

A Randomized Controlled Study of a Home Health Care Team

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Abstract: This report describes the findings of a randomized study of a new team approach to home care for homebound chronically or terminally ill elderly. The team includes a physician, nurse practitioner, and social worker delivering primary health care in the patient's home, including physician house calls. Weekly team conferences assure coordination of patient care. The team is available for emergency consultation through a 24-hour telephone service. The team physician attends to the patient during necessary hospitalizations. This approach was evaluated in a randomized experimental design study measuring its impact on health care utilization, functional changes in patients, and patient and caretaker

satisfaction.

The team patients had fewer hospitalizations, nursing home admissions, and outpatient visits than the controls. They were more often able to die at home, if this was their wish. As expected, they used more in-home services, measured in weighted cost figures; their overall cost was lower than their controls, but the difference was not statistically significant. Their functional abilities did not change differently from the controls, but they, and especially their informal caretakers in the home, expressed significantly higher satisfaction with the care received. (*Am J Public Health* 1985; 75:134-141.)

Introduction

Because of the well-recognized inadequacy in provision of physician services in the home, the care of seriously and chronically ill elderly and terminal patients is frequently relegated to hospital and long-term care facilities, or to traditional home nursing services supplemented by episodic emergency room visits and crisis hospitalizations. In an effort to provide necessary medical services to allow homebound patients who wished to remain at home to do so, a home health care team was established in Rochester, New York. It consisted of a physician (internist), nurse practitioner, and medical social worker all of whom are experienced in geriatric care. Available, on call, on a 24-hour, seven day per week basis, they provide primary care for a case-load of approximately 50 homebound patients, all of whom have complex and debilitating chronic conditions or are terminally ill.^{1,2}

In this report, the results of a randomized controlled evaluative research study of the team's effectiveness and acceptability are summarized.

The dearth of published research, adequately designed to assess the outcome of complex health service interventions in respect to efficacy, effectiveness, and efficiency, has been repeatedly lamented both before and after the design of this study. This is nowhere more evident than in the area of long-term care for the elderly in general and in home care in particular. The need for rigorously designed controlled studies, based on the technology of clinical trials of specific therapies, has been urged with increasing frequency.³⁻⁶ One survey of about 1,000 studies of health services for the elderly published between 1967 and 1978 found only seven which met criteria developed by the authors as to adequate design and execution, and all of these were randomized controlled intervention studies.⁷ That this methodology is adaptable to studies of such multidimensional care systems as home care has been adequately demonstrated,⁸⁻¹⁵ as has the fact that there are significant design and execution

problems which exceed those of more straightforward clinical trials of drugs or other single medical interventions.^{11,13,14,16} In spite of these problems, including those of client selection and recruitment, logistics of follow-up, drop-outs, and consent and cooperation particularly of controls, we concluded that only the randomized design offered any degree of assurance in dealing with selection bias and multiple confounding variables.

The "outcomes" used to compare the results of care provided experimental and control groups had to be sensitive to the incremental effect of adding a physician-led team to existing community services, and to reflect realistically what could be expected to occur in this group of severely disabled, chronically or terminally ill, and largely elderly patients, none of whom had a good prognosis for much improvement in health or even for long survival. These outcomes included the following, stated as hypotheses in terms of the most desirable outcomes expected for the team patients as compared with the controls:

1) Health Care System Utilization

- less hospitalization and other institutionalization;
- less utilization of emergency room and other acute ambulatory care; and
- overall lower cost-weighted utilization of care, in spite of increased care in the home.

2) Patient Health Status

- less rapid deterioration in physical and psychosocial health status; and
- better "morale" (i.e., sense of well-being and life satisfaction).

3) Satisfaction with Health Care

- greater patient satisfaction with care provided; and
- greater caretaker (family or friend) satisfaction with care provided to the team patients.

