Research Report

The Impact of Physical Therapy on Nursing Home Patient Outcomes

The objective of this retrospective study was to assess the intensity and outcome of individual components of interdisciplinary care, including physical therapy, in a teaching nursing home. Two independent reviewers abstracted records from 90 consecutive patients admitted to the nursing home. They rated intensity and outcome of each program component using a structured, standardized data abstraction form. Program components were physical therapy, speech therapy, psychosocial therapy, medication adjustment, and other medical and nursing care. Physical therapy and medication adjustment were the most frequently received therapies. Eighty-eight percent of the patients receiving high-intensity physical therapy and 33% of the patients receiving moderate-intensity physical therapy improved. For medication adjustment, 93% and 72% of the high- and moderate-intensity groups, respectively, improved. In univariate analyses, physical therapy intensity and age were associated with improvement. Baseline function in activities of daily living and cognitive function were not associated with physical therapy outcome. A stepwise multiple logistic regression analysis revealed that only therapy intensity was associated with improved outcome. We conclude that physical therapy was efficacious for patients receiving high-intensity treatment. Advanced age, activities-of-daily-living status, and cognitive impairment were not associated with poor physical therapy outcome. [Chiodo LK, Gerety MB, Mulrow CD, et al. The impact of physical therapy on nursing home patient outcomes. Phys Ther. 1992;72:168-175.]

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In many geriatric care settings, multidisciplinary care has been shown to be of benefit.1-6 Recently, debate has centered on whether an individual intervention or the sum of all the multidisciplinary interventions is responsible for the benefits seen in function, cognition, and mortality. Previous research5 has shown that discharge to nursing homes that include physical therapy as part of multidisciplinary care results in a higher likelihood of discharge to the community and of independent ambulation. Other than reports of beneficial outcomes of multidisciplinary geriatric interventions, there is little published information about physical therapy in

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the nursing home setting. Review of the English-language literature published since the 1960s yielded reports describing the role of physical therapists in nursing homes.6,7 These reports, however, did not address the intensity or outcome of physical therapy administered to patients in nursing home settings. Because the provision of physical therapy to patients in nursing homes remains a controversial topic about which little data exist in the literature to date, this retrospective study was undertaken specifically to determine the contribution of physical therapy and other components of multidisciplinary care to successful outcome of nursing home care.

The project had the following objectives: (1) identify individual components of interdisciplinary care within the nursing home and explore their effectiveness, (2) determine the extent of physical therapy offered in a teaching nursing home, (3) determine the efficacy of physical therapy and other program components in the study population, and (4) identify patient characteristics associated with receipt of physical therapy and with improvement in physical function. The information obtained will be useful in determining whether specific components, particularly physical therapy, merit clinical trials in the nursing home setting.

Method

Design and Site

This study was a retrospective review of consecutive admissions to the Extended Care Therapy Center from February through June 1988. The Extended Care Therapy Center is a 120-bed teaching nursing home, which is part of the Audie L. Murphy Memorial Veterans Affairs Medical Center in San Antonio, Tex.

Data Collection

Of 94 patient admissions, 90 charts (96%) were available for review. Sources reviewed include medical records, physical therapy records, and the admission Patient Assessment Inventory (PAI), a case-mix measurement used for reimbursement.6 The PAI contains observer-reported ratings of a patient’s eating, toileting, transfer, and mobility skills. Two independent reviewers abstracted data from the first 4 months of each patient’s stay using a standard form. The reviewers were physicians who are faculty geriatricians. Information abstracted included demographic data, medical diagnoses, number of medications used, cognitive function as indicated by admission Folstein Mini-Mental State examination score,9 and activities-of-daily-living status.

Each reviewer characterized the type and amount of care received by the patients according to the following program components: (1) physical therapy (ie, general conditioning exercises and functional skills training administered by a physical therapist); (2) speech therapy; (3) psychosocial therapy (ie, evaluation and management by a psychologist, psychiatrist, or social worker); (4) medication adjustment; and (5) other medical and nursing care. General conditioning training included activities directed toward achieving the strength, range of motion, motor control, and sensory integration that are prerequisite for successful performance of activities of daily living and achievement of independent mobility. Functional activity training complemented the general conditioning training and included teaching skills and adaptive techniques required for independence in mobility and activities of daily living. Both the general conditioning training and the functional skills training were administered by a physical therapist. There was no occupational therapist on staff during the majority of the study period.

