Physical Therapy Assessment and Treatment
Protocol for Nursing Home Residents
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Physical Therapy Assessment and Treatment Protocol for Nursing Home Residents

This article describes a standard protocol for assessing physical function in elderly nursing home residents. Major physical dimensions that are measured with the protocol include range of motion, muscle force, muscle reflex activity, sensation, soft tissue status, balance/coordination, and posture. A practical, functionally prioritized treatment model based on the assessment is also presented. The standardized assessment and treatment plan may be useful to the physical therapist in (1) planning and prioritizing treatment, (2) identifying when goals have been met, (3) recognizing when there is a need for treatment plan modification, and (4) educating physical therapy students in applying problem-solving skills in their treatment sessions. [O'Neil MB, Woodard M, Sosa V, et al. Physical therapy assessment and treatment protocol for nursing home residents. Phys Ther. 1992;72:596–604.]

Key Words: Elderly, Nursing homes, Physical therapy.
The purpose of assessing a patient is often to devise an appropriate treatment program. Few assessment protocols include a treatment model from which an effective treatment program can be designed. A standard treatment model based on specific assessment findings should accompany an assessment protocol to assist the physical therapy practitioner in developing a treatment program.

The elderly patient in the nursing home often has many physical impairments that cause disability in several functional activities such as bed mobility, transfers, and ambulation. It is usually not feasible to address all of the patient’s physical impairments in every treatment session. Most patients cannot tolerate this much activity, and most therapists do not have the time required by this treatment approach. Therefore, we believe that therapists should prioritize treatment procedures so that they are focused on two or three short-term goals. This focus will allow the optimal use of treatment time so that the patient’s functional recovery can be maximized.

In order to prioritize treatments, rules are needed to ensure that therapists select the most appropriate treatments for each patient. The purposes of this study were (1) to begin development of a comprehensive, standard assessment tool appropriate for the elderly nursing home resident; (2) to begin development of a treatment model based on the standard assessment from which a prioritized, goal-oriented treatment plan can be developed; and (3) to establish interrater reliability in the use of the standard assessment protocol.

**Methods and Results**

**Assessment and Treatment Protocol Development**

The standard assessment protocol was developed by three experienced physical therapists using a nominal group process whereby the therapists nominated the items to be considered for the protocol, based on their literature review and “expert” opinions. Existing physical therapy assessment protocols appropriate for the elderly patient were gathered from a literature review, local hospitals, and extended care facilities. From these assessment forms and the therapists’ own clinical experience, a list of evaluation procedures or areas of evaluation commonly used in the assessment of the elderly patient was made. One criterion used in determining which evaluation procedures to include in the assessment tool was that the procedure have face or content validity for measuring a physical dimension (1) often affected by aging or age-associated disease, (2) important to performance of activities of daily living, and (3) likely to respond to physical therapy. Psychosocial dimensions were not included, except for gross estimations of behavior, communication skills, and mental status, because these estimations were considered necessary for the therapist’s assessment of the patient’s ability to comply with treatment. Procedures also had to be feasible to administer in a nursing home setting without relying on expensive instruments.

The following evaluation procedures or areas of evaluation met the criteria and were included in the final assessment tool: general behavior, communication skills, mentation, muscle force, range of motion (ROM), muscle reflex activity, sensation, involuntary muscle movements such as tremors, balance, cerebellar tests of coordination, posture, skin integrity, activities of daily living, bed mobility, and locomotion. The specific technique for measuring each of these physical di-

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**PHYSICAL THERAPY TREATMENT ALGORITHM**

<table>
<thead>
<tr>
<th>General Conditioning Training</th>
<th>Functional Activity Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>*** Range of Motion Exercises</td>
<td>** Strengthening and Endurance Exercises</td>
</tr>
<tr>
<td></td>
<td>Balance and Coordination Training</td>
</tr>
<tr>
<td></td>
<td>** Bed Mobility Training</td>
</tr>
<tr>
<td></td>
<td>Transfer Training</td>
</tr>
<tr>
<td></td>
<td>** Wheelchair Training</td>
</tr>
<tr>
<td></td>
<td>** Locomotion Training</td>
</tr>
<tr>
<td></td>
<td>** Balance Training</td>
</tr>
</tbody>
</table>