Materials

Description of the Home Health Care Team

The "Home Health Care Team" was started in 1977 as an outreach program of the University of Rochester Medical Center's Ambulatory Care Unit to provide health care to home-bound, chronically or terminally ill, or disabled patients for whom transportation to the clinic had become too costly or cumbersome. The nurse was a Master's Degree medical nurse practitioner who performed many of the

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physical assessments, routine and emergency, in the community. She was responsible for the nursing plan and supported the medical care in close cooperation with the physician. All patients at intake, and as needed, received home visits and evaluations by the physician who also acted as the patient's attending physician during any hospitalizations. The social worker helped to deal with the many social, financial, and emotional problems, freeing the physician and the nurse practitioner to devote their efforts mostly to the medical and nursing aspects of care. Patients at intake received one home visit by each team member to perform the initial assessments. An interdisciplinary care plan was then established which designated one team member as the primary care provider with consultative visits by the others as needed.

Informal Care Providers and Friends—The Home Health Care Team encouraged informal care by family and friends by providing them with the necessary physical and psychological support and education to take on or continue home care. Initially every patient-applicant to the program was required to have a care provider (a family member or friend) within the same household. Soon after the start of the program, however, this requirement was relaxed to include homebound patients living alone with a helper close by and available, but not necessarily in the same household.

A 24-hour telephone service offered by the team and backed up by the physician was a vital part of this support system. All patients were advised to restrict telephone calls and service requests to office hours if at all possible, but were given the nurse practitioner's and the physician's home telephone numbers to be used for emergency consultations. In addition, they were given the access number to the physician's pager which acted as the ultimate resource for the patients. An off-hour telephone call study describes numbers, content of, and responses to these phone calls,¹ which were surprisingly low in number, especially during the night hours. More than 70 per cent of the calls could be handled by the phone call alone without need for immediate follow-up.

Financing of the Clinical Program—Insofar as possible, the clinical services of the Home Health Care Team were provided on a fee-for-service basis, the payment mechanism most patients had used previously. The same mechanism was used by the control patients. The principle of requesting customary payment for the Home Health Care Team services was not only indispensable to its operation, but also forced the care providers to plan the clinical services within a realistic framework of cost consciousness, in order to be acceptable to the patients.

The present third party reimbursement rates with patient co-payments, where possible, did not adequately cover the cost for all services. The social worker's involvement in the home, for example, is at present rarely reimbursed and the physician's time for home visits and overall involvement in the team only inadequately so.

The grant allowed us to budget for some overhead costs, which are usually assigned to the physician, and provided for the salary of the social worker. Subsequent to the experimental period, local foundations have supplemented the cost for non-reimbursable services.

Methods

Referral and Eligibility

Patients were referred from a variety of sources following a publicity campaign informing health professionals and

the community at large of the program. A sample size of 200 to 250 was desired over the period of study based on ability of the team to care for half that number (estimated from previous team experience of turnover, visit frequency, and case load). All referrals that seemed potentially appropriate were screened in person by the team social worker who decided eligibility based on the patient being home-bound, wishing to remain at home, having significant illness (not primarily psychiatric) requiring medical care, not having a physician who would make home visits, living within the county, having a family member or friend ("caretaker") who could assist in their care at home, and being willing to participate in a research study. Following informed consent to participate in the study, patients were stratified into terminal (largely cancer patients who were receiving palliative care only and had prognoses for survival of three months or less) and non-terminal groups, ability to respond to questionnaires, and being a member of a couple, both members of which wished to participate in the study; within each stratum they were randomized into experimental (team) and control groups. The patients were informed of the result of randomization immediately following the initial interview, in order to keep the base-line information as free as possible of bias from knowledge of the result either by the patient or interviewer.

Interviews

Interviews were conducted by interviewers trained by the field work coordinator with practice interviews, role playing, and biweekly feedback meetings. Ten of the 14 interviewers had had previous survey experience.

Interview and data-collection instruments and scoring methods included:

- **Initial Base-line Questionnaire**, based on instruments previously used at this medical center and tested thoroughly in the National Health Survey.^{17,18}

- **Health Service Utilization Diary**, designed for this study, was a complete record of the patients' use of health services for up to six months following study entry, kept on a daily basis by the patient or the family caretaker.* Utilization data from the diaries were analyzed both as units (e.g., days of inpatient stay, visits to clinics, home care nurse visits, hours of aide care, etc.) and weighted to estimate total utilization costs using current average charges for services in the community at the main provider agencies.** Since the objective of the utilization analysis was to estimate a steady state of service provision for a changing population of patients, the data were adjusted for the length of time each subject was at risk for utilizing health services during the study period, i.e., for six months, or until death or drop-out if at less than six months. For each patient, the cost-weighted utilization data were converted into a "day-cost" figure, averaged over total time in the study, for each type of

*All home or ambulatory care visits, hours of home health aide care, days of hospital or nursing home care, and related services were recorded. The diaries were monitored and collected bi-weekly by the interviewers. The diary recording of hospitalizations was validated, and corrected where necessary, by comparison with billing forms, and the diaries were also cross-checked against a sample of Visiting Nurse Service records.

