regression Models

	Mortality (Time to Death within 12 Months from Enrollment: Relative Hazard)[a,b]	Change in ADLs within 3 Months from Enrollment[a,c]	Change in ADLs within 12 Months from Enrollment[a,c]	Self-Assessed Health at 3 Months after Enrollment[a,c]	Self-Assessed Health at 12 Months after Enrollment[a,c]
Age	1.024**	1.197**	1.324**		
Female				0.089*	
Non-Hispanic	2.117**				
MSQ	1.053**	0.032**	0.068**	−0.019**	
Sum of ADLs		−0.243**	−0.444**		
Transfer ADL	1.952**				
Dressing ADL	1.511**				
Sum of IADLs		0.104**	0.123**		
Bladder incontinence		0.154*	0.339**		
Bowel incontinence		0.172*	0.455**		
Cancer without chemotherapy	1.558**				
Cancer with chemotherapy	8.584**				
Renal failure	1.982**				
Daily oxygen	2.618**				
Cerebrovascular disease		0.188*			
Number of diseases			0.062*	0.055**	0.040**

(Continued)

TABLE 3—*Continued*

	Mortality (Time to Death within 12 Months from Enrollment: Relative Hazard)[a,b]	Change in ADLs within 3 Months from Enrollment[a,c]	Change in ADLs within 12 Months from Enrollment[a,c]	Self-Assessed Health at 3 Months after Enrollment[a,c]	Self-Assessed Health at 12 Months after Enrollment[a,c]
Living situation relative to living alone:					
With relative			0.229*		
With spouse			0.234*		
With others			0.459**		
In a nursing home			1.449**		
Self-assessed health at baseline relative to excellent:					
Good				0.422**	0.146*
Fair				0.723**	0.462**
Poor				1.126**	0.721**
Missing				0.685**	0.290**
Self-assessed health at baseline not excellent:	1.907**				

Notes: [a] Variables that were listed in table 2 and not included here were not significantly associated with any of the outcomes.

[b] Coefficient values below 1 indicate that the program characteristic is associated with lower mortality.

[c] Negative coefficient values indicate better functional and self-assessed health outcomes.

*$p < 0.05$, **$p < 0.01$.

Second Set of Analyses. The second phase was aimed at identifying groups of specific program characteristics that partly explained the program's overall effect. Retaining all the previously selected individual risk factors, we fit models in which the saturated set of twenty-two program indicator variables were replaced by predefined groups of up to eight specific program characteristics (e.g., five financial variables), noting that these models could be viewed as proper nested submodels of the full model, which included all twenty-two program indicators. We then performed likelihood ratio tests and F-tests to obtain p-values for each group of program characteristics (table 4, part B).

Third Set of Analyses. In the third stage, we identified which specific program characteristics within each group significantly contributed to the group's overall significance, if the group as a whole had been found to be significant in our second set of analyses. Table 5 displays the coefficient estimates and associated p-values for the reduced subset of significant predictors, adjusted for all previously selected individual risk factors as well as the other significant program characteristics within the same group.

Fourth Set of Analyses. In the fourth stage, we simultaneously included all the significant program characteristics from all groups in a single model along with all previously selected individual risk factors. The second row of table 4, part A, gives the percentage of program variation (based on all twenty-two program indicators) that all these selected program characteristics jointly explain.

Limitation of These Analyses. Because we had more than twenty-two program-level variables that were hypothesized to affect outcomes and only twenty-three programs, we were unable to examine the contribution of each program characteristic in the presence of all others. Accordingly, we aggregated program variables into seven groups and reported on the association between them and the outcomes based on models including only variables within the same group. It is important to keep this in mind when interpreting the results. To the degree that variables in different groups are correlated, their estimated effect could be due partly to correlated variables in other groups. Therefore, we emphasize that the results presented in the next section are not meant to imply causal relationships between a program's characteristics and its enrollees' health outcome, but only statistical correlations, which may be confounded by missing variables. They should be viewed as generating hypotheses and not as

TABLE 4
Association between Program Characteristics and Risk-Adjusted Health Outcomes

