Change in Wheelchair Transfer Performance During Rehabilitation of Men With Cerebrovascular Accident

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Key Words: transfer evaluation

Objectives. A retrospective study was conducted to investigate differences in the functional outcome between patients with left cerebrovascular accident (left CVA) and right cerebrovascular accident (right CVA) in wheelchair transfer performance. It was hypothesized that the level of improvement in left CVA and right CVA groups of patients would not be the same, due to the different constellation of neurological impairments.

Method. Data were obtained from the admission and discharge scores on the Functional Independence Measure of 100 male patients, 50 with left CVA and 50 with right CVA.

Results. Both groups demonstrated a statistically significant improvement between admission and discharge for wheelchair to bed, wheelchair to toilet, and wheelchair to tub or shower transfers (p < .001). However, there were no statistically significant differences between the two groups at admission or discharge for any of the three transfers, even after statistical removal of the effects of age, number of days from onset of stroke to rehabilitation, and number of days in rehabilitation.

Conclusion. The lack of difference between the groups at time of discharge may have obscured a difference in the rate of transfer learning during the course of rehabilitation.

For persons who have sustained a cerebrovascular accident (CVA), the contralateral hemiparesis or hemiplegia that impairs their motor functioning frequently affects their mobility. When ambulation is affected, one of the first intervention strategies used by occupational therapists to increase the patient's mobility is the teaching of wheelchair transfer skills. A safe transfer, completed without assistance and as expeditiously as possible, contributes to the goals of occupational therapy: patient sufficiency in self-care, work, and leisure. There are theoretical and empirical grounds for thinking that relearning in general and transfer performance in particular may be influenced by whether the patient sustained a left cerebrovascular accident (left CVA) or a right cerebrovascular accident (right CVA) due to the different impairments from lesions in different hemispheres (Mills & Digenio, 1983). If different impairments necessitate different approaches to transfer skill learning, it would be important for occupational therapists to be aware of these differences in order to provide the best possible treatment for persons with CVA.

Background

CVA is the most common origin of neurological deficits (Berkow & Fletcher, 1987) and persons with CVA form the primary diagnostic group treated by occupational therapists.
therapists (Tromblcy, 1989). Wheelchair transfer skills are among the most important skills that must be mastered by persons with this diagnosis (Pedretti & Zoltn, 1990). Performance of these skills can be measured by the level of assistance needed by the patient to accomplish a wheelchair transfer, from independent to completely dependent (Mills & Digenio, 1983).

Several differences in impairment experienced by patients with left CVA and right CVA have been identified. For example, patients with left CVA often have deficits in verbal communication such as receptive, expressive, or global aphasia, as well as left-right confusion, deficits in memory, motor apraxia, and decreased coordination, sustained contraction (Masden, 1985). Those with right CVA are more likely to have visuospatial deficits, left visual field deficits, distractibility, denial of problems with the left side of the body, impulsive behavior, dressing apraxia, difficulty crossing the midline of the body, and depression (Masden, 1985). Because transfer skills are built upon perceptual, motor, and cognitive components, an impairment in any of these components may affect the patient’s ability to learn and perform transfers. These effects could occur during any of the three stages of learning: input, processing, or performance (see Table 1).

Other empirical differences between patients with left CVA and with right CVA that may influence the learning of transfers have been noted. Korner-Bitensky, Mayo, and Kaizer (1990) found that response time of patients with left CVA who had visual hemineglect deteriorated between time of admission and 6 weeks later. Response time of patients with right CVA improved, although it occasionally fluctuated due to depression. Korner-Bitensky et al. (1990) also noted that patients with left CVA took longer to respond to sudden changes in position than patients with right CVA.

Robinson, Fitts, and Kraft (1990) examined motor abilities and differences between patients with left CVA and right CVA by testing finger tapping rate and grip strength. Patients with left CVA exhibited bilateral slowness in alternation of distal motion (tapping rate), whereas patients with right CVA exhibited lower sustained contraction scores (grip strength). Because any of these impairments (response to position change, bilateral coordination, sustained contraction) can affect the performance of a transfer, it seems reasonable to hypothesize that there may be functional differences between patients with left CVA and patients with right CVA as well.

In a functional outcomes study, however, Mills and Digenio (1983) found no statistically significant differences between patients with left CVA and those with right CVA in the functional categories of mobility (transfer performance) and activities of daily living (ADLs). In addition, they discovered no differences between the two groups in perception–information processing and the total length of hospital stay. However, there were significant differences in the category of language; patients with left CVA obviously demonstrated more difficulties.

Bos (1991) suggested that health professionals teach patients with left CVA who have communication disorders (receptive, expressive, or global aphasia) through strategies within their comprehension abilities. Thus, strategies used to teach transfers might be different for patients with left CVA and right CVA even if functional outcomes were, on average, the same.

