

Evaluation of Restorative Care vs Usual Care for Older Adults Receiving an Acute Episode of Home Care

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CLINICIANS, POLICY MAKERS, AND older persons themselves increasingly acknowledge that a primary goal of health care for older, particularly multiply and chronically ill, persons should be to optimize function and comfort rather than solely to treat individual diseases.¹ With acknowledgment of this goal has come attempts to identify events that trigger functional loss and to develop methods that prevent or reverse this process.²⁻⁵ Episodes of acute illness and hospitalizations are high-risk times for functional decline to occur. For example, between 25% and 50% of all hospitalized older persons experience loss of functional independence during hospitalization.^{5,6} Only a third recover to prehospital levels of functioning by 3 months.⁷ Many older persons who decline during an acute illness or hospitalization are referred for home care services.^{8,9} An episode of home care service thus represents a readily identifiable time for instituting interventions to improve functional outcomes.

Both broad and disease-specific home-based clinical strategies have been

See also Patient Page.

Context Illness and hospitalization often trigger functional decline among older persons. Home care services implemented for functional decline provide an opportunity to intervene to improve outcomes.

Objective To compare functional status and the likelihood of remaining at home for persons receiving restorative care vs usual home care.

Design and Setting Intervention using prospective individual matching conducted between November 1, 1998, and April 30, 2000. Six offices of a home care agency in Connecticut were used. One branch office served as the restorative care unit and the other 5 served as usual care offices.

Participants Patients receiving home care through the restorative care office who were 65 years or older; in receipt of Medicare-covered home care lasting at least 7 days; with absence of severe cognitive impairment; and not terminal, bedridden, or requiring total care were matched with patients from 1 of the usual care offices. The matching factors included age, sex, race, baseline self-care function, cognitive status, whether hospitalization preceded the home care episode, and date of the home care episode. Of the 712 eligible restorative care patients, 691 (97%) were matched with a usual care patient.

Intervention Restorative care, provided by the home care agency nursing, therapy, and home health aide staff, was based on principles from geriatric medicine, nursing, rehabilitation, and goal attainment.

Main Outcome Measures Remaining at home, functional status at completion of the home care episode, and duration and intensity of home care episode.

Results Compared with usual care, and after adjusting for baseline characteristics and other factors, restorative care was associated with a greater likelihood of remaining at home (82% vs 71%; odds ratio [OR], 1.99; 95% confidence interval [CI], 1.47-2.69) and a reduced likelihood of visiting an emergency department (10% vs 20%; OR, 0.44; 95% CI, 0.32-0.61). Home care episodes were shorter (mean [SD], 24.8 [26.8] days vs 34.3 [44.2] days; $S = -17821$; $P < .001$). Restorative care patients had better mean (SD) scores than usual care patients in self-care (11.0 [2.1] vs 10.7 [2.5]; $P = .07$ after adjustment), home management (9.5 [2.9] vs 9.2 [3.0]; $P = .05$ after adjustment), and mobility (3.3 [0.8] vs 3.2 [0.9]; $P = .02$ after adjustment).

Conclusions This trial suggests that reorganizing the structure and goals of home care can enhance health outcomes of older patients without increasing health care utilization.

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studied; the outcomes of these interventions have been mixed.¹⁰⁻¹⁶ In most of these studies, whether successful or not, the interventions were not provided by home care clinicians and the services were not governed by Medi-

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care regulations. The relevance to existing home care services is thus unclear, particularly given recent efforts, such as the prospective payment system,¹⁷ designed to constrain escalating home care costs.

Concomitant with changes in home-care-payment policy, the Center for Medicare and Medicaid Services (formerly the Health Care Financing Administration) has mandated attention to functional outcomes of patients receiving home care.¹⁸ This mandate has been operationalized by instituting a standardized assessment of health and functional measures using the Outcome and Assessment Information Set (OASIS).^{19,20} The confluence of these mandates to both constrain costs yet improve outcomes provides the opportunity to investigate innovative and cost-effective clinical strategies. Over the past decade, we and others have developed multidisciplinary restorative models of care based on the integration of relevant principles from geriatric medicine,²¹⁻²⁴ rehabilitation,^{13,25-27} nursing,²⁸⁻³⁰ and goal attainment.^{21,23,25,26} The aim of the present study, conducted in a real-world setting, was to compare restorative vs usual care in the following areas: functional status, likelihood of remaining home, duration and intensity of the home care episode, emergency visits to a physician, emergency department (ED) visits, and pain or dyspnea.