**Figure.** Physical therapy treatment algorithm. Asterisk (*) indicates progress to next highest functional level when patient can perform the activity with moderate assistance (26%-50% assistance); continue training at lower functional level until patient requires supervision or is independent. Double asterisk (**) indicates continue strengthening, balance, and coordination training until adequate to support or to advance endurance in the functional activity. Triple asterisk (***) indicates total assistance: patient expends less than 25% of the effort.
dimensions and the sequence of testing were defined prior to the study. 27-30 The level at which each physical dimension was determined to be impaired or considered to have a deficit was also defined. (For further details concerning the evaluation procedure, see Appendix 1.) This level was called the impairment threshold (eg, shoulder flexion <120°, hip flexion <100°, ankle dorsiflexion <5°).

Following the evaluation, the therapist recorded all impairments (ie, the area and degree of deficit) detected using a list of 18 assessments with their defined impairment thresholds. For example, if the patient was found to have Poor strength in the right shoulder, “impaired strength, right upper extremity” was checked. The specific area of weakness, in this example the shoulder, should be written in the space provided next to the recorded assessment.

After developing the assessment protocol, two broad categories of therapeutic procedures were considered in developing a treatment protocol: general conditioning training (GCT) and functional activity training (FAT) (Appendix 2). General conditioning training includes physical therapy activities that are necessary for improving physical characteristics such as strength, ROM, and balance. These activities were included because we believe that they are prerequisites for successfully performing functional activities. Functional activity training includes training in bed mobility, transfers, wheelchair activities, gait, and activities of daily living. Usually, GCT will precede or accompany FAT until the patient can perform the functional activities without assistance.

To assist the therapist in planning a treatment program, a treatment model was developed (Figure). Standardized rules were made to be used in conjunction with the treatment model so that treatments and goals could be prioritized. We believe that the treatment plan should consist of training in one or two functional activities and one or two general conditioning activities. If more activities are planned for the patient, we believe that the chance of obtaining a training effect or carryover by the patient is greatly decreased because of the lack of intensity in any one activity.

To use the treatment model (Figure), the therapist first uses the assessment protocol to determine the patient’s lowest functional level in which he or she is dependent. Bed mobility is obviously the lowest functional activity, and locomotion is the highest.

Next, the therapist must determine what physical impairments are contributing to the patient’s inability to independently perform that functional activity. The therapist may then prioritize treatment for these impairments by answering the following questions: (1) How much does each impairment contribute to the patient’s inability to perform the functional activity? and (2) How much can physical therapy improve this impairment? The following scale is used to quantify the therapist’s answers to these questions: 5 =maximally (100%), 4 =strongly (75%), 3 =moderately (50%), 2 =minimally (25%), 1 =not at all (0%). Impairments in which physical therapy would never be effective (as judged by the therapist), such as impaired strength secondary to permanent paralysis, are automatically placed at the bottom of the priority list. Impairments that do not contribute to the patient’s dependent function (as judged by the therapist) are also placed at the bottom of the priority list. The remaining impairments are rank-ordered from highest to lowest by adding the scores the therapist gave for the two questions. Treatments for the two highest impairments are then prioritized into the initial physical therapy plan. This treatment plan consists of training the patient at the lowest dependent functional level and treating the patient for the two highest-priority impairments. As each short-term goal is met, the treatment priority list will change to reflect the patient’s progress.

If the patient is totally dependent in all functional activities, it is not feasible to work on function, because the therapist is providing more than 75% assistance. Therefore, the treatment program begins with GCT to prepare the patient for FAT. As soon as the patient requires less than 75% assistance in bed mobility, the therapist begins FAT at that level. The patient is progressed to the next functional level when the current activity can be performed with less than 50% assistance. The therapist continues training at the lower functional level, however, until the patient is independent in that functional activity. If the patient shows no response to therapy within 2 to 4 weeks, training at that level is terminated and the next prioritized area is chosen. Appropriate GCT is continued until adequate to support or to advance endurance in the functional activity.

If the patient is independent in some functional activities but dependent in others, the treatment plan begins on the right side of the model shown in the Figure and focuses on the lowest functional activity at which the patient is dependent. The necessary GCT to support this functional activity is determined by rank-ordering the impairments as described previously. As soon as the patient can perform 50% of this functional activity, treatment and goals are advanced to include training in the next higher functional activity. Appropriate GCT is continued to support or to advance the functional activity.