The intensity of therapy received in each program area was rated as high, moderate, or minimal to none. For physical therapy and speech therapy, the intensity category was rated by number of sessions per week and duration of therapy. High-intensity therapy was defined as three or more sessions per week for at least 8 weeks.

Moderate-intensity therapy consisted of one or two sessions per week for at least 8 weeks or three to five sessions per week for fewer than 4 weeks. If fewer than one session per week was received or duration was less than 4 weeks, intensity was rated as minimal to none. All psychosocial therapy and other medical and nursing care intensity ratings were based on the frequency and duration of the interventions received. For example, interventions requiring at least two visits or consultations per week for at least 4 weeks were ranked as high-intensity therapies. Those interventions requiring more than one visit per month but less than two visits per week were considered moderate-intensity therapies, and those requiring less than one visit per month were rated as minimal-intensity therapies. Medication adjustment intensity was based on the number of medication changes made. Scheduled prescription medications were defined as major medications, and nonprescription medications (eg, acetaminophen, psyllium) were defined as minor medications. Changes in five minor medications or three major medications were rated as high-intensity changes, changes in two to four minor medications or one or two major medications were rated as moderate-intensity changes, and changes in fewer than two minor medications were rated as minimal-intensity or no changes.

Outcome Assessment

Outcomes were rated as improved (beneficial), unchanged, or worsened (detrimental) at 4 months postadmission. Outcome in each program area was ascertained by reviewing progress notes of the appropriate therapist as well as nursing and medical progress notes reflecting performance in the specific area. If the patient was discharged or died before 4 months postadmission, outcome at the time of discharge or death was used. Agreement was reached on 85% of initial ratings of therapy intensity and outcome; all disagreements were adjudicated by discussion among the two raters until consensus was achieved. 
The physical therapy outcome rating was based on change in strength, endurance, or activities of daily living, as documented by the physical therapist, nurse, or physician. The speech therapy outcome rating was based on documented change in speech or swallowing.

Beneficial changes in medication adjustment included institution of medications that were indicated, discontinuation of medications that were not indicated, and documented benefits from medication changes. If no changes in medications occurred, outcome was rated as unchanged. Detrimental changes included institution of medications that were not indicated, discontinuation of medications that were indicated, and documented adverse effects from medications or medication changes.

The psychosocial therapy outcome rating was based on change in cognitive function, behavior, symptoms of depression or psychosis, or resolution of social barriers that facilitated discharge. The outcome for other medical and nursing care was rated on the basis of improvement or deterioration in the patient's medical condition and documented benefit or deterioration as a result of the evaluations or procedures performed.

**Data Analysis**

Descriptive statistics were used to describe patient characteristics, type of care received, and outcomes of care. In the analyses, outcomes were dichotomized as improved or not improved for each program area. All patients' data were included in the analysis. Patients receiving no therapy and those receiving minimal-intensity therapy were combined to form one group in the analyses. We intended to explore the following hypotheses: (1) The type and intensity of therapy would be associated with outcome; (2) the independent variables of age, cognitive function, baseline activities-of-daily-living status, and number of medical problems would correlate with outcome; and (3) patient characteristics (i.e., age, Mini-Mental State examination score, and diagnosis) may be associated with type and intensity of therapy received. Age, cognitive function score, baseline activities-of-daily-living status, number of diagnoses, and therapy intensity were considered in univariate analyses in the groups improving and not improving in physical therapy and medication adjustment. Correlations were reported as odds ratios. Odds ratios are used in retrospective studies to measure strength of association. They consist of the odds of exposure to a factor (in this study, physical therapy) if a condition (in this study, improved physical function) is present divided by the odds of exposure if the condition is not present. Those factors found to have a significant association with outcome were then examined by stepwise multiple logistic regression analysis.

**Results**

Table 1 presents the demographic and medical characteristics of the patients in this study. The majority of the patients were elderly, unmarried, white men. Fifty percent of the patients were admitted after hospitalization, 24% were admitted from home, and 21% were admitted from community nursing homes. The patients' mean age was 69 years. Thirty-eight percent of the patients had a stroke, and 25% were demented. Serious medical conditions and functional dependencies were very frequent in this sample. During the 4-month observation period, 14% of patients died, 15.5% were discharged home, and 4% were discharged to another nursing home.