METHODS

Setting and Design

The setting for this controlled clinical trial was the oldest home care agency in Connecticut. One branch office of this agency served as the restorative care office while the remaining 5 offices served as the usual care offices. The restorative office was chosen because of its proximity to the researchers who participated in development and implementation of the restorative model. All offices operated under the same home health administration; staff at all the offices received the same training in agency policies and procedures. Random assignment of patients to the restorative or usual care offices was not

possible because of geographic considerations and because patients needed to be assigned to the next available home care staff. However, individual prospective matching³¹ ensured that patients in the 2 groups were comparable at baseline. This study was approved by Yale University School of Medicine's human investigations committee. Since there was no direct patient contact and no patient identifiers in the analysis data set, informed consent was not required.

Participants

Eligibility criteria, selected to identify older persons at risk for functional decline after acute illness or hospitalization but with the potential for maintaining or improving their function, included age of 65 years or older; receipt of an episode of Medicare-covered home care between November 1, 1998, and April 30, 2000—except for hospice care—lasting at least 7 days; absence of severe cognitive impairment that would impede ability to participate (defined as requiring considerable assistance in routine situations, not alert or oriented or able to recall directions, or constant disorientation); not requiring total assistance with care; and not bedridden. Eligible patients from the restorative and usual care offices were identified concurrently. The pool of potential usual care patients was sufficiently large to permit the use of a computerized algorithm designed to match patients according to age (within 5 years), sex, race, self-care, or basic activities of daily living (ADLs) function at admission to home care, and baseline cognitive status. These matching factors were selected either because they are key demographic characteristics or because previous work had identified them as factors predictive of functional decline following hospitalization.⁷ Two additional matching factors were whether the patient was enrolled following an acute hospitalization and initiation of the home care episode before or after November 1, 1999. The latter factor was chosen to control for secular trends in care. All eligibility criteria and match-

ing factors were ascertained from the OASIS-B database as described below.

All restorative and usual care participants were enrolled prospectively. The matched cohort was created as follows: (1) all admissions to the restorative care office during the study period were prospectively identified (n=1394 admissions); (2) admissions meeting eligibility criteria were identified (n=957 admissions); (3) to avoid repeated observations of the same person, only the first eligible episode of home care for each person was selected (n=712 persons; 94% of persons ≥ 65 years receiving an episode of home care lasting ≥ 7 days from the restorative office were included in the study; 58 persons were excluded because of severe cognitive impairment, total care, bed bound, or hospice); (4) all admissions to the usual care offices during the study period were identified (n=7945 admissions); (5) admissions to the usual care offices meeting eligibility criteria were identified (n=4448 admissions); (6) the first eligible episode of home care for each potentially eligible usual care recipient was selected (n=3690 persons); and (7) using the computerized matching algorithm, 691 (97%) of the restorative care recipients were matched on all 7 factors to 1 of the 3690 usual care recipients for a sample size of 691 matched pairs. Compared with the 691 restorative care recipients included in the study, the 21 unmatched eligible recipients were slightly older (mean [SD], 82.3 [10.6] vs 78.8 [6.9] years), less likely to have been hospitalized prior to home care (33% vs 63%), and more likely to be nonwhite (14% vs 3%). They did not differ by sex or admitting diagnoses.

Intervention

In the restorative office, all care was provided by the home care agency's nursing, physical and occupational therapy, and home health aide staff under the approval of the patients' physicians and in accordance with all Center for Medicare and Medicaid Services regulations and policies. Involvement with patients' physicians was unchanged and consisted primarily of approval of or-

ders and communication necessary to manage medical conditions in both the restorative and usual care groups. The development and implementation of the restorative care strategy has been described elsewhere.³² The restorative care model was based on the following principles adapted from geriatric medicine, nursing, rehabilitation, and goal attainment²¹⁻³⁰: (1) diagnosis and treatment of individual diseases (primary goals in usual home care) are best considered a means toward the ultimate goal of optimal health and function; (2) health and functioning may be compromised by various combinations of diseases, impairments, adverse effects of treatments, as well as by psychosocial and environmental factors, so the care plan should address these multiple domains; and (3) persons are more likely to adhere to treatment plans if they are involved in setting goals and in determining the process for meeting these goals.^{21,23,33}