Reliability Testing

Twenty patients (18 male, 2 female) from the Extended Care Treatment Center at the Audie L. Murphy Memorial Veterans Affairs Hospital at San Antonio were randomly selected to participate in interobserver reliability testing. The criteria for subject inclusion were (1) age 60 years or older, (2) no acute illnesses that would preclude testing, and (3) deficiencies in at least two activities of daily living. Patients with a score less than 50% on the Folstein Mini-Mental State Examination were excluded. After the evaluation procedure was explained to the subjects, all agreed to participate.
The ages of the subjects ranged from 63 to 93 years, with a mean of 81.5 years (SD=0.5) for the women and a mean of 73.7 years (SD=0.3) for the men. The major diagnoses relating to functional disabilities were paraplegia (3), degenerative joint disease (2), fractured hip (5), cancer (1), cerebrovascular accident/hemiplegia (6), Parkinson's disease (1), below-knee amputation (1), and rheumatoid arthritis (1).

Two physical therapists, with an average of 12.5 years of clinical experience (one with 14 years' experience and the other with 10 years' experience), performed the physical therapy evaluations using the standard assessment form. Prior to the initiation of the study, both therapists were trained for standardization in the use of the assessment form. This training was administered by a senior physical therapist and a geriatrician using approximately 10 patients. Each subject was evaluated by these two physical therapists on consecutive days at approximately the same time of day. The order of evaluation was randomized by the flip of a coin. The physical therapists were not aware of any prior results from each other's evaluations.

In order to standardize the test positions and to emphasize function and efficiency, we elected to test voluntary ROM and muscle strength of all extremities with the patient positioned supine. This was done because some of the patients were completely bedridden and unable to assume different positions. The supine position also is commonly used for testing elderly patients in nursing home facilities.

The Kappa statistic was used to determine the amount of agreement between the two therapists' assessments and treatment plans, thereby establishing the interrater reliability of both the evaluation form and the treatment model. The Kappa statistic was chosen because it is applicable to categorical variables and because it assesses agreement beyond what would be expected based on chance alone. According to Landis and Koch,31 Kappa values

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### Table 1. Interrater Reliability Results for Assessment Items

<table>
<thead>
<tr>
<th>Assessment Item</th>
<th>No. Agree</th>
<th>No. Disagree</th>
<th>Percentage of Agreement</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impaired ROM, a right upper extremity</td>
<td>17</td>
<td>3</td>
<td>85</td>
<td>.68</td>
</tr>
<tr>
<td>Impaired ROM, left upper extremity</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.76</td>
</tr>
<tr>
<td>Impaired ROM, right lower extremity</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.80</td>
</tr>
<tr>
<td>Impaired ROM, left lower extremity</td>
<td>17</td>
<td>3</td>
<td>85</td>
<td>.58</td>
</tr>
<tr>
<td>Impaired strength, right upper extremity</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>.79</td>
</tr>
<tr>
<td>Impaired strength, left upper extremity</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.47</td>
</tr>
<tr>
<td>Impaired strength, right lower extremity</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.64</td>
</tr>
<tr>
<td>Impaired strength, left lower extremity</td>
<td>15</td>
<td>5</td>
<td>75</td>
<td>.64</td>
</tr>
<tr>
<td>Postural dysfunction</td>
<td>15</td>
<td>3</td>
<td>83</td>
<td>.45</td>
</tr>
<tr>
<td>Impaired balance/coordination</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.05</td>
</tr>
<tr>
<td>Dependent bed mobility</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>.91</td>
</tr>
<tr>
<td>Dependent transfers</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.72</td>
</tr>
<tr>
<td>Dependent wheelchair</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>.94</td>
</tr>
<tr>
<td>Dependent ambulation</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.67</td>
</tr>
<tr>
<td>Impaired feeding</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.61</td>
</tr>
<tr>
<td>Impaired dressing</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.79</td>
</tr>
<tr>
<td>Impaired grooming</td>
<td>18</td>
<td>1</td>
<td>95</td>
<td>.89</td>
</tr>
<tr>
<td>Overall</td>
<td>293</td>
<td>44</td>
<td>87</td>
<td>.71</td>
</tr>
</tbody>
</table>

aROM=range of motion.

bExcludes extreme Kappa value of .05 found for impaired balance/coordination item.

