A Randomized Trial of Physical Rehabilitation for Very Frail Nursing Home Residents

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Background.—Past studies suggest multidisciplinary interventions that include physical therapy (PT) can improve function of nursing home residents. This trial specifically evaluates effects of PT for frail long-stay nursing home residents.

Design.—Randomized, controlled trial.

Setting.—One academic nursing home and eight community nursing homes.

Patients.—A total of 194 elderly nursing home residents dependent in at least two activities of daily living residing in the nursing home for at least 3 months.

Interventions.—Patients were randomized to individually tailored one-on-one PT sessions or friendly visits (FVs) three times a week for 4 months. Physical therapy included range-of-motion, strength, balance, transfer, and mobility exercises.

Main Outcome Measures.—Performance-based physical function assessed by the Physical Disability Index; self-perceived health status assessed with the Sickness Impact Profile; observer-reported activities of daily living; and falls.

Results.—Eighty-nine percent and 92% of PT and FV sessions, respectively, were attended; 5% and 9% of subjects dropped out in the PT group and FV group, respectively. Compared with the FV group, the PT group experienced no significant improvements in overall Physical Disability Index, Sickness Impact Profile, or activities of daily living scores. A 15.5% improvement in the mobility subscale of the Physical Disability Index was seen (95% confidence interval [CI], 6.4% to 24.7%); no benefits in range-of-motion, strength, or balance subscales were found. Compared with the FV group, the PT group used assistive devices for bed mobility tasks less often ($P=.06$) and were less likely to use assistive devices and wheelchairs for locomotion ($P<.005$). There were 79 falls in the PT group vs 60 falls in the FV group ($P=.11$). Charge for the 4-month PT program was $1220 per subject (95% CI, $412 to $1832).

Conclusion.—This standardized physical therapy program provided modest mobility benefits for very frail long-stay nursing home residents with physical disability due to multiple comorbid conditions.

(*JAMA*. 1994;271:519-524)

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Presented in part at the Society of General Internal Medicine, Primary Session, Washington, DC, April 2, 1993, and the Gerontological Society of America symposium, Washington, DC, November 22, 1993.

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IMPROVING quality and reducing costs of nursing home care are crucial as the nursing home population expands in the upcoming decades.[1] Past research has shown that multidisciplinary preventive strategies can defer or delay nursing home placement through intensive short-term posthospital rehabilitation programs.[2-6] However, remedial strategies that focus on enhancing functional independence of individuals already residing in nursing homes are relatively understudied. Such restorative strategies ideally could be targeted at long-stay residents, as these residents represent the majority of nursing home occupants and account for approximately 80% of the costs of nursing home care.[7] Furthermore, these residents typically have impaired functional and physical status that directly contributes to their high health care utilization and costs.

A few uncontrolled studies have shown that multidisciplinary programs in nursing home settings are feasible and improve functional outcomes.[8-11] These programs have multiple components, including medical, psychosocial, and physical therapy (PT). Delineation of the successful from the unsuccessful components of therapy is not possible. However, one retrospective study[12] suggests that PT lasting at least 8 to 16 weeks is effective in improving function in nursing home residents with multiple conditions, even for those with marked functional dependency and cognitive impairment.

Currently, nursing home residents who receive and are reimbursed for PT usually are residents who have suffered a recent acute event, such as hip fracture or stroke. In contrast, most long-stay residents, whose reduced function is often due to deconditioning and multiple chronic conditions rather than acute events, do not receive PT and are not eligible for its reimbursement.[13] The aim of this trial was to assess whether a PT program tailored to these long-stay residents' disabilities improved physical function and self-perceived health.