Key characteristics of the restorative care included: (1) training of the home care nurses, therapists, and home health aides in issues relevant to rehabilitation, geriatric medicine, and goal attainment; (2) reorganization of the home care staff from individual care providers into an integrated, coordinated, interdisciplinary team with shared goals; (3) reorientation of the focus of the home care team from primarily treating diseases and "taking care of" patients toward working together to maximize function and comfort; and (4) the establishment of goals based on input from the patient, family, and home care staff, and agreement among this group on the process for reaching these goals.³² A self-care progress report helped to clarify goals, establish a baseline, standardize the assessment of patients, clarify care responsibility across the multiple providers, and track patients' incremental progress toward reaching the goals.³² The report also provided a relatively nonburdensome method for communication among members of the home care team who visited the patients at different times. The interventions targeting physical impairments and tasks of daily

living were based on those developed in 2 previous home-based intervention programs.^{13,24,34,35} The treatment plan included various combinations of exercise and training; behavioral changes; environmental adjustments and adaptive equipment; counseling and support; training and education of patient, family, and friends; and medication adjustments. Implementation occurred over 3 months and included inservicing of all nurses and physical therapists by agency staff who had participated in designing the model and who provided oversight to the staff during the study. Agency home care aides underwent 1 day of training at a nearby rehabilitation hospital.

Usual Care

No attempt was made to change home care practices in the usual care offices. The care of patients in these offices was directed by the medical orders developed to manage specific diseases. While the nurses and therapists made efforts to communicate regularly, at least by telephone, their care plans (including direction of the home health aides) were developed independently.

Data

All descriptive and outcome data were ascertained using the OASIS-B, which was mandated by the Center for Medicare and Medicaid Services for all patients receiving Medicare services from home care agencies.¹⁸ The OASIS-B data set^{19,20,36} must be completed by a nurse or a therapist at the time of admission to home care, every 60 days, and at discharge from home care. Descriptive data include sociodemographic characteristics such as age, sex, race, living situation, and availability of social supports; medical data including medical diagnoses, inpatient diagnoses for individuals discharged from the hospital, incontinence, pressure sores, and wounds; cognitive and psychological conditions (including depressive symptoms, anxiety, and confusion); vision and hearing impairments; and symptoms including dyspnea and pain. The reliability of these measures was tested

by the developers.³⁷ In a pilot study of 19 patients cared for by the participating home care agency, the interrater reliability between a home care nurse and a nurse research assistant was moderate ($\kappa=0.40-0.75$) for depressed mood, cognition, pain, bowel incontinence, and sleep and excellent ($\kappa>0.75$) for urinary incontinence, pressure ulcers, anxiety, vision, and hearing.

Outcomes

Discharge location following completion of the episode of home care was dichotomized as remaining at home vs other (rehospitalization, death, nursing home placement, unknown). The duration of the episode of home care was based on the start and end dates recorded in the OASIS-B database while intensity was based on the number of nursing, physical therapy, and home health aide visits recorded in the billing files. For individuals who remained at home after home care discharge, additional primary outcomes included self-care and home management, ADLs, and mobility. These 3 functional measures were defined and scored (for purposes of this study) similarly to existing standard research instruments.³⁸ The self-care ADLs included grooming, dressing the upper body, dressing the lower body, bathing, eating, and using the toilet. The home management ADLs included planning and preparing light meals, use of transportation, doing laundry, housekeeping, shopping, ability to use the telephone, and management of oral medications. Mobility included walking and transferring (from bed to chair). Responses for each functional item were collapsed into 3 categories (0=unable to perform task; 1=performs task with assistance; and 2=independent in performing task). The items were then aggregated into summary scores of self-care (range, 0-12), home management (range, 0-14), and mobility (range, 0-4) in which higher scores reflect greater functional independence. Other outcome measures included ED visits, urgent care visits to a physician, and frequency of dyspnea and pain.