**The actual mean of hospital daily charges for the patients hospitalized during the study was obtained from their billing forms and was used as the hospital per diem weight. The physician home visit weighting factor was developed from estimates of total costs of a visit, including overhead and travel time, derived from a time-motion study of the home care team reported elsewhere.²

service, and aggregated for team and control groups into average "day-costs" for each service.

- *The Sickness Impact Profile (SIP)* was used to assess the patient's physical and psychosocial health status.¹⁹ Interviewer-administered SIPs were obtained, where possible, from patients at study entry and at three and six months after entry. Self-administered surrogate SIPs were obtained from their caretakers at the same time. Scores were computed for the physical and psychosocial dimensions of the SIP, and for the total SIP. A comparison of patient and surrogate SIPs indicated a good level of agreement between the total and dimension scores.²⁰ Therefore, if any patient scores were missing, surrogate scores were substituted, when available, for the complete set of SIP scores for that patient.

- *Philadelphia Geriatric Center (PGC) Morale Scale* was used on patients who were mentally capable on initial, three, and six-month interviews to assess "morale" or life satisfaction.²¹

- *Patient and Caretaker Satisfaction Questionnaires* were administered separately to both patients and their caretakers, whenever possible, at study entry and at three- and six-months follow-up. The questionnaire contained 26 items dealing with satisfaction with the medical care received by the patient, each item having a five-point Likert-type response scale. These items were grouped into seven satisfaction scales: general satisfaction, availability of care, continuity of care, physician availability, physician competence, personal qualities of physician, and communication with physician. Scale scores were summed to give a total satisfaction score (ranging from 26 to 130, a higher score indicating greater satisfaction) which was used in testing hypotheses in this study. Details of the scales, and of the procedure used to develop and test them, are reported elsewhere.²²

- *Death*—Date and place of death were ascertained for all patients who died during the six-month follow-up period, and who had not been lost to follow-up.

Results

Intake and Attrition

A total of 243 patients was referred to and seriously considered for the study during the 27 months of intake (i.e., patient and/or caretaker were interviewed and screened by the social worker). Of these, 210 were deemed eligible for the study, and 167 (79.5 per cent) of these signed the consent form and entered into the study. Randomization yielded 85 team and 82 control patients. Of these, 158 underwent the initial interview. The other nine either changed their minds and dropped out (5), moved away (1), or died (3) before the initial interview was performed and before they knew the results of randomization.

After the initial interview, an additional 15 subjects were lost to follow-up. This resulted in a total attrition (drop-out or move) rate of 12.6 per cent (21/167) from time of signing the consent, and 9.5 per cent from time of initial interview (15/158). The total attrition rate was higher for controls (19.5 per cent) than for team patients (5.9 per cent) although three of the controls were lost because they moved away and part of the difference was explained by higher control attritions prior to results of randomization being known. Thus, deliberate "dropping-out" among controls was 15.9 per cent (13/82) and among team patients 4.6 per cent (4/85), for a total of 10.2 per cent (17/167) for all subjects entered into the study.

Of the original 167 patients randomized, 69.4 per cent (59/85) of team and 64.6 per cent (53/82) of control patients at three months, 60.0 per cent (51/85) of team and 57.3 per cent (47/82) of control patients at six months were still alive and under follow-up.

Characteristics of Team and Control Patients at Intake

Selected characteristics of the 158 patients who completed the initial interview, based on data from these interviews, are presented in Table 1. Overall, the randomization procedure produced two reasonably comparable groups. The only demographic variable which showed a statistically significant difference was sex, with 61 per cent females in the team group compared with 76 per cent in the controls; this is taken into account in the analysis by adjustment for sex. Previous health care utilization and diagnoses in the two groups were quite similar.