Other differences between right CVA and left CVA have been found to be related to the timing of rehabilitation. Nowack, Satterfield, and Connor (1984) researched the time lag between onset of CVA and the beginning of rehabilitation. Their study examined treatment outcome including upper extremity function, self-care, measures of mobilization, and transfers. Patient outcomes were poorer when there was a greater length of time between the onset of the CVA and rehabilitation. Johnston and Keister (1984) also studied the timing of rehabilitation. They found that early rehabilitation for patients with left CVA yielded better outcomes than for patients with right CVA and suggested that patients with right CVA had more cognitive deficits such as constructional apraxia, visual-sensory neglect, spatial disorganization, and disturbed body image. Progress in rehabilitation was more difficult because overcoming these cognitive deficits took time. Johnston and Keister (1984) stressed, however, that their study had not been designed to investigate the matter in depth, thus their explanation may not be accurate.

There are documented differences in impairments between patients with left CVA and those with right CVA. Whether these differences result in different functional outcomes has not been clearly established.

The main purpose of this study, therefore, was to compare the rehabilitation performance of men with left CVA and right CVA on three transfers: bed to wheelchair, wheelchair to toilet, and wheelchair to tub or shower. A secondary purpose was to compare the ambulation status of the two patient groups at the time of admission and of discharge, because this status would affect the level of transfer independence.

Method

This study used retrospective record review in a quasi-experimental design to examine the differences in wheel-
chair transfers between patients with left CVA and those with right CVA. The dependent variables were levels of assistance needed to perform the three types of transfer at time of rehabilitation admission and discharge. Age of the patient, number of days between onset of CVA and admission to rehabilitation, and number of days in rehabilitation were investigated as covariates. The sample size was chosen to provide experimental power of .70, assuming a large effect size of .5 (Portney & Watkins, 1993).

Subjects

Men with an admission diagnosis of CVA who had been discharged from the rehabilitation unit of a hospital in the Pacific Northwest were the population of interest in this study. The population was limited to men because a follow-up study was to be conducted in the West Bank of Jerusalem and its environs with male subjects only, allowing comparison of the results of the two studies.

Following Institutional Review Board approval from the hospital, 50 patients with left CVA and 50 patients with right CVA were sequentially selected from medical records, beginning with those patients discharged in December 1992, and working backward in time. The following inclusion criteria were used in the selection process:

1. Absence of diagnoses other than CVA that could affect ability to transfer, such as brain tumor, dementia, decreased vision, orthopedic problems, or other related neurological disease
2. Presence of all extremities
3. Inclusion of wheelchair transfer training in the treatment plan
4. Complete data available on pertinent sections of the FIM and on demographic variables

Instrument

From the several data sources available in the hospital records, a scale that measured functional performance, the Functional Independence Measure (FIM), was selected to provide information on transfer performance (Granger, Hamilton, & Sherwin, 1990; Rothstein & Jette, 1985). Law (1993) described the FIM as a global ordinal scale for functional assessment and concluded that, although difficult to interpret, it was useful in making decisions about therapy effectiveness. Several studies have used the FIM to investigate the therapeutic outcome of treatment for self-care, transfers (mobility), and locomotion (Acevedo-Navarro, Alvelo, & Torres, 1992; Palliccino, Snyder, & Granger, 1992). Reliability and validity studies on the FIM have been reported elsewhere (Dirunno, 1992). The FIM uses a scale of 7 levels to rate functional performance. Level 1 is a total assist in which the subject contributes 0% to 24% of the physical effort; Level 2 is a maximal assist in which the subject contributes 25% to 49%; Level 3 is a moderate assist in which the subject contributes 50% to 74%; and Level 4 is a minimal assist in which the subject contributes 75% to 100%. Patients who function at Level 5 need supervision; patients at Level 6 have modified independence, meaning they need an adaptive or assistive device; patients at Level 7 have complete independence and are safe. The current study used the FIM items of wheelchair to bed, wheelchair to toilet, and wheelchair to tub or shower transfer, collected at time of admission and at discharge.

The researchers received FIM data for the two groups from the hospital rehabilitation department. The FIM data provided basic demographic information, time between onset of CVA and admission to rehabilitation, number of days in the rehabilitation facility, and the level of assistance for the three wheelchair transfers at admission and at discharge. Data were entered into a mainframe computer and analyzed with the SPSS-X program (SPSS, 1988).

Results

The mean age for the group with left CVA was 71.5 years, for the group with right CVA it was 72.0 years (see Table 2). None of the demographic differences between the groups was statistically significant.