METHODS

The trial protocol, which included a 4-month intervention with bimonthly as-

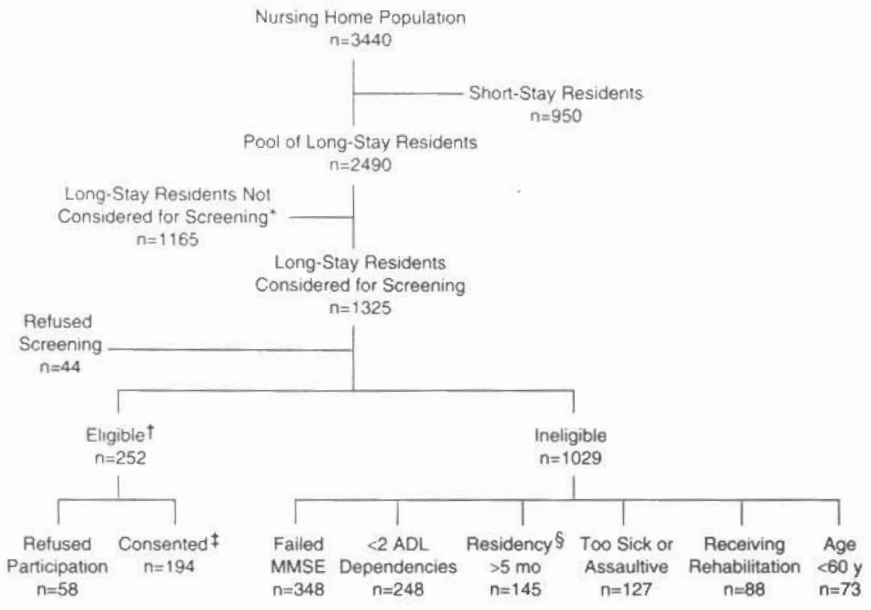

Fig 1.—Subject recruitment schematic. Asterisk indicates that when physical therapy and friendly visitor treatment slots were not available, long-stay residents were not screened; dagger, all patients received approval to participate from their physicians; double dagger, informed consent followed by family notification; and section mark, during the first 3 months of a 2-year recruitment period, only residents residing in homes more than 3 months and less than 5 months were considered eligible as the original intent was to enroll an inception cohort of long stayers. The 5-month maximum was dropped early as it became apparent that few long-stay residents would fit into this narrow window. MMSE indicates Mini-Mental State Examination; and ADL, activities of daily living.

sessments of main outcomes for 1 year, has been described.[14] This article presents results of the 4-month assessment that was performed after the active intervention period; outcomes were expected to be most affected at this time point. Subjects were long-stay nursing home residents from one academic nursing home (11 subjects) and eight community nursing homes (183 subjects) in San Antonio, Tex. Nursing homes with large populations of long-stay residents, adequate space, and the minimal PT equipment necessary for the intervention were chosen as study sites.

Selection and Recruitment

Eligibility criteria were chosen to enroll a study population that represented long-stay residents with a broad spectrum of disabilities who might benefit from PT and in whom outcomes could be assessed reliably. Inclusion criteria were (1) age older than 60 years, (2) residence in the nursing home for at least 3 months, and (3) dependence in two or more activities of daily living (ADL). (San Antonio nursing home policies routinely prohibit independent bathing, which results in de facto classification of all residents as dependent in at least one ADL.) Exclusion criteria were (1) terminal illness or active medical condition that in the judgment of the physician of record precluded participation in PT, (2) severe dementia (a prorated score of <50% on the Folstein Mini-Mental State Examination [MMSE][15] with the denominator adjusted downward to exclude items that could not be completed because of motor or visual impairment), (3) inability to follow a two-step command, (4) a known assaultive behavior pattern, and (5) receiving PT currently or within the last 2 months.

Subjects were recruited as shown in Fig 1. Average age, education, and marital status did not differ between those who participated and those who refused, but a greater proportion ($P<.05$) of persons who refused to participate (81%) were non-Hispanic whites compared with participants (72%).

Trial Regimen

Randomization was performed after baseline assessments by calling a central number. Randomization was blocked in groups of four and stratified by nursing home site. Subjects randomized to PT received one-on-one sessions three times a week; each session lasted 30 to 45 minutes. Verbal instructions were given in the subject's language of choice (Spanish or English). Therapy was provided in the nursing home, either at the bedside or in a PT room. Physical therapy was provided by one of six therapists, all of whom had prior experience with nursing home residents. All received training for 2 months in a standardized trial assessment and treatment protocol. Reliability testing between therapists regarding the protocol were performed after initial training and after 1 year; κ statistics of at least 0.50 were required for each assessment and treatment area.

