Physical Therapy Interventions for Patients With Stroke in Inpatient Rehabilitation Facilities

Background and Purpose. The purpose of this study was to describe physical therapy provided to patients with stroke in inpatient rehabilitation facilities. Subjects and Methods. Data were collected from 972 patients with stroke receiving physical therapy services at 6 rehabilitation facilities in the United States. Descriptive statistics were derived to describe physical therapy sessions, including proportion of therapy time spent in specific functional activities and proportion of those activities that included any of 59 interventions. Results. Mean length of stay was 18.7 days (SD=10.3), and patients received physical therapy, on average, 13.6 days (SD=7.8). Patients attended, on average, 1.5 (SD=0.3) physical therapy sessions per day, with each session lasting 38.1 minutes (SD=17.1). Gait and prefunctional activities were performed most frequently (31.3% and 19.7% of total treatment time, respectively). For gait activity, physical therapists used balance and postural awareness training in more than 50% of sessions and used strength training for more than 50% of sessions of prefunctional activities. Eighty-six percent of the patients received evaluation, and 84% of the patients and families received education. Discussion and Conclusion. Therapists selected an eclectic approach to intervention rather than specific intervention techniques. The approach to patients’ care included interventions to remediate impairments and to compensate for functional limitations. Therapists also reported frequently using motor control and motor learning approaches to facilitate all activities. This approach to care is largely consistent with existing stroke care guidelines and advances in the scientific theories of motor control and motor learning. [Jette DU, Latham NK, Smout RJ, et al. Physical therapy interventions for patients with stroke in inpatient rehabilitation facilities. Phys Ther. 2005;85:238–248.]

Key Words: Physical therapy, Rehabilitation, Stroke.

Diane U Jette, Nancy K Latham, Randall J Smout, Julie Gassaway, Mary D Slavin, Susan D Horn
According to data from the National Health and Nutrition Examination Survey (NHANES I, II, and III), there were 3.7 million people aged 25 years or older reporting a history of stroke in the United States in 1991. In 1994 alone, there were 457,000 patients aged 25 to 74 years discharged from hospitals with an underlying diagnosis of stroke. Only 8.9% of those patients were discharged to a long-term care facility, suggesting that the remainder were discharged to rehabilitation settings or to their home. Indeed, in a study using data from the Uniform Data System for Medical Rehabilitation (UDSmr) in 1999, Tesio et al found that approximately 58,000 patients with stroke who survived and had a rehabilitation admission of less than 1-year duration had been admitted to rehabilitation facilities within 90 days of symptom onset. On admission to a rehabilitation facility, these patients scored, on average, less than 5 (“completing a task with supervision,” where 1=“total assistance” and 7=“complete independence”) on all 13 motor items of the Functional Independence Measure (FIM).

The 1995 Agency for Health Care Policy and Research (AHCPR)* clinical practice guideline for poststroke rehabilitation and the 1999 Royal College of Physicians (RCP) National Clinical Guidelines for Stroke recommend that patients with acute stroke receive care provided by rehabilitation professionals who are experts. Furthermore, a systematic review of the literature published in 1999 showed support for early implementation of rehabilitation interventions for improving functional outcomes for patients with stroke. A study conducted in Switzerland and Belgium in 2000 showed that, following stroke, patients engaged in therapeutic activities 28% of the working day in Belgium and 45% of the working day in Switzerland. Physical therapy accounted for 77% and 70% of the therapeutic activity time in each country, respectively. Taken together, the information from these sources suggests that many patients with stroke each year are likely to receive physical therapy and that physical therapy comprises an important and a relatively large component of their rehabilitation.

The AHCPR* and RCP4 guidelines provide a framework for understanding the recommended strategies for physical therapists in providing care to patients with stroke. Several recommendations are particularly salient:

1. Examination/evaluation for all patients to determine baseline motor impairments and function.

*Although currently called the Agency for Healthcare Research and Quality, the guidelines were developed by the agency under the name held by it in 1995. We will refer to the guidelines by the AHCPR acronym.
2. For patients who have some voluntary control over movement of the involved limbs, exercises and training for remediation of impairments, including those to improve “strength” (the term used in the guidelines) and motor control and function and those designed to help the patient relearn sensory-motor relationships.