The interrater reliability of the individual items constituting the primary functional outcome measures was assessed in a pilot sample of 20 home care recipients between 2 home care nurses from either the restorative office or 1 of the usual care offices and between the home care nurse and a research assistant. Interrater reliability was moderate ($\kappa=0.40-0.75$) for dressing the lower body, eating, bathing, using the toilet, transferring, doing laundry, and managing medications and excellent ($\kappa>0.75$) for dressing the upper body, grooming, walking, shopping, and using the telephone. Only the κ scores for housekeeping, transportation, and meal preparation were less than 0.40. These low κ scores were expected because almost no one in the study was able to perform these activities without assistance, which resulted in excellent agreement (>90%) but low κ scores because of maldistribution.³⁹ The weighted κ scores for the aggregate scores were 0.85, 0.59, and 0.67 for self-care, home management, and mobility, respectively.

Statistical Analysis

Differences in patient characteristics between the restorative and usual care groups at start of care were assessed using the McNemar test for binary variables, and the paired *t* test for continuous variables. The primary outcome, remaining at home at completion of the home care episode, was investigated with conditional logistic regression, using the technique developed by Holford et al.⁴⁰ To evaluate the effect of the intervention on duration and intensity of the home care episode, the signed rank test was applied to pairwise differences in duration and intensity of care. This test was performed for all pairs with complete data and separately for the subset of individuals who remained at home. The duration of home care episode was also compared for patients at the restorative care office vs one of the usual care offices for a period of 1 year prior to the implementation of the restorative care intervention. The signed rank test was also

used to estimate the effect of the intervention on self-care, home management, and mobility function. These data were available only for patients who remained at home at the end of the home care episode. Pairwise differences in each variable at completion of care were analyzed.

Unmatched multivariate analyses, controlling for baseline self-care, all matching factors, and for the diagnosis triggering the home care episode, were used to test the robustness of the matched results. Logistic regression was applied to remaining at home and ED visit; ordinary least squares regression was used to analyze self-care, home management, and mobility; Cox proportional hazards regression was applied to duration of home care. The results of unmatched analyses were similar to those produced by the matched analyses. Two-tailed hypotheses tests were performed to determine statistical significance. All analyses were performed using SAS statistical software (Version 8.1, SAS Institute Inc, Cary, NC).

RESULTS

Patient characteristics at start of the home care episode are reported in TABLE 1, stratified by restorative vs usual care office. Characteristics are provided first for the full set of pairs and then for the subset of pairs in which both patients remained at home at completion of the home care episode because functional outcome data were available only on this subset. Restorative and usual care recipients were well matched on the functional measures at baseline except that the restorative care recipients had higher self-care scores than usual care recipients (TABLE 2; $P<.001$).

After adjusting for baseline characteristics, patients receiving the restorative care intervention were more likely than those receiving usual care to remain home at the completion of the home care episode (adjusted odds ratio [OR], 1.99; 95% confidence interval [CI], 1.47-2.69; Table 2). One usual care and 3 restorative care recipients

died during follow-up. While restorative care was not associated with a lower likelihood of requiring at least 1 urgent care visit to a physician's office (3% vs 4%), recipients of the restorative model of care were less than half as likely to have an ED visit during the home care episode (adjusted OR, 0.44; 95% CI, 0.32-0.61). Patients in the restorative care group had significantly ($P<.001$) shorter care duration than usual care patients both with and without removal of statistical outliers, defined as a duration of more than 200 days (Table 2). Conversely, the mean (SD) duration of an episode of home care among persons who met our eligibility criteria in the year prior to the implementation of the restorative model (excluding outliers) was 34.4 (32.3) days in the restorative and 35.7 (30.2) days in the usual care offices for a mean difference of 1.3 (2.6) days. Although a similar proportion of both groups received each type of visit, restorative care recipients had a lower number of physical therapy, nursing, and home health aide visits than usual care recipients (Table 2). These differences in number of visits were of at least borderline significance for all recipients.

Discharge scores of self-care, home management, and mobility were all significantly, albeit modestly, higher in the restorative care unit patients than in the usual care group in analyses that accounted for baseline differences (Table 2). No baseline data for dyspnea or pain were available, but at discharge from home care a similar number reported dyspnea (10% vs 11%; $P=.17$), while fewer restorative than usual care recipients reported pain (35% vs 42%; $P=.002$).