Study Outcomes

Utilization—Table 2 shows the average utilization rates per patient per month, adjusted for days "at risk" in the study, expressed in the relevant units for each service. Days spent in hospital and nursing home were less for team than for control patients, as were all the other out-of-home services except emergency room visits, while utilization of services in the home was higher for team patients. Absolute number of hospital and nursing home admissions during the first six months in the study and average lengths of stay were also less for team than control patients (Table 3), as were ambulatory out-of-home services, unadjusted for days at risk.

Table 4 displays "day cost" figures for all days "at risk" in the first six months for team and control patients. The average cost per day for all services recorded for team patients was \$47.83, or 8.6 per cent less than the \$52.33 for control patients, using the standardized weights. For team patients, out-of-home services were 61.1 per cent of what they were for controls, while in-home services were 60.9 per cent more. The most important factor in explaining the overall difference is the reduced hospitalization among the team patients, at 62.0 per cent of the day cost of the controls. It should be emphasized here that these "cost" figures must be interpreted carefully, as they are intended only as a reflection of relative intensity of care and cannot be extrapolated directly into some actual dollar saving estimate, although they are based on actual dollar costs in this community.

The results of the statistical analysis for significance of the adjusted differences in day-costs between the team and control groups using the multiple regression approach to analysis of variance,²³ are presented in Table 5.*** These values are adjusted for age, sex, and prognosis, and are therefore slightly different from the values of the differences which would be calculated from the actual unadjusted day-costs in Table 4. The only differences which proved to be statistically significant were in the in-home day-costs during the first 90 days where team patients averaged higher costs ($p < 0.01$). Total and out-of-home day-costs showed what appears to be a strong numerical trend toward being lower

***Before analyzing the day-costs, a principal components analysis was done on the day-cost data base to determine whether there were any strong associations among the components of the day-cost. This analysis suggested that in both team and control groups in-home and out-of-home day-costs were virtually uncorrelated. Therefore, it was decided as a primary analysis to analyze these two components separately.

TABLE 1—Characteristics of Study Groups at Intake into Study

	Team (N = 82)	Control (N = 76)
<i>Patient Characteristics</i>		
Age (years)		
Mean	73.8	77.4
Median	75.5	78.5
% Female*	61.0	76.3
% White	73.2	85.5
% Married	42.7	32.9
% Living Alone	23.2	18.4
Mean Years of Education	9.6	8.9
Third Party Eligibility/Coverage (primary)		
% Medicaid	31.7	26.3
% Medicare	73.2	76.3
% Blue Cross/Shield (alone or with Medicare)	34.2	34.2
Prognosis		
% Terminal	22.0	18.4
% Non-Terminal	78.0	81.6
Primary Diagnosis		
% Cancer	20.7	17.1
% Stroke	12.2	17.1
% Arthritis/Rheumatism	8.5	11.8
% Other (all below 10%)*	58.6	54.0
<i>Previous Health Services Utilization</i>		
Physician contacts in preceding 2 weeks (not including in ED or Hospital)		
% One or more	24.4	19.7
Home nursing visits in preceding 2 weeks		
% One or more	42.7	46.1
Acute hospitalizations in preceding year		
Mean days	17.5	18.1
% One or more admissions	51.2	54.0
Long-term care in preceding year		
Mean days	3.3	9.8
% one or more admissions	9.8	4.0

*The only one significant by chi-squared test at the 5% level ($p = 0.038$).

**e.g., Dementia, ASHD, Chronic Lung Disease, Multiple Sclerosis.

for team patients, especially during the first 90 days. Note that variance of out-of-home values was proportionately much higher than for in-home, as measured by the standard error.

Statistical tests on the unadjusted means of team and control day-costs are presented in Table 6. Conventional unequal variance t-tests and the non-parametric Mann-Whitney test confirmed the t-tests done in the adjusted multiple regression analysis, and showed comparable levels of significance, except that the out-of-home day-cost difference became significantly lower for the team, at less than the 0.05 level, using the non-parametric test, for both the first and the second three-month periods. Of interest is the fact that mean day-costs were much less during the second three months than during the first three for both team and control patients. Part of the explanation for this, to be investigated further below, was the death during the first three months of many of the seriously and terminally ill patients.