Heterogeneous deficits required PT to be tailored to individual needs. Standardized and reliable assessments that assessed deficits in 17 areas and assigned scores for importance of the deficit for independent function as well as potential for remediation were used.[16] Treatment plans for the three to five highest ranked deficits were then selected using a prioritized algorithm (Fig 2) and were refocused as needed based on monthly evaluations. Definition and application of therapeutic modalities also were standardized among therapists with no more than two to three deficits being addressed per treatment session. Therapy sessions could include training in passive and active range-of-motion exercises, active and progressive resistance exercises, endurance activities, motor control activities (balance and coordination), bed mobility skills, transfers to various surfaces and heights, wheelchair propulsion, and gait training. All training incorporated repetitions and/or incremental increases in task difficulty, and therapy progression was based on explicit criteria for each activity. For example, strength resistance exercises were performed in sets of 10 to 15 repetitions using cuff weights or elastic bands. Weights were added or resistance increased each time the subject successfully completed 10 repetitions at a given weight or resistance. Exercises were discontinued when the therapist judged the subject to have adequate strength to focus on a higher level of functional training, such as ambulation. Balance training included static and dynamic repetitive activities that focused on progressive narrowing of the base of support or progressive movement of the center of gravity outside of the base of support. Bed mobility and transfer training emphasized five successive repetitions of tasks, such as bridging and moving from a supine to sitting position. Locomotion training focused on increasing distances of ambulation or wheelchair propulsion.

Control group subjects received one-on-one friendly visits (FVs) three times a week for 4 months to control for potential Hawthorne effects of the intervention. The FV program used a standardized protocol and usually consisted of reading to subjects in their language

of choice. Activities were designed to avoid physical exercise and cognitive and psychosocial interventions, such as puzzles and elicitation of feelings.

Baseline and Follow-up Measures

Physical status was assessed at baseline and 4-month follow-up using the Physical Disability Index (PDI), an observer-administered, performance-based measure consisting of 54 items that assess four areas: range of motion, strength, mobility, and balance.[17] Twenty range-of-motion items for upper and lower extremities were assessed passively in the supine position with a standard goniometer and were measured in degrees. Twenty upper-extremity and lower-extremity strength items were isometric tests performed in the supine position and were measured in kilograms using a Nicholas Manual Muscle Tester[18] for most major muscle groups and a Jamar Smedley-type dynamometer for handgrip (Therapeutic Equipment Corp, Clifton, NJ).[19] Balance and mobility were assessed with six and eight items, respectively, and were measured as seconds required to perform tasks, such as chair stand, semitandem stand, moving up in bed, moving from a supine to sitting position, chair transfer, and 50-foot locomotion. Use of assistive devices for mobility tasks was recorded. The summary PDI as well as subscale scores ranges from 0 to 100, with higher scores indicating better function. The PDI was administered by a therapist who was unaware of the subject's assignment status.

General function was assessed using the Katz ADL Scale plus an additional question regarding mobility dependency. The Katz ADL Scale scores six activities (bathing, dressing, feeding, toileting, transfers, and continence) from 1 (no assistance required) to 3 (completely dependent).[20] Scores range from 6 to 18, with higher scores indicating greater dysfunction. The ADL information was abstracted from the chart and verified by the subject's primary nurse. Self-perceived health status was assessed using the Sickness Impact Profile (SIP), an instrument with established reliability and validity in nursing home residents without severe cognitive impairment.[21,22] The 128-item questionnaire, including its psychosocial and physical dimension subscales (omitting work and home management categories), was used. The SIP scores range from 0 to 100, with higher scores indicating poorer self-perceived health. Two supplementary measures, the Folstein MMSE[15] and the short Geriatric Depression Scale (GDS)[23], were used to assess cognition and depressive symptomatology. The SIP, MMSE, and GDS were administered in the subject's language of choice by research associates who were unaware of the subject's assignment status.