### Table 2. Interrater Reliability Results for Treatment Items

<table>
<thead>
<tr>
<th>Treatment Item</th>
<th>No. Agree</th>
<th>No. Disagree</th>
<th>Percentage of Agreement</th>
<th>Kappa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of motion</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.42</td>
</tr>
<tr>
<td>Strength/endorseance</td>
<td>20</td>
<td>0</td>
<td>100</td>
<td>.84</td>
</tr>
<tr>
<td>Sensory stimulation/normalize tone (muscle reflex activity)</td>
<td>16</td>
<td>4</td>
<td>80</td>
<td>.58</td>
</tr>
<tr>
<td>Postural training</td>
<td>16</td>
<td>2</td>
<td>89</td>
<td>.11</td>
</tr>
<tr>
<td>Balance/coordination training</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.87</td>
</tr>
<tr>
<td>Modalities</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.67</td>
</tr>
<tr>
<td>Bed activities</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>.91</td>
</tr>
<tr>
<td>Transfer training</td>
<td>18</td>
<td>2</td>
<td>90</td>
<td>.82</td>
</tr>
<tr>
<td>Locomotion training</td>
<td>19</td>
<td>1</td>
<td>95</td>
<td>.89</td>
</tr>
<tr>
<td>ADL* training: feeding</td>
<td>15</td>
<td>5</td>
<td>75</td>
<td>.60</td>
</tr>
<tr>
<td>ADL training: dressing</td>
<td>15</td>
<td>5</td>
<td>75</td>
<td>.50</td>
</tr>
<tr>
<td>ADL training: grooming</td>
<td>16</td>
<td>3</td>
<td>84</td>
<td>.57</td>
</tr>
<tr>
<td>Overall</td>
<td>206</td>
<td>31</td>
<td>87</td>
<td>.68</td>
</tr>
</tbody>
</table>

aADL=activities of daily living.
bExcludes extreme Kappa value of .11 for postural training item.
greater than .70 to .75 represent excellent agreement between raters beyond chance. Kappa values between .40 and .70 represent fair to good agreement, and those below .40 represent poor agreement. The percentage of agreement between the two therapists for each assessment and treatment plan was also determined as a secondary means for statistical analysis.

The entire assessment protocol took an average of 45 minutes to administer. One subject could not stand for the postural assessment portion of the assessment protocol because of pain. One subject with paraplegia could not sit for a postural assessment because of sacral ulcers. In analyzing agreement between the assessment of postural dysfunction and the treatment of postural training, these two subjects were excluded. All of the other subjects tolerated the assessment well. One subject was not tested for grooming skills because his dentures were being repaired; therefore, there were only 19 observations for the assessment of impaired grooming and the treatment of grooming training.

The results of the interrater reliability testing for each assessment and treatment using the Kappa coefficient and the percentage of agreement are presented in Tables 1 and 2, respectively. The Kappa values for patient assessments ranged from .45 to .94, except for the impaired balance category, which had a low Kappa value of .05. All the percentages of agreement for the assessments were 75% or better. The Kappa values for patient treatment ranged from .42 to .91, except for the postural training category in which the Kappa value was .11 and the balance training category in which the Kappa value could not be calculated. All percentages of agreement for the treatments were also 75% or better.

**Discussion**

A standard, comprehensive assessment and treatment protocol appropriate for the heterogeneous elderly nursing home resident population was developed and found to have good interrater reliability. The protocol has face validity and was developed by physical therapists with extensive experience in assessing and treating elderly persons. Multiple important dimensions of physical assessment, including ROM, strength, balance, coordination, and posture, were included. A relevant prioritized treatment plan based on the assessment findings and modeled on addressing both GCT and FAT was also developed. Moreover, this protocol is different from existing instruments because it is applicable to nursing home residents with multiple debilitating conditions and because it links therapists' assessments with subsequent treatment plans. Thus, it represents a pragmatic instrument for physical therapists practicing in nursing homes.

In general, items included in the standardized assessment and treatment protocol demonstrated fair to high interrater agreement among therapists and thus can be expected to be administered in a reliable manner. Because only two therapists were used as raters and because both raters were in part trained by the test developers, the reliability coefficients obtained must be considered with extreme caution. Future studies using raters not trained by the test developers are needed to determine more generalizable reliability.