A. Contribution of Program Characteristics to Explained Variation in Health Outcomes

	Mortality (Time to Death within 12 Months from Enrollment)	Change in ADLs within 3 Months from Enrollment	Change in ADLs within 12 Months from Enrollment	Self-Assessed Health at 3 Months after Enrollment	Self-Assessed Health at 12 Months after Enrollment
Percentage of total explained variation attributable to program effects[a]	18%	18%	16%	9%	23%
Percentage of program effects explained by specific program characteristics included in analyses	24%	87%	90%	15%	49%

(Continued)

TABLE 4-*Continued*

B. Overall p-Values Indicating Statistical Significance of Each Set of 1 through 8 Program Characteristics in Explaining Each Outcome[b]

	Mortality (Time to Death within 12 Months from Enrollment)	Change in ADLs within 3 Months from Enrollment	Change in ADLs within 12 Months from Enrollment	Self-Assessed Health at 3 Months after Enrollment	Self-Assessed Health at 12 Months after Enrollment
Financial factors (5)	0.220	0.004	<0.001	0.209	0.807
Personnel (8)	0.174	0.008	0.006	0.663	0.278
Contract staffing (1)	0.874	0.822	0.182	0.659	0.636
Practice variables (7)	0.002	0.003	<0.001	0.377	0.001
Case mix (8)	0.107	<0.001	<0.001	0.372	0.024
Program size (2)	0.194	0.009	<0.001	0.088	0.122
Program age (1)	0.140	<0.001	<0.001	0.032	0.010

Notes: [a] The total explained variation is composed of variation due to individual enrollee characteristics and program effect. This table examines the program's contribution to the explained variation.

[b] Shaded cells with $p < 0.05$ indicate significant association. Numbers in parentheses indicate the number of characteristics included in each category. For example, five financial variables were included in the analysis of financial factors.

TABLE 5
Program Characteristics Influencing Risk-Adjusted Health Outcomes

	Mortality (Time to Death within 12 Months from Enrollment: Relative Hazard)^{a}	Change in ADLs within 3 Months from Enrollment^{b}	Change in ADLs within 12 Months from Enrollment^{b}	Self-Assessed Health at 3 Months after Enrollment^{b}	Self-Assessed Health at 12 Months after Enrollment^{b}
I. Financial factors	NS^{c}	S	S	NS	NS
1. Percentage of participant time under full capitation		−0.212**	−0.533**		
2. Freestanding site		−0.211**	−0.372**		
II. Personnel	NS	S	S	NS	NS
1. Number of disciplines at care meetings		0.043*	−0.451*		
2. Ethnic overlap between participants and nonprofessional staff		−0.023**	−0.017*		
3. Medical director with geriatric training		−0.275**	−0.319**		
4. Medical director with only administrative responsibilities		0.207**			

5. Percent FTE of medical director			−0.004**		
III. Practice variables	S	S	S	NS	S
1. Total FTEs per 100 enrollees					−0.519**
2. Ratio of professional FTEs to nonprofessional FTEs	0.989**		1.009**		
3. Specialty concentration			0.006*		0.005**
4. Service concentration	0.956**	0.015*	0.029**		1.013**
5. Separate dementia program		0.194**			
6. Propensity to hospitalize		0.210**	0.233*		
7. Team effectiveness			−0.011**		
IV. Case mix	NS	S	*S*	NS	S
1. Median ADL			−0.257**		
2. Variation in ADLs			0.495*		
3. Percentage of participants with middle ADLs		1.746**	4.103**		
4. Percentage of participants with late ADLs			1.231**		

(Continued)

TABLE 5—*Continued*

	Mortality (Time to Death within 12 Months from Enrollment: Relative Hazard)[a]	Change in ADLs within 3 Months from Enrollment[b]	Change in ADLs within 12 Months from Enrollment[b]	Self-Assessed Health at 3 Months after Enrollment[b]	Self-Assessed Health at 12 Months after Enrollment[b]
5. Average number of diagnoses					−0.032**
6. Concentration in diagnoses			0.002*		
7. Percentage of participants with dementia		−0.726	−3.028**		
8. Percentage of participants living alone		0.854*			0.412**
V. Program size	NS	S	S	NS	NS
1. Participants (in 100s)		−0.079**	−0.124**		
VI. Program age	NS	S	S	S	S
1. At time of enrollment		−0.042**	−0.059**	−0.013*	−0.016**

Notes: [a] Coefficient values below 1 indicate that the program characteristic is associated with lower mortality.