3. For patients with persistent movement and sensory deficits that cannot be remediated, teaching of alternative or compensatory methods for performing functional tasks and activities, including gait re-education, practice of activities of daily living (ADL), and community activities.

4. Patient and family education as an integral part of the rehabilitation process, particularly in moving and handling patients safely at home.

5. Individualized decisions about the prescription of adaptive and assistive devices (e.g., ankle-foot orthosis, cane) only if other methods are not possible for completing an activity.

Despite evidence suggesting that physical therapy may be useful in rehabilitation of patients with stroke and recommendations for broad classifications of interventions based on clinical guidelines, the literature contains little information describing the precise nature of interventions provided by physical therapists. For the most part, reported studies have been conducted in countries outside the United States, have described intervention only in terms of duration or frequency, have involved a limited number of patients, or have asked therapists about intervention choices for hypothetical patients.

Given the limitations of reported studies and a lack of information about how patients with stroke are managed by physical therapists in the United States, we undertook a study to describe the care provided by physical therapists for patients with stroke in 6 inpatient rehabilitation facilities in the United States. Our purpose was to describe the physical therapy plan of care in terms of the types of therapeutic activities engaged in by patients during physical therapy sessions; the interventions used by physical therapists during the activities; the duration, frequency, and intensity of physical therapy sessions; and the personnel who provided them. We also examined the percentage of sessions that included examination/evaluation, the combinations of activities used most commonly during physical therapy sessions, and the percentage of patients or families who received some education from the physical therapist.

Method

Subjects

Data were collected between March 2001 and August 2003 from consecutive patients with stroke seen at 6 rehabilitation hospitals in the United States. This care was provided by 86 physical therapists, physical therapist assistants, physical therapy aides, and students. Data were collected as part of a large multicenter study of stroke rehabilitation. One thousand twenty-six patients were enrolled in the study at the 6 US sites. Sites were in northern California, southern California, Oregon, Utah, Pennsylvania, and Washington, DC. Inclusion criteria included a diagnosis code (ICD-9 CM) of 430 to 438.99, age greater than 18 years, recent stroke (within 1 year of admission) as the reason for admission, and no interruption in rehabilitation services of greater than 30 days. The data analyses in this article are based on 972 patients who received physical therapy during their rehabilitation stay. The mean age of those patients was 66.1 years (SD = 13.3, range = 18–95). Men comprised 50.7% and women comprised 49.3% of the sample. Fifty-six percent of the patients were white, 24.4% were African American, 4.7% were Asian, and the remaining patients were of other races. Forty-three percent of the patients had left-sided hemiplegia, 44% had right-sided hemiplegia, 10% had bilateral involvement, and the remainder had other types of involvement.

Procedure

Similar to a previous observational study related to physical therapist practice, therapists used data collection forms to record interventions they used during each physical therapy session with a patient across the episode of care. Physical therapy data collection forms and definitions were developed by physical therapists from the centers involved in the study to describe processes of care and interventions used in physical therapy across settings. The interventions were largely derived from the Guide to Physical Therapist Practice; however, the therapists were encouraged to identify the full scope of interventions that they used in their practice. Instructions for completing the forms and definitions of all terms related to activities and interventions listed on the forms were supplied in a training manual to those individuals providing care. One physical therapist at each site participated in a train-the-trainer session under the direction of the project team and then provided training to other therapists in his or her rehabilitation unit. Training consisted of sessions with colleagues using specific case examples to identify, correct, and confirm interventions checked by the various therapists attending. The physical therapists in charge of training at each site were designated as resources for questions related to data collection and recording as the forms were used on a daily basis. Each site developed internal auditing methods.
to ensure that data collection forms were used as intended. Verbal reports of progress and challenges or questions about form use were discussed during weekly telephone conferences that included the project team and at least one clinical representative from each site.

Data collection forms allowed physical therapy providers to describe treatment sessions in terms of categories of activities: prefunctional, bed mobility, sitting, transfers, sit-to-stand, wheelchair mobility, pre-gait, gait, advanced gait, and community mobility. Therapists could identify one or more activities that they worked on with the patient within a session. Within each of these activity categories, therapists recorded the amount of time spent on the activity with the patient and up to 5 specific interventions that they used during the performance of that activity. Therapists could select from 59 interventions, including 8 neuromuscular, 5 musculoskeletal, 2 cardiopulmonary, 4 cognitive/perceptual, 3 educational, 4 equipment related, 3 modalities, and 2 pet therapy interventions.