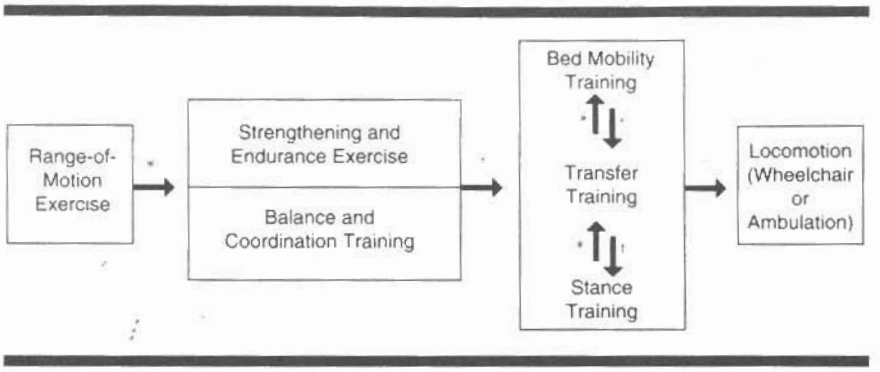

Fig 2.—Physical therapy treatment algorithm. Asterisk indicates progress to next highest functional level when patient can perform the activity with moderate assistance (25% to 50% assistance) and continue training at lower functional level until patient requires only supervision or is independent; and dagger, continue strengthening, balance, and coordination training until adequate to support or to advance endurance in the functional activity.

Charges for PT and FV sessions were determined by summing (1) wages and fringe benefits for personnel time; (2) travel expenses; (3) equipment based on annual depreciation; and (4) overhead. Total health care charges were determined by summing PT or FV charges with nursing home, hospitalization, physician and other health professional visits, emergency department visits, procedures, and medication charges.[24] Nursing home charges were estimated using reimbursement fees based on resource utilization groups[25,26] that were standardized for Texas nursing homes. Hospitalization charges were based on diagnosis related group reimbursements standardized for San Antonio and unadjusted for capital or medical education expenses. Associated professional fees were imputed from standard Health Care Financing Administration figures. Medication charges were based on standard *Red Book* pharmacist reference prices.[27] Health professional and emergency department visit and procedure charges were based on prevailing Medicare Part B allowable charges for San Antonio.

Compliance, Crossovers, Cointerventions, and Adverse Effects

Compliance was defined as the proportion of scheduled sessions that were completed. Control patients who received PT were monitored by nursing home and hospital record review. Cointerventions, including hospitalizations, emergency department and physician visits, and changes in medications, also were monitored. Three subscales of the Multiphasic Environmental Assessment Procedure[28] were used to assess potential baseline differences and changes in the following nursing home characteristics: (1) physical and architectural features, (2) policies and programs, and (3) staffing characteristics. Adverse effects were monitored by research assistants who were blinded to the patient's assignment status. Falls consisted of those mentioned in charts, incident reports, or both.[29] Patient interviews supplemented by chart and incident report reviews were used to classify adverse events, including muscle or joint soreness, sprains, or injuries classified as mild, moderate, or severe. In addition, therapists kept unblinded logs of adverse effects and any injuries that occurred during PT.

Statistical Analysis

Statistical analyses were performed with SAS (SAS Institute Inc, Cary, NC).[30] Logistic regression was used to evaluate any differences in baseline characteristics between groups. Analysis of main effects used the intention-to-treat strategy. After testing whether data met assumptions for analysis of covariance, a step-down F test procedure was used to evaluate the effect of physical therapy on primary outcome measures. Step-down F tests are a multivariate extension of the analysis of covariance model.[31] The tests were conducted sequentially beginning with the 4-month assessment. Preceding measurements of the same variable (eg, baseline and/or 2 months) were entered as covariates in the model. Of the 14 patients who dropped out before the 4-month assessments, nine had 2-month assessments that were included in the analyses. Since step-down tests are not independent, a multiplicative adjustment was made to maintain the α level at .05 for all tests in the step-down series. Nursing home site was included as a random effect variable in all models. The MMSE score was included as a covariate in analyses of PDI results because preliminary testing showed change in MMSE scores was significantly associated with PDI outcomes.