[b] Negative coefficient values indicate better functional and self-assessed health outcomes.

[c] S and NS denote significant or not significant association of the whole category at the 0.05 level, as shown in table 4.

*$p < 0.05$, **$p < 0.01$. Variables that were listed in table 2 and not included here were not significantly associated with any of the outcomes.

showing definitive proof of the effect of the program's characteristics on health outcomes.

Because we present a large number of analyses, some correlations may be found to be significant solely by chance. We tested hypotheses regarding thirty-two program characteristics in relation to five outcomes (160 comparisons). At the 5 percent level of significance, we expected eight variables to show a significant association due to chance, but we found forty-one significant correlations, a much larger number of significant relationships.

Results

Because the main focus of this article is on the association between programs' characteristics and their enrollees' health outcomes, we report the associations between individual risk factors and outcomes in table 3, without discussing them.

Organizational Characteristics Associated with Enrollees' Health Outcomes

Table 4 examines the variation in enrollees' health outcomes and characteristics related to the programs that contributed to this variation.

Table 4, part A (first row), shows the percentage of variation in enrollees' outcomes that is explained by the individual programs, after controlling for individual risk factors. It ranges from a low of 9.3 percent for self-assessed health (SAH) at three months to a high of 23.4 percent for SAH at twelve months.

Table 4, part A (second row), shows the percentage of variation due to program effects explained by specific program characteristics. They are discussed in greater detail later. These program characteristics best explain the program-related variation in functional outcomes: they explain 87 percent of the program-related variation at three months and 90 percent at twelve months. The programs' characteristics also explain a substantial percentage (49 percent) of the program-related variation in long-term SAH, but they explain less of the variation in short-term SAH (15 percent) and in mortality (24 percent).

Table 4, part B, shows the significance of the association between each group of program characteristics and each outcome. Both short- and long-term functional status outcomes were significantly associated with all but one characteristic, suggesting that PACE programs may have a strong and pervasive focus on improving these outcomes, as many aspects of the programs are associated with these outcomes. The SAH at twelve months was associated with three of the groups of program characteristics. The SAH at three months and mortality were associated with only one group of program characteristics.

Program Characteristics Associated with Better Functional Outcomes

Most of the program characteristics that we examined were significantly associated with functional outcomes. The following associations were particularly noteworthy (the numbers in parentheses refer to the relevant row in table 5). We offer next a short discussion of each association, speculating about the reasons for the significant associations that we found.

Those persons enrolled in programs whose medical director was a trained geriatrician had better functional outcomes. Furthermore, medical directors who spent at least some time in direct patient care were associated with better short-term functional outcomes, and having the medical director spend more time in PACE (i.e., a higher FTE) was associated with better outcomes at twelve months. These findings suggest that the medical director may play an important role in a program like PACE, even though many of the program's services are not medical (i.e., home and personal care) (II, 3, 4, and 5).

Programs with more effective teams were associated with better functional outcomes at twelve months. This finding is consistent with the PACE philosophy that a cohesive and effective team can offer better care. This finding suggests that for a patient population like PACE's enrollees, who require complex services, the coordination of these services and the development and implementation of care plans by a comprehensive team that cover all disciplines may be important (III, 7).

A staff composed of more aides than professionals and with more ethnic similarity between aides and enrollees was associated with better functional outcomes. The reason might be the fact that aides tend to spend a substantial amount of time with the individuals for whom they care and thus have an opportunity to play an important social and motivational role, such as encouraging enrollees to attempt more tasks on their own. Such an interaction is likely to be more successful when the aides and the patients have a common cultural background, which allows them to better understand each other and may lead to greater empathy (II, 2, and III, 2).