The proportion of patients receiving moderate- and high-intensity therapy in each program area is demonstrated in Figure 1. Physical therapy and medication adjustment were the most commonly received treatments. Thirty-seven percent of the patients received high-intensity physical therapy, and 29% received moderate-intensity physical therapy. High- and moderate-intensity medication adjustment were received by 31% and 32% of the patients, respectively. Thirteen percent and 37% of the patients received high and moderate intensities, respectively, of other medical and nursing care. Psychosocial therapy and speech therapy were received by fewer than 16% of patients.

Figure 2 shows therapy outcome in each program area. For physical therapy, 88%, 33%, and 13% of those patients who received high-, moderate-, and minimal-intensity therapy, respectively, improved. For medication adjustment, 93% of the high-intensity treatment group, 72% of the moderate-intensity treatment group, and 45% of the minimal-intensity treatment group improved. The mean number of scheduled medications at admission was 5.0 (SD = 2.6). At 4 months postadmission, the mean number of scheduled medications was 3.6 (SD = 1.8) (P = .0001 for the difference in number of medications at baseline versus at 4 months).

Because physical therapy and medication adjustment were successful and were received by adequate numbers of patients to permit analysis, factors predictive of success were explored.
In an effort to assess possible selection biases, univariate analyses comparing age, cognitive function, and baseline activities-of-daily-living status in patients in each physical therapy intensity group were performed. Older age was associated with lower physical therapy intensity ($P = .02$). Activities-of-daily-living status and cognitive function were not associated with intensity of therapy. Stepwise multiple logistic regression analysis for the factors age, age-treatment intensity interaction, and physical therapy intensity revealed that only physical therapy intensity was significantly correlated with outcome ($P < .0001$).

There were no significant differences in mental status, activities-of-daily-living status, or number of diagnoses between those patients with improvement and those without improvement. A similar procedure was used for outcome of medication adjustment. Univariate analyses for the variables age, cognitive function, activities-of-daily-living status, number of diagnoses, and intensity of medication adjustment revealed that only therapy intensity was associated with improved outcome.

**Discussion**

This retrospective study was one of the first attempts to describe the contribution of physical therapy to successful outcome of nursing home care. Physical therapy was frequently used and was beneficial to the majority of patients who received it. Cognitive impairment, very advanced age, and severe functional dependency were perceived as decreasing the likelihood of benefit from physical therapy in this study. Surprisingly, even patients with moderate to severe cognitive and functional impairments improved in physical function. Age had no independent effect on physical therapy outcome.

Medication adjustment was a frequent and effective intervention. In the majority of patients, the adjustments consisted of elimination of unnecessary or toxic medications. Our definition of improvement included reduction
Table 2. Factors Associated with Improved Physical Function in Univariate Analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.96</td>
<td>0.92-0.99</td>
<td>.02</td>
</tr>
<tr>
<td>Number of diagnoses</td>
<td>1.06</td>
<td>0.90-1.26</td>
<td>.48</td>
</tr>
<tr>
<td>Cognitive function</td>
<td>1.02</td>
<td>0.96-1.09</td>
<td>.55</td>
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<tr>
<td>ADL* status</td>
<td>0.82</td>
<td>0.63-1.05</td>
<td>.12</td>
</tr>
<tr>
<td>Therapy intensity</td>
<td>5.98</td>
<td>2.96-12.11</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

*ADL=activities of daily living.

This study had a number of limitations. In any nonrandomized study, selection bias is a serious concern. Subtle selection criteria may have been used to select patients for physical therapy who were more likely to improve. Prognosis could have affected the intensity of therapy. Prognostic indicators, including baseline activities-of-daily-living status, cognitive function, and number of diagnoses, however, did not differ between those patients who improved and those who did not improve in physical function. The strength of the association between physical therapy intensity and outcome makes the association seem unlikely to be due to selection bias alone and is a very strong recommendation for physical therapy.

Older patients were less likely to have improved physical function and less likely to have received high-intensity physical therapy. The multivariate analysis, however, revealed that only physical therapy intensity, and not age, was significantly correlated with outcome. Therefore, though selection bias cannot be definitively excluded, we have examined reasonable proxy measures for prognosis and have not found evidence that selection bias accounted for the substantial improvement associated with receiving physical therapy or the dose response effect between therapy intensity and outcome.