Table 6 also shows the results of F-tests on the difference in variances of the unadjusted day-cost means. The variance in the control group out-of-home costs was significantly greater than the team's at <0.01 level, both during the first and the second three-month periods, and led to a total day-cost variance significantly greater than the controls at <0.05 level.

Because of the initial expectation that patterns of care would be different and utilization and costs higher for terminal patients than for non-terminal ones, a secondary analysis was undertaken to compare the unadjusted day-costs of the team and control patients who died within the

first three months as opposed to those who did not. Table 7 demonstrates that those patients dying within three months had much higher out-of-home day costs than did those

TABLE 2—Mean Utilization Rates per Patient per Month for Days at Risk in First Six Months in Study

Medical Care Utilization	Team (N = 81)* (per month)	Control (N = 75)* (per month)
<i>Out-of-Home</i>		
Hospital Days	2.04	3.29
Nursing Home Days	0.55	1.32
MD Office Visits	0.05	0.17
Clinic Visits	0.11	0.53
Emergency Room Visits	0.26	0.05
Ambulance Rides	0.12	0.17
Chairmobile Rides	0.05	0.11
<i>In-Home</i>		
MD Home Visits	1.10	0.14
Nurse Home Visits	2.29	2.13
Social Worker Visits	0.16	0.04
RN Hours**	8.40	6.32
LPN Hours**	5.49	0.83
Home Health Aide Hours	65.66	42.64
Homemaker Hours	4.20	3.80
Home Lab Tech Visits	0.18	0.02
Meals on Wheels Visits	0.50	0.35

*This and succeeding tables on utilization data indicate one patient less in each of the groups than were stated previously to have completed the initial interview since two died immediately afterwards, before there were any days "at risk."

**The RN and LPN hourly-paid care was usually for terminal hospice patients who required constant care and was distinct from the briefer episodic nurse practitioner or community health nurse visits which were paid by visit.

TABLE 3—Hospital and Nursing Home Admissions during the First Six Months in Study

	Team (N = 81)	Control (N = 75)
<i>Hospital Admissions</i>		
Admissions per patient*	0.35	0.41
Mean length of stay	12.6 days	14.3 days
Median length of stay	8.5 days	11 days
Range of length of stay	1–59 days	1–37 days
<i>Nursing Home Admissions</i>		
Admissions per patient**	0.06	0.11
Mean length of stay	51.8 days	61.9 days
Median length of stay	36 days	56 days
Range of length of stay	8–159 days	1–129 days

*Team: 28 admissions of 24 patients (4 patients had 2 admissions each)

Control: 31 admissions of 25 patients (6 patients had 2 admissions each)

**Team: 5 admissions of 5 patients

Control: 8 admissions of 7 patients (1 patient had 2 admissions)

surviving, and that team out-of-home and total day-costs were substantially lower than those of controls. However, for those alive at three months there was virtually no difference between team and controls in mean day-cost. Thus, the team effect in reducing overall utilization (hospitalization having the major effect) appears to have been entirely in the group of patients who died. Similar day-cost differences were observed between those stratified initially as terminal versus non-terminal over the entire six-month period, even though not all "terminal" patients died and some "non-terminal" ones did.

Thus, hypothesis one, on health care system utilization, is supported, at least in the trends, except for emergency room visits.

Sickness Impact Profile—The multiple regression approach to analysis of variance, in which treatment effects were controlled for age, sex, and initial SIP scores, revealed no differences between team and control SIP scores either at three months (55 team and 49 control cases) or at six months (39 team and 34 controls). The adjusted score difference

(team minus control) at six months for patient-reported SIPs was 0.3 and for caretaker-reported SIPs was minus 0.9, very small differences since the mean unadjusted scores at the various time intervals ranged between 28 and 39.

Patient Morale—At the initial interview, 61 team and 50 control patients were able to respond to the PGC Morale Scale. By six months, 32 team and 23 control patients were still in the study and able to respond; 31 team and 22 control patients answered both initially and at six months. There were no differences, or even trends, between team and control group mean scores at any point, or over time, in total score or in the sub-scores of the scale. For example, for patients responding both initially and at six months, mean initial score for team patients was 25.6 and for controls 26.8, and at six months were 25.9 and 25.8, respectively. Thus, hypothesis two, on patient health status, is not supported.