The functional outcomes for those enrolled in programs with lower hospitalization rates were, on average, better. This association might reflect the constraints of the fixed, capitated revenues of PACE programs. A greater use of hospital care, which is the most expensive service that PACE provides, limits the resources available for other services, including those that may be more important to maintaining functional status (III, 6).

Enrollees receiving care during the period when the programs were capitated for both Medicare and Medicaid had better outcomes. The reason might be that when the programs receive capitated payment for both Medicaid and Medicare, they have more flexibility in using financial resources where they are needed, for both acute and long-term care, without having to conform to the rigid rules of the usual system of care. PACE programs typically start with capitated Medicaid payments and fee-for-service Medicare payments. Medicare capitation usually begins only a year or two later. After this initial period, the program continues with capitated payment from both payers (I, 1).

Better outcomes also were associated with larger and older programs. Because in PACE there is a high correlation between program size and age, with the oldest programs also being the largest, we also examined program size and age in the same model. In this analysis only program age was significant. This finding might reflect the programs' learning curve, both for admitting enrollees who are better suited to their services and for learning how to serve their population better (V and VI).

The analysis suggests that a mix of enrollees skewed toward late-loss ADLs, like eating (Morris, Fries, and Morris 1999), and middle-loss ADLs, like dressing, toileting, transferring, and walking (Morris, Fries, and Morris 1999) is associated with worse outcomes. This may result from the constraints of fixed revenue. A larger percentage of individuals requiring ADL help limits the amount of help available for each enrollee, which may result in worse outcomes. This is consistent with the finding that a higher percentage of individuals living alone, and therefore requiring more home care services, also is associated with worse outcomes at three months, indicating that a balanced population may be an advantage (IV, 1 and 8).

Program Characteristics Associated with Better Self-Assessed Health (SAH) Outcomes

Fewer program characteristics were associated with SAH outcomes. Higher staffing levels were associated with better SAH at twelve months. This finding differs from the other outcomes, to which the distribution of professionals versus nonprofessionals, but not the total staffing level, was important. This might reflect the impact of nonspecific care that can be provided by any staff member. Perhaps the greater number of staff allows them to spend more time with enrollees, and the increased interaction time may influence enrollees' well-being, leading to better-perceived health (III, 1).

As with functional outcomes, a staff that is more diverse and provides more diverse services was associated with better long-term SAH outcomes (III, 3 and 4).

A higher percentage of enrollees living alone was associated with worse outcomes at twelve months. This again might be a reflection of the resources per enrollee, which may be less generous in programs that need to provide more services at home (IV, 8).

The programs' maturity was associated with better SAH at both three and twelve months, perhaps reflecting improvement as the programs learned how to better care for their enrollees (VI, 1).

Program Characteristics Associated with Survival

Unlike functional and SAH outcomes, only two factors were associated with mortality. Lower mortality was associated with having more professionals than nonprofessionals, in contrast to the finding for functional status. The mix of staff skewed toward professionals may indicate a more medically oriented program, which is consistent with a stronger emphasis on survival (III, 2).

Lower mortality also was associated with a higher concentration of services, that is, with programs providing the same type of services to most or all enrollees (III, 4).

Program Characteristics Not Associated with Any Outcomes

Several program characteristics were not associated with any of the outcomes we studied. Contracting for personnel, particularly nurses and nurses' aides, is an alternative to employing salaried personnel. PACE programs may use contract staff because they face labor shortages or because this provides more flexible scheduling. Our analysis (table 4) did not identify a relationship between outsourcing labor and enrollees' outcomes.

Although an ethnic overlap between the nonprofessional staff and the enrollees was associated with better functional outcomes, the ethnic overlap between enrollees and the professional staff was not associated with any of the outcomes. This perhaps indicates that the interaction between enrollees and professionals is dominated by professional standards of conduct and structured around "professional" content and thus varies less with cultural similarity. The reason may also be that nonprofessionals seem to be more important to functional outcomes and that professionals are more important to mortality outcomes.