At time of admission to rehabilitation, both groups had the same percentages for the three types of locomotion: 31 subjects used a wheelchair as the primary means of locomotion, 14 subjects used both wheelchair and walking, and 5 subjects used walking only (see Figure 1). At discharge, 13 subjects in each group used a wheelchair as the primary means of locomotion. Seventeen subjects in the group with left CVA used both wheelchair and walking, whereas 12 subjects of the group with right CVA used both. For 20 subjects of the group with left CVA and 25 subjects of the group with right CVA, walking was the primary type of locomotion (see Figure 1).

The frequency of assistance levels for locomotion at time of admission and discharge for the two groups, regardless of the means of locomotion used, is shown in Tables 3 and 4. The mean level of assistance required for all transfers at admission, according to the FIM data, was 3.3 for both the group with left CVA and the group with right CVA, i.e., slightly better than moderate. The standard deviation of the mean at admission was 1.04 for the group with left CVA and 1.09 for the group with right CVA. At discharge, the mean level of assistance had improved to 5.0 for the group with left CVA and to 4.9 for the group with right CVA (i.e., supervision). The standard deviation for the group with left CVA was 1.34; for the group with right CVA it was 1.31.

Comparisons were made with a dependent t test to investigate improvement in transfer performance within the two groups. Results showed statistically significant

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improvement occurred for each of the three types of transfers ($p < .001$) (see Figure 2).

Next, an independent $t$ test was performed to investigate the differences between the two groups at admission and discharge for each type of transfer. No statistically significant difference was found between the two groups for any of the three transfers. The same comparison of transfer performance was then investigated for subjects who received earlier rehabilitation. For each group, subjects were ranked according to the number of days between onset of eVA and beginning of rehabilitation. For each group, the third receiving the most prompt rehabilitation was compared to the third receiving the most delayed rehabilitation. Again the differences in transfer performance were not significant.

Finally, an analysis of covariance was conducted to determine whether elimination of the effects of age, number of days in rehabilitation, and number of days from onset of eVA to rehabilitation had an effect on the improvement of transfer performance. The results showed that the younger the patient, the earlier the treatment, and the more days in rehabilitation, the better the treatment outcome ($F_{[age]} = 7.11, p = .009; F_{[in rehabilitation]} = 6.60, p = .012; F_{[onset to rehabilitation]} = 4.72, p = .032$), with no significant difference between the groups with left eVA and right eVA.

### Discussion

The current study examined differences between patients with left eVA and those with right eVA on performance of wheelchair transfers. Subjects with left eVA and right eVA did not differ significantly in their ability to perform transfers at time of admission or discharge, confirming the findings of Mills and DiGenio (1983). Both groups did improve significantly in their transfer performance between admission and discharge for all three types of transfer (bed to wheelchair, wheelchair to toilet, wheelchair to tub).

Even when the effects of age, time from onset of eVA

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**Table 2**

Demographic Characteristics of the Sample ($n = 100$)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Left CVA</th>
<th></th>
<th>Right CVA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>$M$</td>
<td>Range</td>
</tr>
<tr>
<td>Number of subjects</td>
<td>50</td>
<td>100</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>47</td>
<td>94</td>
<td>46</td>
<td>92</td>
</tr>
<tr>
<td>Other$^a$</td>
<td>3</td>
<td>6</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>41</td>
<td>82</td>
<td>36</td>
<td>72</td>
</tr>
<tr>
<td>Single/divorced$^b$</td>
<td>9</td>
<td>18</td>
<td>14</td>
<td>28</td>
</tr>
<tr>
<td>Discharged to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>41</td>
<td>82</td>
<td>38</td>
<td>76</td>
</tr>
<tr>
<td>Other$^c$</td>
<td>9</td>
<td>18</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Age (years)</td>
<td>71.5</td>
<td>35-90</td>
<td>72.0</td>
<td>41-90</td>
</tr>
<tr>
<td>Time between onset and rehabilitation (days)</td>
<td>15.5</td>
<td>2-117</td>
<td>13.4</td>
<td>2-83</td>
</tr>
<tr>
<td>Time in rehabilitation (days)</td>
<td>18.9</td>
<td>6-48</td>
<td>19.4</td>
<td>3-51</td>
</tr>
</tbody>
</table>

*Note.* eVA = cerebrovascular accident.

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**Table 3**

Locomotion Level of Assistance Group with Left eVA

<table>
<thead>
<tr>
<th>FIM Levels</th>
<th>Admission</th>
<th></th>
<th></th>
<th>Discharge</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>7 Complete independence</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Modified independence</td>
<td>1</td>
<td>2</td>
<td>23</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Supervision</td>
<td>14</td>
<td>28</td>
<td>9</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Minimal assist</td>
<td>20</td>
<td>40</td>
<td>6</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Moderate assist</td>
<td>12</td>
<td>24</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Maximal assist</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Total assist</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* eVA = cerebrovascular accident, FIM = Functional Independence Measure.