Patient and Caretaker Satisfaction—Unadjusted patient satisfaction scores were comparable in team and control groups at intake, and showed a trend toward greater satisfaction among team patients at three months and six months (Table 8). Team caretakers, however, showed markedly greater satisfaction than control caretakers at three months and at six months, differences which were highly significant. In all groups studied, including control group patients and caretakers, there was an increase in satisfaction scores over time, which was most marked during the first three months of follow-up. This effect was also seen when paired data only were used.

Results from the multiple regression approach to analysis of variance in which treatment effect was adjusted for initial satisfaction score, age, and sex indicate significantly higher mean scores for team compared with control caretakers both at three months and at six months, and for patients at six months only.

In view of the significant treatment effects on caretaker and, to a lesser degree, patient satisfaction, a more detailed examination of satisfaction sub-scales was undertaken. Treatment effect on caretaker satisfaction was noted in all sub-scales, but to a greater degree in satisfaction with

TABLE 4—Mean Weighted Utilization ("Day Costs") for Days at Risk in First Six Months in Study

Medical Care Utilization	Team (N = 81)	Control (N = 75)	Team/Control
<i>Out-of-Home</i>			
Hospital Days	\$20.40	\$32.88	62.0
Nursing Home Days	1.00	2.42	41.3
MD Office Visits	.05	.18	76.3
Clinic Visits	.12	.57	
Emergency Room Visits	.51	.10	
Ambulance Rides	.16	.23	
Chairmobile Rides	.03	.06	
Subtotal	\$22.27	\$36.44	61.1
<i>In-Home</i>			
MD Home Visits	\$ 2.56	\$.32	160.9
Nurse Home Visits	3.20	2.98	
Social Worker Visits	.22	.05	
RN Hours	2.10	1.58	
LPN Hours	1.19	.18	
Home Health Aide Hours	15.32	9.95	
Homemaker Hours	.84	.76	
Home Lab Tech Visits	.03	.003	
Meals on Wheels Visits	.10	.07	
Subtotal	\$25.56	\$15.89	
Total	\$47.83	\$52.33	91.4

TABLE 5—Significance Tests on Mean Day-Cost Differences by Follow-up Period Adjusted for Age, Sex, and Prognosis between Team and Control Groups

	0 to 180 Days	0 to 90 Days	91 to 180 Days
Total Day-Costs			
Difference (\pm S.E.)*	-\$6.06 (\pm 9.64)	-\$3.67 (\pm 10.08)	-\$0.15 (\pm 3.33)
p-value**	ns	ns	ns
Out-of-Home Day-Costs			
Difference (\pm S.E.)*	-16.66 (\pm 9.62)	-14.42 (\pm 10.02)	-3.42 (\pm 2.67)
p-value**	ns	ns	ns
In-Home Day-Costs			
Difference (\pm S.E.)*	+10.61 (\pm 3.96)	+10.74 (\pm 3.96)	+3.27 (\pm 2.26)
p-value**	0.008	0.008	ns

*Team vs control day-cost, \pm standard error of the estimate; minus (-) value indicates adjusted team day-cost is lower than control.

**p-value from t-test on the difference between the adjusted day-cost means, using multiple regression approach to analysis of variance.

ns = not statistically significant ($p > 0.05$)

physician availability, competence, and personal qualities. Patient sub-scale scores showed relatively little treatment effect, with the exception of the sub-scales dealing with availability of care in general, with availability of the physician, and with personal qualities of the physician.

Hypothesis three is therefore supported, particularly in respect to caretaker satisfaction.

Mortality, Survivorship, and Place of Death—Exact mortality rates during the six months of the study cannot be calculated because of the subjects who were lost to follow-up, especially among the controls. Eliminating those on whom survivorship was unknown at six months after intake, the total known six-month mortality rate for the team patients was 36 per cent (29/80) and for the controls 29 per cent (19/66), including those who died before the initial interview.