COMMENT

Compared with usual care, the restorative care model was associated with a greater likelihood of remaining at home following completion of an episode of Medicare-covered home care, and a lower likelihood of requiring an ED visit or of complaining of pain at the time of discharge from home care. Restorative care recipients had slightly higher

self-care, home management, and mobility functioning scores at completion than did usual care recipients. While we did not perform formal cost-effectiveness analyses, the fact that restorative care recipients had shorter, and less intensive, home care episodes, and comparable or lower utili-

zation in other areas than usual care recipients, strongly suggests that the restorative model was cost-effective.

Comparing the results of the present study with previous home-based investigations is difficult. In previous studies, investigators addressed management of specific diseases¹⁰ or inves-

tigated the home as a substitute for the hospital for treating acute problems.^{15,16} Furthermore, most studies tested interventions superimposed on Medicare-covered services provided by home care agency staff.¹⁰⁻¹⁶ Nevertheless, similar to prior investigations, the present study does suggest that

Table 1. Admission Characteristics of Home Care Recipients*

Characteristic	Total Pairs		Pairs Who Remained at Home†	
	Restorative Care Office (n = 691)	Usual Care Office (n = 691)	Restorative Care Office (n = 382)	Usual Care Office (n = 382)
Age, mean (SD), y‡	78.8 (6.9)	78.8 (6.9)	78.6 (6.5)	78.6 (6.5)
Men‡	281 (41)	281 (41)	142 (37)	142 (37)
Nonwhite race‡	24 (3)	24 (3)	11 (3)	11 (3)
Admitted from‡				
Hospital	432 (63)	432 (63)	238 (62)	238 (62)
Rehabilitation facility	110 (16)	110 (16)	67 (18)	67 (18)
Nursing home	20 (2)	20 (2)	10 (3)	10 (3)
Home	129 (19)	129 (19)	67 (18)	67 (18)
Admitted to home care after November 1, 1999‡	311 (45)	311 (45)	200 (52)	200 (52)
Impaired cognition‡	124 (18)	124 (18)	56 (15)	56 (15)
Dependence in ≥1 self-care activity at baseline‡	255 (37)	254 (37)	138 (36)	155 (41)
Visually impaired	75 (11)§	102 (15)	35 (9)	48 (13)
Severely hearing impaired	39 (6)	30 (4)	19 (5)	15 (4)
Living situation				
Alone	229 (33)	243 (35)	135 (35)	137 (36)
With spouse	285 (41)	278 (40)	155 (41)	150 (39)
With other	177 (26)	170 (25)	92 (24)	95 (25)
Depressed mood	111 (16)	101 (15)	58 (15)	65 (17)
Urinary incontinence	70 (10)	68 (10)	29 (8)	31 (8)
Diagnosis at admission				
Cardiac other than congestive heart failure	111 (16)	101 (15)	58 (15)	65 (17)
Congestive heart failure	41 (6)	46 (7)	16 (4)	24 (6)
Pneumonia/respiratory	96 (14)§	72 (10)	63 (16)§	41 (11)
Gastrointestinal tract infection	26 (4)	14 (2)	14 (4)	7 (2)
Urinary tract infection	25 (4)	19 (3)	14 (4)	9 (2)
Stroke/other neurological	40 (6)	34 (5)	25 (7)	15 (4)
Musculoskeletal	49 (7)	59 (9)	26 (7)	34 (9)
Skin ulceration	27 (4)	29 (4)	17 (4)	16 (4)
Diabetes	16 (2)	23 (3)	4 (1)	9 (2)
Injury	15 (2)	24 (3)	9 (2)	18 (5)
Other	245 (35)	270 (39)	13 (36)	144 (38)
Comorbid conditions				
Cardiac other than congestive heart failure	470 (68)	481 (70)	249 (65)	265 (69)
Congestive heart failure	76 (11)	93 (14)	37 (10)	48 (13)
Respiratory	96 (14)§	72 (10)	63 (16)	41 (11)
Neurological	61 (9)	58 (8)	31 (8)	32 (8)
Musculoskeletal	155 (22)§	111 (16)	81 (21)	66 (17)
Diabetes	150 (22)	147 (22)	80 (22)	83 (22)
Gastrointestinal tract	40 (6)	35 (5)	24 (6)	22 (6)

*Values expressed as number (percentage) unless otherwise indicated.