A single-sample test for proportions was used to evaluate whether the PT

group experienced greater numbers of falls than expected. The proportion of falls observed in the PT group was compared with a hypothesized value of 50% of the total number of falls experienced by both groups. Two-sample tests for proportions were used to evaluate the effect of PT on proportions of injurious falls and falls requiring health care utilization. In these analyses, the total number of falls experienced within each group was used as the denominator. Bonferroni corrections were used to adjust for number of tests.

RESULTS

Subjects assigned to the PT group and FV group were similar with respect to all baseline demographic and clinical characteristics (Table 1). Seventy-five percent had at least three comorbid conditions, while 25% had more than five comorbidities. Fifty-eight percent of subjects used wheelchairs for locomotion, 39% were ambulatory, and 3% were bed bound. No cerebrovascular accidents or fractures had occurred within the last 3 months, and most (90%) had occurred more than 1 year prior to study entry.

Table 1.—Baseline Characteristics of Subjects by Group*

Characteristics	Intervention Group (n=97)	Control Group (n=97)
Age, y	79.7 (8.5)	81.4 (7.9)
Female, %	70	71
White, %†	91	90
Education, y	10.1 (4.1)	9.7 (3.8)
Length of stay, d	223	231
Visually impaired, %‡	67	65
Hearing impaired, %§	58	62
Chronic conditions, n	5.1 (2.0)	5.0 (2.1)
Cerebrovascular accident, %	47	42
Arthritis, %	40	37
Congestive heart failure, %	30	24
Ischemic heart disease, %	22	29
Injuries/fractures, %	23	29
Obstructive lung disease, %	15	18
Parkinson's disease, %	9	6
Medications, n	5.7 (3.1)	5.6 (3.1)
Antidepressants, %	19	15
Benzodiazepines, %	10	12
Antipsychotics, %	8	8

*Where appropriate, values are presented as means with SDs given in parentheses, except for length of stay which is median days. None of the above characteristics were statistically significantly different between groups.
†Twenty percent of these were Hispanic.
‡Visually impaired indicates mean visual acuity worse than 20/40.
§Hearing impaired indicates better ear threshold of 40 dB at single frequency of 2000 Hz.

Most subjects (94%) assigned to PT received strength and endurance exercises. Eighty percent of subjects received training in transfers, 77% in range of motion, 75% in balance and coordination, 66% in gait, 65% in bed mobility, and 34% in wheelchair propulsion. Approximately one third of scheduled sessions included exercises in balance and coordination, transfers, or mobility (bed, wheelchair, or gait). Sixty-nine percent of sessions included strength and endurance training, and 40% included range-of-motion exercises.

Dropouts, Compliance, Crossovers, and Cointerventions

Fourteen subjects (7%) did not complete follow-up assessments, five in the PT group and nine in the FV group. All PT dropouts and seven of the FV dropouts were due to deaths. Eighty-nine percent of scheduled PT sessions were completed, and 92% of FV sessions were completed, However 13 and eight persons assigned to the PT group and FV group, respectively, missed more than 3 weeks of scheduled sessions due to acute illnesses and hospitalizations. Ten subjects in the FV group received at least one PT session from an outside source; none received more than 2 weeks of PT. There were 22 hospitalizations in each group. Mean length of stay for PT subjects was 10 days compared with 11 days for FV subjects ($P>.05$). The PT subjects had 313 physician visits compared with 280 visits for the FV group ($P>.05$). Average numbers of prescriptions as well as numbers of psychotropic and antihypertensive medications did not differ between groups at baseline or follow-up ($P>.05$). No significant differences between nursing homes in terms of architectural features, policies and programs, or staffing were found at baseline or follow-up ($P>.05$).