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**Table 4**

Locomotion Level of Assistance Group with Right eVA

<table>
<thead>
<tr>
<th>FIM Levels</th>
<th>Admission</th>
<th></th>
<th></th>
<th>Discharge</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
<td>Frequency</td>
<td>Percent</td>
</tr>
<tr>
<td>7 Complete independence</td>
<td>1</td>
<td>2</td>
<td>11</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Modified independence</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Supervision</td>
<td>13</td>
<td>26</td>
<td>15</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Minimal assist</td>
<td>19</td>
<td>38</td>
<td>4</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Moderate assist</td>
<td>14</td>
<td>28</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Maximal assist</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Total assist</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* eVA = cerebrovascular accident, FIM = Functional Independence Measure.
Admission: Left & Right CVA Groups

Discharge: Left CVA Group

Discharge: Right CVA Group

Figure 1. Locomotion type at admission and discharge for groups with left CVA and right CVA.

Figure 2. Functional Independence Measure levels of assistance at admission and discharge for three transfer types for groups with left CVA and right CVA.

to rehabilitation, and length of rehabilitation were statistically removed, there were no significant differences between the subjects with left CVA and right CVA. Thus this study did not replicate the findings of Johnston and Keister (1984) that early rehabilitation for patients with left CVA yielded a better outcome than for patients with right CVA. The current study did find that the mean time from onset to rehabilitation was 2 days longer for patients with left CVA than for those with right CVA. This difference was not statistically significant and may have been due to one patient with left CVA who began rehabilitation 117 days after the CVA.

Garrison (1991) recommended that therapeutic teams address patients with left CVA and right CVA with different teaching techniques based on differences in neurological deficits. The current study uncovered no evidence that the therapeutic approaches used for patients with CVA resulted in different functional outcomes.
Transfer performance, as measured by the FIM, showed no differences between patients with left CVA and those with right CVA. This lack of difference may exist because therapists continued to treat patients until an acceptable level of assistance for transfers was achieved (FIM "supervision only"). At the same time, however, the average length of time in rehabilitation for the groups with left CVA and right CVA was about 19 days (range about 5 to 50 days). Therefore rehabilitation does not seem to have required one type of patient to spend longer in treatment than the other type to achieve the same acceptable level of transfer performance.

Limitations and Research Recommendations

One factor that may have obscured differences between the two groups in the current study was the nature of the data collected. The FIM ratings were obtained at admission and time of discharge. The discharge rating does not tell how soon before discharge that level of performance was achieved. Thus possible differences in learning curves between the two groups would not have been detected. The FIM data also did not reveal, in the discharge mean rating of needs supervision, why supervision was needed. Was it because verbal cues were necessary to help the patient sequence the task, or was it due to safety concerns arising from neglect or difficulties with physical movement? Finally, the data also did not indicate whether the discharge occurred because insurance coverage was exhausted or because other factors prevented continued treatment.

Although a retrospective record review might lack the rigor of a prospective study, the outcomes of this research may be useful for guiding further inquiries. Future studies may investigate how therapists employ different teaching techniques when treating patients with left CVA and patients with right CVA, whether day-by-day learning curves for transfer performance are different, and whether other functional performances at discharge are affected by the site of the CVA.

Summary

A retrospective study on differences in transfer performance between patients with left CVA and right CVA was conducted with FIM data collected at admission and at discharge in a rehabilitation unit. A statistically significant improvement in performance occurred between the two measurement periods for all three types of transfer (bed, toilet, tub) for both subject groups. However, no statistically significant differences were revealed between the two groups either at admission or at discharge for any type of transfer. Age of patients, time in rehabilitation, and time from onset of CVA to rehabilitation were found to affect transfer performance. This effect, however, was essentially the same for both groups. Whether one group achieved this discharge level of performance sooner than the other could not be determined. Therefore, no conclusions can be drawn about the extent to which therapists successfully accommodated the different learning needs of patients with left CVA versus those with right CVA. Further research is needed to investigate the functional outcome of different therapeutic interventions for patients with CVA.

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This study was undertaken by Maha Suliman Khader in partial fulfillment of the requirements for the degree of Master of Occupational Therapy from the University of Puget Sound, Tacoma, Washington.

References


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**Brain Atlas & Functional Systems**

Josephine C. Moore, PhD, OTR, FAOTA

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Use colored pencils or pens to color in the structures that belong to each functional system in order to understand their relation to each other. Appendices supplement the atlas by emphasizing the relationships of structures and by providing additional information about the functional systems of the central nervous system, including potential dysfunctions. 54 pages, 1993.

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