Discussion

PACE programs share many features such as the patient population, the delivery system, and the financial incentives of a managed care model. They also exhibit wide variations in risk-adjusted patient outcomes (Mukamel et al. 2004). In this study we examined these variations in PACE enrollees' health outcomes to understand whether and which specific program features are associated with better outcomes.

The first important observation is that a program's characteristics do seem to matter, as they are associated with the enrollees' outcomes and health status. The second observation is that the significance of these associations varies. Many program characteristics are associated with the prevention of functional decline. Fewer, however, are associated with influencing SAH and mortality. These findings might reflect the PACE programs' mission, which is to allow persons to remain in the community living independently for as long as possible and with the highest possible quality of life. This mission has probably led the PACE programs to focus their resources and services on preserving and improving functional status and has made them less likely to follow a medical model that emphasizes survival above all else. In fact, PACE programs encourage their enrollees to discuss advance directives and to make their preferences known (Temkin-Greener and Mukamel 2002; Temkin-Greener, Gross, and Mukamel 2005). Thus the focus of PACE on independent living could explain our finding of a much less pervasive program effect on mortality.

Another possibility is that the program characteristics we examined are not those that are important to mortality outcomes. For example, we did not have information about advance directives or program policies with respect to end-of-life care, which may be associated with mortality outcomes.

The pervasiveness of program characteristics associated with functional outcomes suggests that PACE programs may be able to choose different routes to improving care. For example, our findings suggest that having a full-time medical director may be associated with better outcomes. Smaller programs with fewer patients may have difficulty justifying employing a full-time medical director. Such programs may, however, require that their medical directors not only perform management duties but also provide direct patient care. Our findings show that this in itself might lead to better functional outcomes and might also be a way of increasing the medical director's time commitment to the program, even in small programs. Alternatively, programs could choose to focus on strengthening the ethnic similarity of enrollees and nonprofessional staff, or if this were difficult, perhaps to educate their staff about their enrollees' culture. Depending on their external and internal environments, different programs are likely to find some strategies easier to implement than others. Our findings offer a menu of alternative actions, all of which may be associated with improvement.

Self-assessed health outcomes were associated with programs' characteristics mostly in the longer run, at twelve months. Furthermore, unlike functional status, many of the variables that we examined did not show a statistical relationship to these outcomes. Perhaps this is a reflection of the more complex nature of self-assessed health, which might be viewed as a measure of the person's gestalt and thus is influenced by many aspects of his or her health, both physical and mental. Accordingly, it might be more difficult for programs to influence self-assessed health. The characteristic that seems to have the greatest effect on self-assessed health is the total number of staff per one hundred enrollees. Unlike other quality improvement initiatives, hiring more staff is usually a difficult way to improve care because it requires a greater long-term commitment of resources.

Another interesting finding is that the programs' maturity was associated with better functional and self-assessed health outcomes. This suggests that programs might have to learn what type of enrollee they can best care for and to adjust their admission decisions in order to obtain enrollees who are better matched to their program's strengths. Alternatively, programs might have to learn how to care better for those whom they admit, thus leading to better outcomes. This raises the question of whether the lessons that programs learn as they mature can be transferred to newer programs, thereby shortening or even eliminating their learning curve.

The one consistent finding across all the outcomes we examined was the lack of significant association with contract labor. The reason may be that contract labor may have both positive and negative effects on outcomes, thereby canceling each other out. Programs may employ contract personnel, most likely nurses and aides, if they have difficulty hiring permanent staff or if this is a more financially advantageous approach. The use of contract staff may offer programs more flexibility and allow them to avoid short-staffing situations, which, in turn, may be associated with better outcomes. In contrast, contract staff is less likely to be part of the "PACE culture," may not be as effective team members, and may be more subject to turnover. Turnover may result in less continuity of care for enrollees and more difficulties in creating and maintaining personal relationships.

Policy Implications for Programs Serving the Frail Elderly

Although PACE is a unique program in that it provides comprehensive services addressing all the needs of a frail and older population, the lessons learned from the PACE experience might offer useful insights to other programs serving similar populations.