Adverse Effects and Falls

Therapists reported no injuries during therapy sessions, but subjects complained of moderate muscle soreness at 7% of sessions. Subjects receiving PT compared with subjects receiving FVs reported the following adverse effects, respectively: severe soreness, 10% vs 11%; severe bruises, 2% vs 1%; and severe fatigue, 4% vs 1%. Seventy-nine falls among 44 PT subjects were recorded compared with 60 falls among 38 FV subjects ($P=.11$). Seven falls in PT subjects resulted in serious injuries, such as sprains, lacerations, and/or fractures, while two falls among FV subjects resulted in serious injuries ($P=.16$). Thirteen and seven falls in the intervention group and control group, respectively, required health care utilization, such as radiographic studies, emergency department visits, and/or hospitalizations ($P=.41$).

Main Outcome Measures

Baseline and follow-up scores for the main outcome measures are provided in Table 2. Multivariate logistic regression showed no statistically significant differences between groups at baseline for these measures. The greatest physical function deficits were in the areas of strength and mobility; range-of-motion deficits were least common. Eighty-one percent of subjects were dependent in three or more ADL. Average SIP scores

Table 2.—Main Outcome Measures at Baseline and Follow-up*

	Baseline		2-Month Follow-Up		4-Month Follow-Up	
Measure†	Intervention Group (n=97)	Control Group (n=97)	Intervention Group (n=95)	Control Group (n=94)	Intervention Group (n=92)	Control Group (n=88)
Physical Disability Index‡	56.6 (10.5)	58.3 (11.3)	...	...	54.6 (12.0)	55.0 (13.3)
Range of motion	74.0 (8.9)	76.8 (10.3)	...	...	73.1 (10.8)	74.5 (11.5)
Strength	44.9 (17.9)	45.4 (19.1)	...	...	42.3 (22.1)	39.2 (23.6)
Balance	59.5 (25.9)	60.0 (25.3)	...	...	55.9 (26.0)	60.7 (26.3)
Mobility	44.1 (24.7)	51.2 (25.6)	...	...	46.8 (24.8)	45.8 (26.7)
Sickness Impact Profile	45.7 (18.6)	41.3 (17.8)	48.3 (18.6)	43.1 (18.2)	48.5 (20.3)	42.9 (19.1)
Physical	56.2 (19.1)	53.4 (18.5)	59.4 (19.2)	56.4 (20.1)	58.1 (21.7)	55.3 (20.4)
Psychosocial	40.3 (23.9)	33.7 (22.0)	42.2 (24.5)	34.5 (21.2)	42.9 (24.6)	34.3 (23.5)
Activities of Daily Living Scale	13.7 (2.3)	13.4 (2.4)	13.7 (2.6)	13.6 (2.4)	14.1 (2.2)	13.9 (2.5)
Geriatric Depression Scale	6.3 (3.5)	6.2 (3.6)	6.6 (3.6)	5.7 (3.8)	6.6 (3.6)	6.2 (3.8)
Mini-Mental State Examination	21.3 (4.2)	21.5 (4.3)	20.9 (5.4)	20.8 (5.3)	21.0 (5.8)	21.6 (5.3)

*Values in parentheses are SDs.
†Higher scores on Physical Disability Index and Mini-Mental State Examination indicate better function whereas higher scores on Sickness Impact Profile, Activities of Daily Living Scale, and Geriatric Depression Scale indicate poorer function.
‡Physical Disability Index not administered at interim 2-month follow-up for feasibility reasons.

Table 3.—Main Outcome Measures for Physical Therapy Group Compared With Friendly Visitor Group

Measure	Improvement, %*	95% Confidence Interval	P	Detectable Differences†
Physical Disability Index	3.7	−7.2 to 14.6	.45	8.1 (4.4)
Range of Motion	0.4	−3.2 to 4.0	.73	2.8 (2.0)
Strength	9.2	−9.8 to 28.1	.25	16.3 (6.4)
Balance	−7.4	−22.8 to 8.1	.26	17.3 (10.5)
Mobility	15.5	6.4 to 24.7	.01	5.6 (2.4)
Sickness Impact Profile	4.2	−20.3 to 11.9	.52	12.5 (5.6)
Physical	−2.6	−17.4 to 12.3	.66	13.7 (7.7)
Psychosocial	−7.8	−31.2 to 15.6	.43	17.1 (6.3)
Activities of Daily Living Scale	0.4	−4.6 to 3.7	.80	3.3 (0.5)
Geriatric Depression Scale	−0.3	25.7 to 25.1	.97	23.9 (1.5)
Mini-Mental State Examination	−1.3	−8.0 to 5.5	.63	5.7 (1.2)