The survival profiles after adjustment for prognosis were tested for significance, assuming exponential survival, by the method of Aitken and Clayton.²⁴ The log-likelihood ratio chi-square statistic for the comparison of team and

control survivorship had a value of 1.4 with one degree of freedom, indicating no difference ($p > 0.10$). Seventy-two per cent of all terminal stratum patients were dead by three months, while only 11 per cent of the non-terminal were, indicating the prognosis was quite accurate.

Place of death was determined for 43 of the 45 deaths: 20 (71 per cent) of the team patients died at home compared with 7 (47 per cent) of control group patients. Place of death could not be determined for two control group patients.

Discussion

The trend toward reduced hospital utilization seen among the team patients appears to be explained almost entirely by the lower costs of care of team cases who died during the study period and is related to the considerably higher proportion of team than control patients dying at home. However, this conclusion should not tempt one to recommend the team care approach only for patients designated as "terminal". The entire study population, by admis-

TABLE 6—Significance Tests on Unadjusted Mean Day-Costs by Follow-up Period

	0 to 180 Days	0 to 90 Days	91 to 180 Days
Number			
Team	81	81	58
Control	75	75	53
Total Day-Costs*			
Team (\pm 1 SD.)	\$47.57 (\pm 56.03)	\$47.78 (\pm 59.02)	\$14.34 (\pm 13.84)
Control (\pm 1 SD.)	42.24 (\pm 72.85)	\$50.30 (\pm 74.64)	15.33 (\pm 19.73)
t-Test p-value	ns	ns	ns
Mann-Whitney p-value	ns	ns	ns
F-test p-value	0.022	0.040	0.010
Out-of-Home Day-Costs*			
Team (\pm 1 SD.)	22.24 (\pm 50.20)	22.86 (\pm 53.79)	3.83 (\pm 9.38)
Control (\pm 1 SD.)	36.37 (\pm 72.61)	34.87 (\pm 74.13)	7.74 (\pm 16.95)
t-Test p-value	ns	ns	ns
Mann-Whitney p-value	0.045	0.033	0.016
F-Test p-value	0.001	0.005	0.0001
In-Home Day-Costs*			
Team (\pm 1 SD.)	25.34 (\pm 27.27)	24.92 (\pm 26.79)	10.51 (\pm 12.04)
Control (\pm 1 SD.)	15.87 (\pm 22.58)	15.43 (\pm 22.92)	7.59 (\pm 11.26)
t-Test p-value	0.019	0.018	ns
Mann-Whitney p-value	0.003	0.002	ns
F-test p-value	ns	ns	ns

*These costs are all very slightly less than those in Table 5, since they do not contain the social worker day-cost estimate (re-adjusted from the utilization diaries due to her activity in the non-clinical research part of the study) and the chairmobile costs (added in later for Table 5).

ns = not statistically significant ($p > 0.05$)

TABLE 7—Unadjusted Mean Day-Cost by Survival at Three Months

	n	Out-of-Home Day-Cost	In-Home Day-Cost	Total Day-Cost
Dead by 3 Months				
Team	(21)	\$ 57.67	\$34.91	\$ 92.58
Control	(16)	110.79	13.87	124.66
Total	(37)	80.64	25.81	106.45
Alive at 3 Months				
Team	(60)	\$ 9.83	\$21.99	\$31.82
Control	(59)	16.19	16.41	32.61
Total	(119)	12.99	19.22	32.21

sion criteria, was a group of severely disabled homebound patients with multiple medical problems, the type of patient most at risk of developing a severe health crisis, often needing institutionalization, and at risk of dying. When death was expected, the impact of the team in providing routine care and 24-hour availability in the home may have affected the willingness of patients and family caregivers to choose home care even in crisis. Thus, the study answers the General Accounting Office call for "more research into the effects of expanded home health care on those elderly highly at risk of placement in nursing homes and on hospital admissions."²⁵ It confirms the hope that in this specific group of patients high intensity home health care can be cost-effective.

The one out-of-home utilization rate which was higher for team patients was emergency room visits. This is a result of the fact that those particular team patients happened to have very low numbers of days at risk and a valid conclusion on this point cannot be drawn. Also of interest is the fact that the variance in the out-of-home day-cost for the controls was substantially greater than for the team patients, suggesting possibly greater control and predictability of hospital costs for the patient under the close surveillance and care of the home care team physician.