The integration of acute and long-term care has long been envisioned as one of the key steps in improving care for those with comorbid chronic conditions and complex care needs. PACE was built as such a model, integrating Medicare's acute and Medicaid's long-term care benefits and funding streams, so that the programs could tailor their services to each enrollee's specific needs. The expectation has been that such a model of care would minimize its reliance on institutional care, thereby preventing or delaying the enrollee's placement in a nursing home, and would work to optimize the functional independence of frail, community-based elderly enrollees.

To foster such best practices, the PACE model of care relies on several unique features. For example, PACE uses a staff model of medical care in which physicians are employed by each program to provide primary care. PACE physicians share the program's values and philosophy of care (Eng et al. 1997), and they spend a considerable amount of time in PACE-related patient activities, like being a member of an interdisciplinary team. The PACE model of care also relies on interdisciplinary teamwork for both planning and delivering care (Temkin-Greener et al. 2004). Most care is provided in the day centers, which the enrollees attend several days per week for therapy, personal and medical services, meals, and supportive care.

Our findings show that many of these PACE-specific features are associated with better risk-adjusted patient outcomes. For example, programs with better-performing teams are associated with better functional outcomes. The association we found between the time that the programs' medical directors devote to medical practice and better functional outcomes also appears to support the rationale for the staff model of care for this population. Similarly, the availability of diverse services, most of which are provided at the day centers, seems to be associated with better risk-adjusted outcomes. An evaluation of PACE, sponsored by the Centers for Medicare and Medicaid Services (CMS) has shown substantial reductions in the use of institutional care for PACE enrollees, compared with that for a control group, and has attributed this to a broad scope of care coordination among diverse disciplines at the day center (Chatterji et al. 2003).

Although these PACE characteristics may indeed be examples of program features well suited to best practices for the very frail elderly, these same features have been criticized as being responsible for PACE's slower than expected growth (Eleazer and Fretwell 1999; Gross et al. 2004; Kane 1999). A number of newer programs, which have been modeled on PACE, began to experiment with less restrictive models that do not require staff physicians, center-based care, or formal interdisciplinary teamwork (Muskie School of Public Service 1997). The Wisconsin Partnership Program (WPP), the Minnesota Senior Health Options (MSHO), the Massachusetts Senior Care Options (MSCO), and similar initiatives in other states represent efforts to liberalize the PACE model so as to appeal to a broader market. A recent study comparing PACE and WPP found PACE to be significantly more effective in controlling hospital and emergency room utilization for its enrollees (Kane et al. 2006). Efforts to relax the PACE model's programmatic features may exact a price in terms of worse process of care measures and poorer outcomes.

More recently, as a result of the Medicare Modernization Act of 2003, Congress created a new type of Medicare Advantage coordinated care plan focused on individuals with special needs (SNP) serving the institutionalized, the dually eligible, and/or those with severe or disabling chronic conditions. By 2006, there were 276 SNPs serving more than 600,000 beneficiaries, most of them dually eligible (see http://www.cms.hhs.gov/SpecialNeedsPlans/Downloads/06SNP_Enrollment_by_Type11-9-06.pdf; accessed June 14, 2007). Unlike PACE, SNPs are not required to implement a specific model of care delivery. According to a recent study underwritten by the Medicare Payment Advisory Commission (Mathematica Policy Research, Inc. 2006), most SNPs have not made major changes to their organization or infrastructure, such as adding new departments, staff, or data systems. Even though SNPs are committed to better coordination of Medicare and Medicaid services, many do not have SNP-specific care coordination and management programs. It still is too early to derive any lessons from the SNP experience. But lessons from PACE suggest that fundamental changes in practice patterns are key to changing utilization and promoting good patient outcomes for the frail elderly. The PACE model for integrating care is expensive to develop and to operate and so may be difficult to promote broadly. But the trade-off that comes with less restrictive models may come at a price of poorer outcomes.

Although our analyses are limited by the small number of PACE programs, the findings did generate hypotheses regarding quality improvement. Programs that undertake such activities should be aware that their own culture and environment may be different and that therefore our findings may not be fully generalizable. Efforts to improve care should be tailored to each program and monitored and adjusted as they progress.

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