†Includes the matched pairs in which both members of the pair were known to remain at home after completion of the home care episode.

‡A matching characteristic.

§Difference between restorative and usual care significant at $P < .05$.

functional and health outcomes of older persons receiving home care can be improved.

Several methodological issues require comment. All patients meeting eligibility criteria who received an epi-

sode of home care through the restorative office were included, thus resulting in a large sample size and the avoidance of selection and volunteer bias. As participants were matched on factors known to be associated with the

outcome, susceptibility bias was also minimized.

All data were obtained from the OASIS-B instrument completed by the home care staff. As the OASIS-B instrument was completed by whichever staff

Table 2. Outcomes of Home Care Recipients Assessed at Completion of Home Care Episode

Outcome	No. of Recipients, in Pairs	Restorative Care Office	Usual Care Office	Type of Statistic	P Value
Remained at home at completion of home care episode, No. (%) [*]	691	569 (82)	490 (71)	1.91 (1.47-2.47)	<.001
Adjusted for baseline factors ^{†‡}				1.99 (1.47-2.69)	<.001
Emergency department visit during home care episode, No. (%) [*]	691	70 (10)	140 (20)	0.45 (0.43-0.48)	<.001
Adjusted for baseline factors ^{†‡}				0.44 (0.32-0.61)	<.001
Duration of home care episode in days, mean (SD)[outlier mean (SD)] [§]					
All recipients	581	24.8 (26.8) [24.8 {26.4}]	34.3 (44.2) [30.2 {29.2}]	S = -17 821	<.001
Adjusted for baseline factors [¶]				0.74 (0.66-0.82)	<.001
Recipients remaining home	382	23.7 (21.9) [23.7 {22.0}]	32.1 (40.4) [28.7 {25.7}]	S = -8042	<.001
Adjusted for baseline factors [¶]				0.75 (0.65-0.86)	<.001
No. of visits for all recipients, mean (SD) [%] [#]	581				
Physical therapy		2.1 (4.7) [36]	2.4 (4.8) [39]	S = -3165	.07
Nursing		6.8 (7.8) [95]	8.5 (12.8) [94]	S = -7058	.04
Home health aides		3.1 (8.5) [35]	4.9 (13.9) [32]	S = -2658	.06
Total visits, mean (SD)		12.5 (16.9)	16.3 (25.6)	S = -9445	.01
No. of visits for recipients remaining home, mean (SD) [%]	382				
Physical therapy		2.3 (5.2) [37]	2.3 (4.2) [40]	S = -924	.34
Nursing		6.5 (7.6) [95]	7.2 (8.0) [94]	S = -2332	.22
Home health aides		2.9 (8.4) [33]	4.2 (12.9) [28]	S = -699	.32
Total visits, mean (SD)		12.2 (17.7)	14.3 (20.7)	S = -2805	.15
Functional outcome, mean (SD)**	382				
Self-care score					
Admission		4.9 (2.0)	4.6 (2.3)	S = 4264	<.001
Discharge		11.0 (2.1)	10.7 (2.5)	S = 1636	.04
Mean difference (discharge - admission) adjusted for baseline factors ^{††}		6.1	6.1	t = -1.81	.07
Home management score					
Admission		3.7 (1.4)	3.6 (1.5)	S = 140	.91
Discharge		9.5 (2.9)	9.2 (3.0)	S = 3469	.04
Mean difference (discharge - admission) adjusted for baseline factors ^{††}		5.8	5.6	t = -1.97	.05
Mobility score					
Admission		0.8 (0.8)	0.9 (0.8)	S = -294	.73
Discharge		3.3 (0.8)	3.2 (0.9)	S = 1824	.03
Mean difference (discharge - admission) adjusted for baseline factors ^{††}		2.5	2.3	t = -2.41	.02

^{*}Conditional logistic regression was used to evaluate remaining at home at completion and emergency department visits for the matched analyses. A total of 253 discordant pairs were used in remaining at home analyses and 182 pairs in emergency department analyses. Participant pairs with missing discharge location or who died were eliminated from remaining at home analyses. Values expressed as odds ratio (95% confidence interval).

[†]The baseline factors controlled for in unmatched analyses were age, sex, race, self-care function at baseline, cognitive status, acute hospitalization prior to home care, date of home care episode, and diagnosis triggering home care episode.