Interventions reflected both specific techniques, such as proprioceptive neuromuscular facilitation (PNF) or neurodevelopmental treatment (NDT), as well as general theoretical approaches to intervention, such as motor relearning. Twenty-seven types of equipment were listed. One category was provided for writing in interventions not provided on the form. This large list of interventions, developed through the effort of those providing care at the sites involved in the study, allowed therapists to choose from a broad range of possible interventions defined by them in ways that they would understand. The forms also allowed therapists to record the amount of time patients spent being examined and evaluated, in co-treatment with other disciplines and in therapy sessions that included more than one patient. Additional information was reported regarding which providers gave the care during the session, including physical therapists, physical therapist assistants, and students (Figure). Data regarding patient characteristics were collected from patients’ medical records following their discharge by trained data abstractors from each institution.

Data Analysis
Descriptive statistics were derived to examine characteristics of the patients and characteristics of their episodes of care, including length of stay, number of days physical therapy was provided, number of physical therapy sessions per day, and number of days physical therapy was provided divided by the total length of stay. The content of treatment sessions was described by determining the duration of each session, the proportion of all physical therapy time spent directed to the activities listed above, and the proportion of those activities that included specific interventions. We also examined the proportion of all physical therapy sessions in which more than one patient was treated by a single provider and the proportion of sessions for which physical therapists, physical therapist assistants, or students were involved in care. In addition, we determined combinations of activities provided to patients during sessions, the proportion of sessions that included examination/evaluation, and the proportion of patients and families who received an educational intervention.

Results
The 972 patients included in this study participated in 21,192 physical therapy sessions during inpatient rehabilitation. The mean length of stay in the rehabilitation setting, or episode of care, was 18.7 days (SD = 10.3, range = 1–75) (Tab. 1). Patients received physical therapy, on average, 13.6 days (SD = 7.8, range = 1–54) during an episode of care, or 73% of the days during their stay in the rehabilitation hospital. The average number of physical therapy sessions per day was 1.5 (SD = 0.3, range = 1–3), and the average time for each session was 38.1 minutes (SD = 17.1, range = 5–360). Approximately 64% of the sessions were attended by physical therapists, 30% by physical therapist assistants, 9% by physical therapy aides, and 7% by students. In approximately 93% of sessions, only one physical therapy provider was present. In addition, approximately 4% of sessions consisted of co-treatment with another discipline. In approximately 10% of sessions more than one patient was treated by a single provider at one time (Tab. 2).

Eighty-six percent of the patients had some examination/evaluation time recorded. Approximately 7% of all sessions included some examination/evaluation, and 5% of all sessions included only examination/evaluation. Table 3 provides data on the types of interventions therapists used in facilitating therapeutic activities with their patients. Only those interventions included in at least 5% of the sessions for any activity are included in the table. Of a total of 18 types of procedural interventions from which therapists could choose to characterize their care of patients, 13 were used during at least 5% of the sessions that included a particular activity. Equipment interventions, pet interventions, and modality interventions were done during less than 5% of the sessions for each activity.

In approximately 78% of the sessions, patients engaged in training in more than one activity. Gait training, prefunctional activities, and transfer training activities were the most frequently addressed activities (31.3%, 19.7%, and 10% of total treatment time, respectively). Gait activities were defined as activities
focusing on skills needed for ambulation over level surfaces and stairs. Interventions provided most frequently to address gait were balance training, postural awareness training, and motor learning (included in 60.5%, 50.2%, and 40.5% of the gait activities, respectively). Balance training was identified as intervention designed to help maintain the body in equilibrium with gravity both statically and dynamically. Postural awareness training was defined as an intervention designed to improve awareness of the alignment and position of the body in relationship to gravity, center of mass, and base of support. Motor learning was defined as providing practice or experiences leading to change in the capability for producing skilled actions.