The only two low Kappa values of .05 and .11 for the impaired balance assessment and postural training treatment items were associated with high agreement percentages of 90% and 89%, respectively. High agreement, but low Kappa values, occur secondary to a well-recognized statistical paradox whenever there is an uneven distribution of judgments. The Kappa values are drastically lowered because both raters rank a particular item (eg, impaired balance, postural training) as occurring in the vast majority of cases. In such a situation, the marginal totals used to calculate the Kappa values are markedly disparate and result in low values. Because of the poor distribution of judgments, reliability cannot be assessed with the Kappa statistic in such circumstances, and the reliability for these assessments remains unknown. Regarding the balance training treatment item, a Kappa value could not be calculated because one rater assessed everyone as needing that item.

There are several limitations to the presented protocol that warrant further study. The protocol was developed on a predominantly male patient sample. Although we have subsequently used the instrument without difficulty in the assessment and treatment of 70 residents of community nursing homes, including 40 women, its evaluation in larger studies that include more women is needed. Interobserver reliability data should be expanded to include more observers. Although intraobserver reliability was not tested in this study because of the inherent inflationary bias in therapists having knowledge of their own prior assessments, future studies should include measures of intraobserver reliability. In addition, the therapists received special training that makes them atypical raters. Finally, the construct and criterion validity of the measure, as well as its ability to detect change, should be assessed.

Several improvements in the assessment part of the protocol also warrant consideration. For example, patients' priorities or goals for therapy could be assessed. A summary of specific impairments that were found could be added. More precise measures of soft tissue swelling other than minimal, moderate, and severe could be developed.

**Conclusions**

Regardless of limitations, we believe the protocol appears promising as a framework from which a reproducible, prioritized physical therapy program can be developed. The treatment model, with its rules for prioritizing treatments, is especially useful for the elderly patient population because these patients typically have decreased physical endurance and multiple impairments that may
require extensive treatments. Focusing the treatment gives this protocol the potential to be used as a tool for communicating goals to both patients and nursing staff. The standardization and reliability of information gathered make the protocol appropriate for practical quality assurance purposes and student training. Because the total time required to complete the entire assessment is less than 1 hour, this protocol is time-efficient and easy to utilize by therapists who often have a limited amount of time to work with patients with multiple deficits. Finally, and most importantly, the protocol gives the clinician a comprehensive assessment and goal-oriented treatment plan based on functional abilities that is specifically tailored for the elderly.

Acknowledgment

We thank Christine Aguilar, MD, for her assistance with this manuscript.