*A positive value indicates an advantage for the physical therapy group over the friendly visitor group.
†Detectable differences indicate posterior calculations of detectable percentage differences at 80% power and $\alpha = .05$. Numbers in parentheses are mean differences in actual scores that could be detected rather than percentage differences.

indicated very poor self-perceived health, with worse perceived physical than psychosocial dysfunction. Fifty-seven percent of subjects met threshold criteria for probable depression on the GDS (score >5), and 63% were mildly to moderately cognitively impaired using the MMSE (score <24).

Main treatment effects are shown in Table 3. No statistically significant improvements were seen for any of the outcomes in the PT group compared with the FV group except for the mobility subscale of the PDI, where a positive improvement of 15.5% (95% confidence interval [CI], 6.4% to 24.7%) was seen. Examples of observed average changes in activities assessed with this subscale were 1.4-, 2.5-, and 3.0-second decreases for treated subjects in time to move up in bed, change from supine to sitting position, and perform chair transfer, respectively, compared with to 2.5-, 3.3-, and 2.1-second increases for control subjects to perform the same tasks. An average improvement of 0.03 m/sec was noted in treated subjects' gait speeds with no change in control subjects' gait speeds.

Intervention subjects accomplished more bed mobility tasks without assistive devices than did control subjects (P=.06). Specifically, 93% of treated subjects used assistive devices at baseline to perform bed mobility tasks (eg, bedrails for rolling from side to side or moving up in bed) compared with 85% at follow-up, while 84% of FV subjects used assistive devices at baseline and follow-up. Ambulatory subjects receiving PT were less likely to use assistive devices for all locomotion tasks compared with ambulatory FV subjects (P<.0001). Subjects receiving PT specifically were less likely to use wheelchairs for locomotion and more likely to ambulate, usually with assistive devices, compared with control subjects (P<.005). Of PT subjects initially using wheelchairs, 33% ambulated at follow-up compared with 14% of FV subjects, while 13% of PT subjects who were ambulatory at baseline became wheelchair dependent compared with 35% of FV subjects. No differences between groups in the individual ADL that assessed mobility and transfers were seen.

Point estimates of other main outcome effects, except for the PDI and its range-of-motion and strength subscales, showed no significant differences between the treatment group and the control group. Posterior power calculations confirmed a priori sample-size estimates and showed 80% power (α=.05) to detect changes between groups of 20% or smaller for all outcome measures (eg, PDI score change of 4.4, SIP score change of 5.6, and ADL score change of 0.5), except the GDS where there was 80% power to detect changes of 23.9% or a score change of 1.5 points (Table 3).

Subjects who experienced worsening mental status during the trial had the greatest deteriorations in PDI scores, regardless of group assignment. Lack of treatment response between groups was not associated with baseline values of or changes in cognition (MMSE) or affect (GDS). Subjects assigned to PT experienced no within-group improvements in either of the two primary outcome measures (the PDI and the SIP) regardless of intensity of therapy received, degree of cognitive impairment, presence or absence of depression, length of stay, or any of the medical diagnoses listed in Table 1 (P>.15). Mobility subscale improvements were associated with younger age, female gender, higher baseline depression scores, and the presence of arthritis or Parkinson's disease (regression model r^2=.19; P<.002). The PT subjects who had the poorest baseline physical function (PDI scores in the lowest tertile) had greater improvements in PDI scores (P=.03) compared with subjects with higher baseline function (PDI scores in the middle and upper tertile). However, subjects assigned to the control group who had the poorest baseline physical function experienced similar improvements in PDI scores, indicating that these changes likely represented a regression to the mean phenomenon.