Prefunctional activities were those determined to be in preparation for later functional activity or activities that physical therapists provided on behalf of the patient without necessarily having direct contact with the patient. In all sessions that addressed prefunctional activities, the interventions most frequently provided were strengthening exercises, balance training, and motor learning (included in 58.2%, 24.4%, and 24.3% of prefunctional activities, respectively). Strengthening exercises were described as interventions where muscular contractions were resisted by an outside force applied manually or mechanically.

Transfer activities were defined as activities focusing on relocating the body from one surface to another.
The interventions most frequently provided to address transfer ability were balance training, postural awareness training, and motor learning (included in 49.6%, 48.0%, and 51.0% of transfer activities, respectively).

Equipment was used most commonly during gait activities and included 4-wheeled walker, ankle-foot orthosis (AFO), and straight cane (included in 22.9%, 17.0%, and 20.2% of gait activities, respectively). During at least one physical therapy session during their admission, 32% of the patients used an AFO, 62% used a form of cane, 55% used a walker, and 30% used a wheelchair. Wheelchair mobility activities were included during less than 2% of the total treatment time.

Overall, 84% of patients or their families received some educational intervention. Patient and caregiver education was most frequently included during transfer activities, advanced gait activities, and community mobility activities.

**Discussion**

To our knowledge, this study is the first to describe physical therapist management of patients with stroke in terms of specific interventions provided during an episode of care in multiple inpatient rehabilitation settings in the United States. Over the past 30 years, the literature on physical therapy interventions for patients with stroke has described these interventions largely in a nonspecific and qualitative manner. A report from 1969 describes the elements of physical therapist management for patients with stroke as including many of the interventions used frequently by the physical therapists in this study: strengthening exercises, bed mobility and sitting activities, transfer and gait training activities, facilitation of motor control, and use of equipment such as AFOs and straight and wide-based canes with patients. A similar descriptive report included recommendations for most of the same interventions as those described in 1969.

The finding that some interventions described in our study have been used in stroke rehabilitation for the past 30 years is not surprising because the basic armamentaria of physical therapists have not changed dramatically and the focus of care continues to be directed toward reducing impairments and facilitating function or adaptation to impairments. Our findings, however,
Table 3.
Interventions Used to Facilitate Activities*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Prefunctional Percentage</th>
<th>Bed Mobility</th>
<th>Sitting</th>
<th>Transfers</th>
<th>Sit-to-Stand</th>
<th>Wheelchair Mobility</th>
<th>Pre-gait</th>
<th>Gait</th>
<th>Advanced Gait</th>
<th>Community Mobility</th>
<th>All</th>
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<tbody>
<tr>
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<tr>
<td></td>
<td>44.2</td>
<td>17.0</td>
<td>12.9</td>
<td>37.9</td>
<td>25.8</td>
<td>8.6</td>
<td>20.7</td>
<td>60.4</td>
<td>10.7</td>
<td>2.9</td>
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</table>

Interventions (% of sessions within each activity that include intervention)