Appendix 1. Physical Therapy Assessment and Treatment Protocol

<table>
<thead>
<tr>
<th>Sequence of Testing</th>
<th>Measurement Technique*</th>
<th>Impairment Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Range of motion (ROM)</td>
<td>Active range of motion (AROM) and passive range of motion (PROM) measured with a standard goniometer.</td>
<td>A joint motion not WSL.°</td>
</tr>
<tr>
<td>2. Strength (muscle force)</td>
<td>Gross manual muscle test performed for all major muscle groups. Graded on scale of 0 to 5, as described by Kendall and McCrea.²⁸</td>
<td>Strength less than 4 (Good)</td>
</tr>
<tr>
<td>3. Muscle tone (reflex activity)</td>
<td>All major muscle groups tested and graded flaccid, hypotonic, normal, hypertonic, or sustained.²⁹</td>
<td>Any group not graded normal</td>
</tr>
<tr>
<td>4. Sensation</td>
<td>Light touch, pain, and proprioception tested for all extremities and graded absent, decreased, normal, or increased.</td>
<td>Any part not graded normal</td>
</tr>
<tr>
<td>5. Involuntary movements</td>
<td>Presence of tremors, chorea, and so on observed in all extremities, the trunk, and the neck at rest and during voluntary movements.</td>
<td>Presence of any involuntary movements</td>
</tr>
<tr>
<td>6. Coordination</td>
<td>Patient touches finger to nose, then touches finger to the examiner's finger. Patient touches heel to shin on command. Rapid alternating movements are tested with pronation/supination and dorsiflexion/plantar flexion. Graded abnormal if there is past pointing, tremors, or ataxia or if patient cannot perform rapid alternating movements.</td>
<td>Any abnormal grades</td>
</tr>
<tr>
<td>7. Soft tissue status</td>
<td>Skin breakdown and swelling observed for all extremities and trunk.</td>
<td>Presence of swelling or extreme blisters or openings</td>
</tr>
<tr>
<td>8. Gross motor skills</td>
<td>Bed mobility and transfers assessed based on the amount of manual assistance needed using a scale of 0 (total assistance) to 5 (independent).</td>
<td>Any task graded less than independent</td>
</tr>
<tr>
<td>9. Posture</td>
<td>Assessed sitting and standing using a modified version of REEDCO's postural screen.³⁰,³¹ Ten areas are graded on scale 1 to 5, with 1=poor, 3=fair, 5=good. Maximum score is 50.</td>
<td>Score of less than 60%</td>
</tr>
<tr>
<td>10. Balance</td>
<td>Sitting: Sit unsupported, feet on floor, for 30 seconds. Postural nudges applied to the sternal and midscapular areas and each shoulder using palms of hands. Dynamic: Reach each arm across the midline. Reach down to each ipsilateral foot.</td>
<td>Unable to maintain balance</td>
</tr>
<tr>
<td></td>
<td>Standing: Sit with normal stance for 30 seconds without an assistive device with eyes open, then closed. Moderate postural nudges applied to the sternum and both shoulders. Dynamic: Positioned as in static test. Step forward, then back with each foot.</td>
<td>Unable to maintain balance</td>
</tr>
<tr>
<td>11. Locomotion</td>
<td>Timed propelling wheelchair 45.7 m (150 ft) without assistance. Timed with stopwatch.</td>
<td>Unable to complete 45.7 m independently</td>
</tr>
<tr>
<td></td>
<td>Timed walking 45.7 m as quickly as possible. Amount of manual assistance given by therapist recorded. Assistance graded as in gross motor skills.</td>
<td>Unable to complete 45.7 m without manual assistance</td>
</tr>
<tr>
<td>12. Activities of daily living</td>
<td>Feeding: Patient is observed cutting food and bringing food to mouth. Dressing: Patient is observed brushing teeth or cleaning dentures and brushing hair. Grooming: Patient is observed donning a shirt and pants or a dress and shoes.</td>
<td>Unable to perform a task in each activity</td>
</tr>
</tbody>
</table>

Measuring Technique Instructions

1. Motor Functions

   Range of motion: Assessed with a standard goniometer at all major joints using the standard methods described by Norkin and White.²⁷ The term "within specified limits" (WSL) is also recorded if the AROM is two thirds of that described as normal by the American Academy of Orthopedic Surgeons. Exceptions to this are: elbow flexion=120 degrees, hip flexion=100 degrees, and dorsiflexion=5 degrees.

(continued)
Appendix 1. (Continued)

Impairment threshold: An assessment of "impaired ROM" is recorded if a joint is not WSL.

**Strength (Muscle Force):** Measured for all major muscle groups in the supine position and graded on a scale of 0 to 5 as described by Kendall and McCrery. Specific positions are defined for each muscle group. In general, the muscle was tested at midrange.

Impairment threshold: An assessment of "impaired strength" is recorded if strength is less than Good (4/5).

**Muscle Tone (Reflex Activity):** Measured in all extremities by having the patient relax completely to allow the physical therapist to passively move the body part through the available ROM.

Impairment threshold: An assessment of "abnormal muscle tone" is recorded under "other" if the muscle is flaccid, hypotonic, or hypertonic or if the reflex is sustained.

**Involuntary Movements:** Noted by observation at rest and during requested voluntary movements.

Impairment threshold: An assessment of "specific dyskinesia" is recorded under "other" if there are tremors, chorea, and so forth.

**Gross Motor Skills/Locomotion:** Assessed based on the amount of manual assistance needed using the following scale:

- **0=Total Assistance:** The patient requires more than 75% manual assistance to perform the activity.
- **1=Maximal Assistance:** The patient requires 51% to 75% manual assistance to perform the activity.
- **2=Moderate Assistance:** The patient requires 26% to 50% manual assistance to perform the activity.
- **3=Minimal Assistance/Contact Guarding:** The patient requires 25% or less manual assistance to perform the activity.
- **4=Supervision:** The patient requires supervision, but no more help than verbal cuing or coaxing. There is no physical contact.
- **5=Independent:** The activity is performed safely without the help of another person. The patient may use an assistive device, but must be independent with it.

Impairment threshold: An assessment of "dependent bed mobility" or "dependent transfers" if graded less than independent.