Average charge per subject for the PT program was $1220 (95% CI, $412 to $1832) compared with $189 (95% CI, $80 to $298) for the FV program. Other health care charges averaged $11 398 (95% CI, $10 929 to $11 849) per subject and did not differ significantly between groups (P>.05). The majority of charges were nursing home (81%) or hospitalization (15%) charges.

COMMENT

Long-stay nursing home residents typically suffer from multiple debilitating conditions and functional dependencies that are directly related to nursing time requirements and costs of care.[32,33] Treatment strategies for such persons usually are aimed at restoring or maintaining function or providing supportive care. Recent trials and descriptive studies suggest multidisciplinary interventions that include rehabilitation with PT can improve function even in the chronically debilitated nursing home resident.[7-12] Thus, PT holds great promise as a prototypical intervention that could improve independence and decrease costs of the frail long-stay nursing home resident.

The PT intervention tested in this trial was designed to reflect basic principles and standard exercises used by physical therapists who treat elderly persons. It was developed by practicing therapists with nursing home experience and was targeted to the individual's particular deficits.[16] Because it was based on standardized assessments and prioritized treatment plans, the therapy program was probably more consistent than what is generally practiced.

Overall results showed that this particular PT program aimed at very frail long-stay nursing home residents with disability due to multiple conditions was substantially more expensive than the FV program and led to modest improvements in mobility. Improvements in time to perform simple tasks, such as sitting up and transferring, were seen, and less use of assistive devices was required for such tasks. In addition, ambulatory subjects receiving PT required fewer assistive devices than control subjects, and wheelchair-bound subjects receiving PT were more likely to ambulate (albeit most often with assistive devices) than control subjects. No significant improvements in other areas of physical performance, self-perceived function, or ADL were seen. That the trial did not miss major

beneficial effects is buttressed by (1) slightly negative effects or no effect for many outcomes (PDI balance subscale, SIP, ADL, and GDS); (2) small within-group declines for the PT group in these outcomes with the members of the control group also experiencing slight declines or no change; and (3) posterior power calculations demonstrating adequate ability to detect clinically significant differences.

These results should not be generalized to residents with acute causes of worsening disability, such as recent hip fracture and stroke, where PT may be especially beneficial. In addition, the results should not be generalized to less frail long-stay residents. Small studies[23-38] and two randomized trials[39,40] involving healthier ambulatory nursing home residents have shown that strengthening exercises can improve muscle function and strength. Notably, one of these interventions focused on intense weight and resistance training of the lower extremities and did not include range-of-motion, transfer, balance, and mobility exercises.[39] The other trial[40] was limited to 49 volunteers from four nursing homes, was randomized by nursing home site rather than subject, and consisted of twice-weekly seated upper-extremity and lower-extremity strengthening exercises.

Because PT is expensive, the need to determine its effectiveness for particular patient groups is critical if such care is to be provided appropriately in an era of shrinking health care resources.[41] Because PT encompasses various therapeutic modalities, specific types and intensities of physical interventions that lead to the greatest benefits must also be identified. Results of this trial suggest that very frail nursing home residents with chronic disabilities benefit modestly from a program incorporating various traditional PT modalities. These results as well as others[34-40] suggest that strength and mobility deficits are common among nursing home residents, and interventions that focus on these deficits may be most beneficial, while other modalities, such as range-of-motion exercises, are less often indicated and may provide minimal to no benefit for many residents.

This work was supported by National Institute on Aging grant UO1AG09117 and Veterans Affairs Health Services Research and Development grant IIR 88-165 of which Drs Mulrow and Gerety were coprincipal investigators. Drs Mulrow and Gerety are recipients of Veterans Affairs Senior Research Associate and Research Associate Awards, respectively.

The authors wish to thank Beverly Gruber, Melanie Woodard, Virginia Sosa, Laurie Hunter, MS, Anna Medina, and Steve Hamre for their participation in this trial; Linnie Morgan for her assistance in manuscript preparation; and each of the nine nursing homes and their residents for their gracious cooperation with this protocol.

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