Procedural interventions

<table>
<thead>
<tr>
<th>Activity</th>
<th>Prefunctional</th>
<th>Bed Mobility</th>
<th>Sitting</th>
<th>Transfers</th>
<th>Sit-to-Stand</th>
<th>Wheelchair Mobility</th>
<th>Pre-gait</th>
<th>Gait</th>
<th>Advanced Gait</th>
<th>Community Mobility</th>
<th>All</th>
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</thead>
<tbody>
<tr>
<td>Balance training</td>
<td>24.4</td>
<td>24.1</td>
<td>74.0</td>
<td>49.6</td>
<td>55.3</td>
<td>8.6</td>
<td>58.3</td>
<td>60.5</td>
<td>59.1</td>
<td>45.4</td>
<td>62.3</td>
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<td>Postural awareness</td>
<td>21.1</td>
<td>36.5</td>
<td>78.8</td>
<td>48.0</td>
<td>56.8</td>
<td>15.3</td>
<td>51.3</td>
<td>50.2</td>
<td>30.1</td>
<td>22.3</td>
<td>55.2</td>
</tr>
<tr>
<td>Motor learning</td>
<td>24.3</td>
<td>62.5</td>
<td>45.9</td>
<td>51.0</td>
<td>45.5</td>
<td>45.2</td>
<td>40.2</td>
<td>40.5</td>
<td>37.8</td>
<td>38.2</td>
<td>52.7</td>
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<tr>
<td>Neurodevelopmental therapy</td>
<td>10.7</td>
<td>12.4</td>
<td>13.1</td>
<td>22.3</td>
<td>28.5</td>
<td>15.7</td>
<td>6.0</td>
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<tr>
<td>Weight-supported gait</td>
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<tr>
<td>Involved upper limb addressed</td>
<td>11.9</td>
<td>19.1</td>
<td>24.9</td>
<td>11.8</td>
<td>13.6</td>
<td>11.2</td>
<td>13.9</td>
<td>7.3</td>
<td></td>
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<td>16.9</td>
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<tr>
<td>Strengthening</td>
<td>58.2</td>
<td>18.1</td>
<td>15.5</td>
<td>14.6</td>
<td>29.9</td>
<td>19.5</td>
<td>12.2</td>
<td>16.9</td>
<td></td>
<td>9.1</td>
<td>41.7</td>
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<td>Passive stretching</td>
<td>18.8</td>
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<tr>
<td>Motor control</td>
<td>20.8</td>
<td>18.4</td>
<td>17.3</td>
<td>18.1</td>
<td>20.2</td>
<td>16.8</td>
<td>20.0</td>
<td>22.2</td>
<td>21.9</td>
<td>12.4</td>
<td>30.0</td>
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<td>Aerobic exercises</td>
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<tr>
<td>Cognitive training</td>
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<td>7.0</td>
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<td></td>
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<td>5.5</td>
<td>16.0</td>
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<td>8.5</td>
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<tr>
<td>Perceptual training</td>
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<td>7.1</td>
<td>6.8</td>
<td>5.0</td>
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<td>5.6</td>
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<td>Patient education</td>
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<td>6.1</td>
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<td>6.0</td>
<td>7.8</td>
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<td>16.8</td>
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<td>Ankle-foot orthosis</td>
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<tr>
<td>Small-base quad cane</td>
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<td>Straight cane</td>
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<td>Parallel bars</td>
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<td>6.3</td>
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<tr>
<td>Wheelchair</td>
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*Percentage shown only if ≥5%.
are consistent with a shift in the physical therapy approach to management of patients with stroke from the specific reflex-based neurofacilitation techniques advocated in the 1960s, such as Bobath, Brunnström, Rood, and PNF, to an approach based on motor control and motor learning theories. In our study, physical therapists identified and defined interventions that they used in practice and could choose up to 5 different interventions to describe their approach to an activity. Although the therapists in our study listed PNF as an intervention, it was used in less than 5% of the sessions. Neurodevelopmental treatment, based on the Bobath approach, was listed as an intervention and used frequently in activities (6%–28%). Other generic interventions, such as balance training, postural awareness, and motor learning interventions, however, were selected more often. The fact that the physical therapists in our study infrequently chose techniques such as PNF during their sessions with patients provides evidence of this shift in therapeutic approach to management of patients with stroke. Our data do not allow us to fully explore which theories of motor learning or motor control influenced the physical therapists’ therapeutic approach to care. The results suggest, however, that advances in scientific theories of motor control and motor learning may have had an influence on physical therapist practice.

The results of our study indicate that functional activities are a focus for physical therapist practice in stroke rehabilitation. That is, the majority of physical therapy session time was spent in functional activities. We also observed that many procedural interventions were integrated into more than one functional activity. Therapists used interventions to address a range of impairments in the context of functional activities. For example, the following procedural interventions were incorporated into transfer activities: balance training, postural awareness, motor learning, NDT, upper-limb activities, strengthening, motor control, cognitive training, and perceptual training. Thus, an approach in which functional training and neurofacilitation were separate activities seems to have been replaced by functional training that incorporates a multidimensional approach. An approach to neurorehabilitation focused on functional activities, as advocated by Carr and Shepherd, disseminated via the proceedings of the II-STEP Conference in 1991, interpreted by Shumway-Cook and Woolf, and seems to have been adopted by physical therapists involved in stroke rehabilitation.