Locomotion is evaluated by having the patient walk or propel a wheelchair along a 45.7-m measured course as quickly, but safely, as possible. Using a stopwatch, the therapist times how long it takes the patient to complete the distance as well as how much assistance, if any, is required. Specific gait deviations are noted. If the patient cannot propel the wheelchair for any distance without the assistance of the therapist, the amount of assistance needed (0-4) is recorded, but not the time and distance.

Impairment threshold: An assessment of "dependent wheelchair mobility" is recorded if the patient is less than independent for 45.7 m. An assessment of "dependent ambulation" is recorded if the patient is less than independent with or without an assistive device.

2. **Sensation:** Assessed in all extremities. Light touch is assessed using a piece of cotton. Pain is assessed using a pinprick, and proprioception is assessed for both position and movement sense.

Impairment threshold: An assessment of "impaired sensation" is recorded under "other" if graded absent, decreased, or increased.

3. **Soft Tissue Status:** All limbs are observed for swelling and skin integrity, then graded on a scale of 0 to 5 for skin integrity and on a scale of 0 to 3 for swelling.

Impairment threshold: An assessment of "impaired soft tissue status" is recorded under "other" if skin is graded 0 to 4 or if swelling is graded 0 to 2.

4. **Balance and Coordination**

Balance

Static and dynamic balance are assessed in the sitting and standing positions. For all of the balance tests, the patient is graded "yes" if he or she can perform the task without losing his or her balance and "no" if he or she cannot perform the task without losing his or her balance. To test static sitting balance, the patient first sits on the edge of the bed without support, with feet flat on the floor and arms across the lap for 30 seconds. If the patient can do this, moderate postural nudge are applied in forward, backward, and sideways directions.

Dynamic sitting balance is tested by having the patient reach each arm forward and across the midline to the opposite side without losing his or her balance. The patient then reaches down to the floor with the ipsilateral hand.

In the static standing balance test, the patient stands with feet in a normal stance and eyes open for 30 seconds, then with eyes closed for 30 seconds. The patient is then asked to tandem stand with eyes open for 30 seconds.

Dynamic standing balance is tested with the patient in a normal stance. The patient is asked to step forward with one foot, then return the foot to the starting position. This test is repeated with the other foot. The patient is then asked to reach down to the floor on either side.

Finally, the patient turns around 360 degrees.

Impairment threshold: An assessment of "impaired balance/coordination" is recorded if any "no's" are scored on the balance tests.

Coordination

Finger to nose: the patient brings the tip of his or her index finger to the tip of his or her nose.

Finger to therapist's finger: the patient brings the tip of his or her index finger to the tip of the therapist's index finger.

Heel on shin: the patient places his or her heel on the contralateral shin. The patient is graded abnormal if he or she points past or misses the target, is tremorous, or exhibits ataxia.

Rapid alternating movements: These movements are tested in the upper extremities by having the patient flex both elbows to 90 degrees, then pronate and supinate the forearms as fast as possible. In the lower extremities, the patient is asked to dorsiflex and plantar flex both ankles as quickly as possible.

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(continued)
Appendix 1. (Continued)

Impairment threshold: An assessment of "impaired balance/coordination" is recorded if there are any abnormal scores on the coordination tests.

5. Posture
A sitting and standing postural screen is performed using a modified version of REEDCO's postural screen. Posture is assessed posteriorly and laterally in a head-to-foot sequence. Each area is graded from 1 to 5, with 5 = good (normal alignment), 3 = fair (minimal to moderate deviations), and 1 = poor (severe deviations). The maximum score of 50 indicates good posture.

Impairment threshold: An assessment of "postural dysfunction" is recorded if the patient scores 59% or less.

6. Activities of Daily Living: Patients are grossly assessed for feeding, grooming, and dressing. Patients are graded independent or dependent.

Impairment threshold: An assessment of "impaired feeding," "impaired dressing," or "impaired grooming" is recorded if any "no's" are scored on these tests.

7. Cerebral Functions
General behavior: This function is observed throughout the entire assessment. Descriptor words such as "cooperative," "friendly," "uncooperative," "depressed," "aggressive," "agitated," "flat affect," and so forth are written on the evaluation form.
Orientation: Assessment is made as to whether the patient is oriented to person, place, and time.
Communication: Problems with speech, vision, or hearing are recorded in this area.

Appendix 2. General Conditioning and Functional Activity Training

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*ADL=activities of daily living.

References

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