There may have been biases in this study that we were unable to detect. In particular, positive relationships between therapy intensity and favorable outcomes could be due to recording bias on the part of the health care providers. The physical therapist and other care providers were not aware of the purpose of this study. Although reviewers were aware of the study objectives, documented change in physical function (for example, ambulation distance) was required to assign outcome category. Though we used standard definitions in determining outcomes, prospective use of independent assessments of therapy intensity and outcome would reduce the potential for abstractor bias and error. Several problems may be attributable to the use of chart diagnoses and data. Their completeness and accuracy may have been imperfect. Important components of therapy that may have been effective, especially characteristics of nursing care and psychological support, counseling, and exercise or activities-of-daily-living training provided by nursing staff, cannot be adequately assessed by traditional medical chart review. Thus, the importance of other medical and nursing care may be underestimated.

Finally, the fact that this study was performed in a Veterans Administration facility limits its generalizability. The Veterans Administration nursing home population is almost all male and is younger than the community nursing home population. Functional status in this study, however, measured as independence in feeding, transfers, and continence, was as severely impaired as that reported for patients in the National Nursing Home Survey. Before attempting to generalize the results of this study to all patients in nursing homes, the efficacy of physical therapy should be studied in a community nursing home sample.

Summary and Conclusions

This study represents one of the first attempts to specifically characterize the relative benefits of individual therapies in a multidisciplinary program within a nursing home. We have found evidence that suggests that physical therapy is effective when given at least three times per week, even for patients with advanced age, marked functional dependency, and cognitive impairment. Rather than identifying groups of patients who were unlikely to benefit from physical rehabilitation, we found that a wider range of patients than expected experienced favorable outcomes. Because of limitations previously mentioned, these results must be considered preliminary. Important future directions should include prospective randomized trials to evaluate the benefits of physical therapy in patients in nursing home settings. Outcome measures that can validly assess physical and functional status changes should be used to ensure that the improvements are clinically significant. Finally, patients with a broad range of disabilities should be included in these trials to confirm that physical therapy is beneficial even for moderately to severely impaired individuals.

References

The benefits of physical therapy in any setting have only recently been tested against patient health outcomes such as long-term nursing home placement or functional status. By functional status, I mean the measured ability of the patient to function physically, psychologically, and socially in everyday life. Those studies that have evaluated patient outcomes have usually focused on hospitalized patients. Chiodo and colleagues have, in this article, issued a challenge to therapists document that they make a significant difference to patients?

It is critical to the future of physical therapy in the nursing home setting, and to the health of patients in nursing homes, if we believe therapy to be effective, that this question be answered; yet, the literature on this subject is sparse. Physical therapy is expensive and is viewed as a more discretionary portion of the nursing home bill than basic nursing care, food, or medications. As discharges to nursing homes, and pressures to control nursing home costs, increase, the quantity and quality of physical therapy will come under increasing scrutiny. As has been true for other aspects of medical practice, not all outcomes are likely to be favorable. Some patients will benefit more than others, and some types of therapy will be better than others. Current patient health outcome measures, such as activities-of-daily-living (ADL) assessments and other functional status measures, may require modification to fully reflect meaningful clinical improvement. Yet, the result of outcome-oriented studies, even when negative, will be to define, refine, and ultimately strengthen the field.

This article provides us with a preliminary “yes” to the question: “Does the intensity of physical therapy, independently or in combination with other measures of the intensity of medical care, improve patient outcomes?” The study design had important strengths in setting about answering this question. Although the study was retrospective, a cohort of all admissions to the nursing home during a specified time frame were identified and followed forward through time (albeit via medical records). Selection bias was thus minimized. Another important feature of the design was the identification of baseline patient characteristics and an analysis of how these characteristics might have affected the intensity of physical therapy.

This is important because it could be that physical therapy intensity is a proxy measure for how sick the patient is. The better outcomes of the patients who received more therapy could be due to the better health of these patients. By examining the relationships between physical therapy intensity and age, cognitive score, and baseline ADL status, the authors have done enough as well as a retrospective study could do to help us evaluate this potential problem. Age, which was associated with lower physical therapy intensity, was then tested in a regression analysis that included the age-intensity interaction as well as physical therapy intensity to predict outcomes, with the result that physical therapy intensity alone was significantly associated with improvement.

Can we then conclude that physical therapy improves outcomes? The authors of this article would agree with me that the answer is not yet available. They acknowledge that their study took place at a single site, that the design was retrospective, and that their measures of patient prognosis and outcome were imperfect. The major objective of this study was to determine whether the intensity of physical therapy, when controlling for other types of therapeutic intensity and for patient characteristics, was associated with improved patient outcomes. To further understand the study’s limitations, and to set an agenda for future research, we must...