The AHCPR clinical practice guideline for rehabilitation of people after stroke noted that physical therapy interventions for patients with stroke could be classified into 3 categories: (1) “remediation,” exemplified by use of neuromuscular facilitation, sensory stimulation, and resistive training to redress impairments; (2) “compensation,” emphasizing independence in basic ADL by teaching patients adaptive techniques using the noninvolved side when they are unable to use the involved side; and (3) “motor control,” encouraging practice of activities under specific, real-life conditions. The guidelines provided recommendations that supported physical therapy interventions based on each of these approaches. The guidelines from the RCP recommended that patients see a therapist “each working day if possible” and that patients receive as much therapy as they could tolerate. They further recommended that gait re-education be offered, although no specific techniques could be recommended on the basis of evidence. Duncan et al reported that adherence to AHCPR guidelines was associated with improved functional outcomes in patients.

The recommendations from both sets of guidelines are broad and recognize the patient’s impairments as important factors in determining the appropriate approach to intervention. If the 3 approaches to intervention suggested in the AHCPR guidelines are valid, however, our findings indicate that therapists use all 3 approaches in their care of patients. Moreover, most sessions (~78%) addressed more than one activity. This “eclectic” approach seems consistent with the RCP guidelines, which note that there is no evidence to support the superiority of one approach over another. An approach to care that includes several activities at each session is consistent with findings related to care provided by physical therapists to patients with musculoskeletal conditions. An “eclectic” approach to management of stroke also has been reported by therapists practicing in the United Kingdom.

A “motor control” approach is suggested by the high percentage of therapy time (~54%) spent with the patient engaged in one of the following functional activities: bed mobility, sitting, transfers, sit-to-stand, or gait. Therapists indicated that they frequently incorporated a motor learning (~53%) or motor control (30%) approach as a procedural intervention. In our study, motor learning interventions were defined by consensus among the participating therapists as targeting impairments in the neuromuscular system and providing practice or an experience leading to change in the capability for producing skilled action. Motor control interventions were defined as targeting impairments in the musculoskeletal system and encouraging purposeful movement and postural adjustment by selective allocation of muscle tension across joint segments. Some people might argue that the definitions of motor control and motor learning are inadequate because they could define the basis for many types of interventions such NDT or wheelchair mobility. Because a therapist in our study could identify
up to 5 types of interventions for each activity, motor control, motor learning, and NDT, for example, could have been selected to describe a therapist’s approach to facilitating an activity with a patient. The literature supports the fact that a lack of a conceptually sound, theory-driven system for classifying interventions is a problem that limits advances in the understanding of rehabilitation in stroke.25

A “remediation” approach to rehabilitation was suggested by prefunctional and pre-gait activities. Almost 20% of all therapy time was spent on prefunctional activities such as strengthening and range-of-motion exercises that were not part of a functional activity. A remediation approach also might include the use of modalities such as biofeedback or functional electrical stimulation. Despite some evidence suggesting the efficacy of electromyographic biofeedback26-27 and functional electrical stimulation28,29 in stroke rehabilitation, these interventions, which were first introduced in the late 1970s, are not supported by the guidelines and appear not to have been adopted widely by therapists in our study. Data indicate that biofeedback and functional electrical stimulation were used in less than 1% of the interventions.

Recently, there has been interest in 2 new approaches to stroke rehabilitation that might be considered to represent a remediation approach to intervention. These approaches include constraint-induced movement therapy, extensive practice for involved upper-limb rehabilitation,17 and weight-supported gait training.30 Therapists in our study used constraint-induced movement therapy infrequently (<1% of sessions), and, despite a large percentage of time devoted to gait training by therapists in our study, weight-supported gait training was used in less than 5% of all sessions.

In our opinion, the use of an AFO, cane, and walker for gait activity by some patients may indicate the use of a “compensatory” approach, as suggested by the AHCPR guidelines.3 A high proportion of treatment time also was spent on transfer training. In some patients, this activity may involve teaching the patient a compensatory strategy for safely moving from surface to surface. Interestingly, in patients with stroke, the greatest functional impairment as well as the greatest improvement has been shown to be in locomotion and transfer ability.31 Therapists in our study may have addressed these activities frequently because patients displayed low levels of ability in these areas at admission and disability in these areas is amenable to improvement. The focus on gait training also is supported by the RCP guidelines.4 Our findings also indicate that therapists spend a great deal of time in therapy working on balance training, but this intervention is not directly supported by the AHCPR guidelines.