[‡]Unmatched analyses performed with logistic regression. Values expressed as odds ratio (95% confidence interval).

[§]Mean (SD) for number of days from start to end of episode. The numbers in brackets are for recipients with the outliers, defined as an episode of more than 200 days, removed. Nine pairs were removed from the full sample and 5 pairs were removed from the subsample remaining at home.

^{||}The effect of the intervention group on duration of home care episode, on number of visits, and on functional measures was estimated with the signed rank test, applied to pairwise differences in matched analyses.

[¶]Unmatched analyses performed with Cox proportional hazards regression. Value expressed as hazard ratio (95% confidence interval).

[#]Mean (SD) for the number of each visit. Analyses were performed with outliers, as defined above, removed.

^{**}The functional outcome scores ranged from 0 to 12 for self-care, from 0 to 14 for home management, and from 0 to 4 for mobility.

^{††}Unmatched analyses performed with ordinary least squares regression. Adjusted for baseline factors, as defined above, and for admission level of the functional outcome.

member was available, the outcome measures were at times obtained by the staff member who provided the care, raising the possibility of biased reporting. However, the outcome OASIS-B was completed in all cases without access to the baseline OASIS-B. The generally high κ scores in our pilot study for the functional measures suggest that the OASIS-B data are reliable as reported by home care staff. Similar to our results, Madigan and Fortinsky⁴¹ found κ scores ranging from 0.67 to 1.0 for individual functional items in the OASIS-B instrument at discharge from home care. We are unaware of other examples of using the OASIS-B instrument completed by home care staff as an outcome measure in a clinical trial. Experience is mounting, however, in the use of the Minimum Data Set, a similar group of descriptive outcome measures used simultaneously for clinical and research purposes,⁴²⁻⁴⁸ including clinical trials.⁴⁸

The depth of data available in some content areas was sacrificed by relying on the OASIS-B instrument, although the primary functional outcome data were ascertained in a manner similar to existing research instruments.³⁸ We chose to use the OASIS-B instrument to reduce the burden on participants who otherwise would have had to complete 2 similar assessments while recovering from illness. Functional outcome measures were lacking for persons who did not remain at home because discharge occurred abruptly and unpredictably. This loss of outcome data would likely have occurred even if there had been research-specific data collection. The clinical relevance of the modest improvements in restorative vs usual care recipients for functional outcomes (equivalent to about one third of an ADL) is unclear, although it was accompanied by a reduced length of home care episode and a greater likelihood of remaining home.

A prospective individual matching strategy, which previously has been shown to result in covariate balancing similar to complete randomization, was chosen to ensure that patients in the 2 groups were comparable at baseline.³¹

This strategy was used recently in another trial in which randomization was not feasible.⁴⁹ Patients were matched on characteristics identified in previous studies as being associated with short-term functional prognosis following hospitalization.⁷ With the exception of the slight difference in self-care, the patients in the 2 groups were well matched. Because a large pool of usual care patients was available, 97% of restorative care patients were able to be matched.

As the trial was conducted in a single home care agency, we cannot comment on generalizability to all home care patients. However, it was the largest home care agency in Connecticut at the time of the trial. We cannot determine whether the lower use and moderately better health and functional outcomes in the restorative compared with usual care offices were due solely to our intervention. The comparable duration of home care episodes in the 2 groups (restorative vs usual care) prior to our intervention followed by the shorter duration during our intervention suggests the restorative model explains at least some of the differences. Data on the other functional and health care utilization measures unfortunately were not available prior to the institution of the restorative model, which coincided with the introduction of the OASIS-B instrument.

While the mechanism of the effect of the restorative model cannot definitively be determined, the enhanced sense of teamwork and improved coordination among the home care staff, the reorientation toward maximizing patients' functional independence, and the inclusion of patients, families, and home care staff in setting goals all likely contributed to the success of the restorative model.³² The model, created to easily be taught and implemented in a real-world home care setting by actual home care staff, should be transportable to other settings.

The results of this trial, which will need to be replicated in other settings, suggest that reorganizing the structure and goals of home care holds promise for enhancing the functional and health

outcomes of older persons. These improved outcomes need not result in increased utilization and, indeed, may be associated with a reduction in ED visits, hospitalization, and home care use.

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