The study results failed to demonstrate any effect of the intervention upon patient functional status (physical or psychosocial) or morale. While the mortality rate was higher among team patients, survivorship, as an indicator of average adjusted time survived during the period of study, did not differ significantly between the two groups. Although no significant improvement in either mortality or morbidity in the team cases was expected due to the age, severity of illness, or terminal status of the subjects, the evidence for no negative effect of team intervention is welcome (it might be of concern, for example, that over-zealous attempts to avoid hospitalization or emergency room care would have adverse effects). There was no evidence, however, for significant

delay in functional deterioration of the team over the control cases, which had been hypothesized.

The strongest statistical results favoring the team were observed in caretaker satisfaction with health care. Trends in patient satisfaction were also strong, especially at six months. Sub-scale analysis indicated that satisfaction sub-scales which seemed the most affected by the intervention were the scales concerned with availability of care in general as well as of physician care in particular and those concerned with characteristics of the physician (personal qualities and competence). These findings are generally consistent with what might be expected from the intervention which made home care, especially physician home care, more available to patients and their families. The increased satisfaction with physician characteristics may be a reflection of the particular physician participating in the Home Health Care Team and may not necessarily occur in replications of the intervention at other sites, or in expansion of the program in Monroe County to include a broader physician group. It is not possible to rule out a "Hawthorne effect" in interpreting these results as patients and caretakers were well aware of being in a demonstration study.

The controls were not truly without intervention in this study, since they kept health utilization diaries and were visited by the interviewers who sometimes perforce offered advice and support. The increase in satisfaction in the control group over the study period may reflect this, while the lesser increment in satisfaction among the controls as compared with the team group may in part be related to disappointment at not having been randomized into the team group initially.

Patient satisfaction scale scores had lower internal consistency than caretaker scores.²² This may reflect the poorer health status of patients, and perhaps their reduced ability to concentrate and answer the questionnaire in a consistent fashion. This may account for the inability to detect as much improvement in satisfaction in patients as compared with caretakers. Also, great stress in caring for seriously ill patients falls on the family members who may therefore be more sensitive than patients themselves to changes in the quality of care provided. In any case, for these disabled, dependent, and severely ill patients and their caretakers, satisfaction with the health care they receive is undoubtedly of much greater relative importance than for the average citizen for whom contact with health providers is far less frequent and significant in the hierarchy of life experiences, and is therefore an even more desirable outcome.

Finally, this high degree of caretaker satisfaction with team care deserves one further comment. The utilization data show that savings in hospital days, the costliest care

TABLE 8—Mean Unadjusted Satisfaction Scores and Significance Tests at Intake, Three and Six Months

	Intake				3 Months				6 Months			
	Team	Control	t-test(p)	MW ^a (p)	Team	Control	t-test(p)	MW ^a (p)	Team	Control	t-test(p)	MW ^a (p)
Patient Satisfaction	(n = 57) 79.0	(n = 47) 81.1	ns	ns	(n = 37) 92.1	(n = 30) 88.7	ns	ns	(n = 31) 95.0	(n = 22) 89.3	ns	ns
Caretaker Satisfaction	(n = 67) 76.1	(n = 65) 75.4	ns	ns	(n = 41) 96.9	(n = 42) 82.1	<.0001	<.0001	(n = 31) 99.8	(n = 33) 88.8	<.002	<.001

^aMann-Whitney Test

ns = not statistically significant (p greater than 0.05)

days, can be attributed almost entirely to the fact that more team patients spent their days of highest care needs at home, where much of the service is provided by informal family caretakers at no cost to the system. Thus, it is most remarkable that these caretakers who contributed most significantly with their time and effort to lowering cost are also the group most satisfied with this care approach. Patient and caretaker satisfaction, therefore, has a direct relationship to health care utilization and cost reduction. Since all patients and caretakers in this study had freely chosen a home care approach, however, similar findings might not be expected in a group forced into the home care option. Thus, although home care at such a critical stage in life is not for everybody, there will always be people who prefer this option, and for them this study has shown that it can be cost-effective and desirable.

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