Education of the patient and family was included in a fairly low percentage of sessions for each activity and in only approximately 7% of the sessions overall. At first glance, this finding does not appear consistent with either set of guidelines. In our opinion, however, teaching the family can often be accomplished in relatively few sessions, and we would not expect family members to be present during most sessions. Overall, 84% of the patients or their families received some educational intervention, thereby suggesting adherence to the guidelines. Education of patients and families in our study tended to be most prevalent in addressing high-level (advanced gait and community mobility) and low-level (transfers) activities. In our opinion, these are activities for which patients may require the most input or help when they return home, depending on their level of mobility skills.

Given our lack of data on specific impairments, we were unable to determine if the AHCPR3 and RCP4 guidelines’ recommendations for use of adaptive and assistive devices were followed. The finding that 30% of the patients used a wheelchair during at least one physical therapy session and the finding that only 2% of total treatment time was used for wheelchair mobility training suggest that the patients may have used wheelchairs for a short period of time during their rehabilitation stay. It seems likely, given the focus on gait training, that physical therapists would work to transition patients from wheelchair to walking mobility. This finding would be consistent with guidelines that suggest adaptive and assistive devices be used only if other methods are not possible for completing an activity. The majority of patients used a cane or a walker during at least some of the treatment sessions.

In our study, physical therapy was provided to patients on 73% of the days during their rehabilitation stay. This finding is consistent with an approach to rehabilitation in which physical therapy is provided on weekdays and not on weekends and appears to be consistent with the RCP guidelines that provide a level B recommendation for therapy every “working day.”4 The RCP guidelines also provide a level A recommendation for patients receiving as much therapy as they can tolerate. In our study, patients received approximately 38 minutes of physical therapy per session and an average of 1.5 sessions of physical therapy on those days that they received physical therapy. Ninety-eight percent of the patients also received occupational therapy for an average of 41 minutes per day across the entire length of stay. It is unclear whether this amount of therapy represents the limits of patients’ tolerance. The finding is interest-
ing, however, in light of the Medicare requirement for acute rehabilitation admission that the patient be able to tolerate 3 hours of therapy per day.\textsuperscript{32}

Our study has some important limitations. Although detailed information about stroke severity and medical condition was collected, we did not have data on patients’ specific impairments such as loss of voluntary motor control. We were unable, therefore, to relate the choice of interventions to impairment as suggested by the stroke guidelines.\textsuperscript{3,4} Because our aim was to describe physical therapy activities and interventions, this report does not suggest that any one intervention or combination of activities results in better functional outcomes for patients. Two previous studies\textsuperscript{23,33} have shown that better outcomes for patients are associated with settings’ higher rates of adherence to clinical practice guidelines.

Another limitation is that we did not specifically test the reliability of the data collection within or among providers. Although physical therapists in the settings we studied were trained in the use of data collection forms and written definitions were provided in a training manual, there are potential limitations in data reliability due to interpretation of the categories of interventions and activities. A problem with interpretation may have resulted in some misclassification of interventions and activities. In our opinion, these random errors are likely to have a small effect on the overall findings because data were collected from a large number of participants (N=972) over many sessions (>20,000). Insofar as any definitions may have inaccurately represented the interventions, however, there is a chance for systematic error. Definitions provided to therapists were somewhat broad and did not allow identification of very specific and detailed descriptions of treatment that might include, for example, how a physical therapist approaches balance training with a patient, what tone of voice is used, how much rest is given, or how challenging the activity is for an individual. Despite this lack of specific detail, to our knowledge there is no other published study that reports this degree of description of physical therapy for a large number of patients with stroke who received care in multiple facilities. This approach to data collection may be considered a first step to further refining descriptions of physical therapy interventions.

**Conclusion**

Physical therapy provided to patients with stroke in inpatient rehabilitation facilities reflected an integration of treatment approaches with inclusion of interventions to remediate impairments and compensate for functional limitations as well as to improve motor control. The care appears to adhere, in general, to stroke guidelines published in the literature. The largest percentage of time in physical therapy sessions was spent on gait activities. Balance training, postural awareness training, and motor learning were included in a majority of treatment sessions. Nearly all patients were provided with an examination/evaluation, and they or their families were provided with education by the physical therapy providers.

**References**


