

BRIEF REPORT

Effectiveness of Home- and Community-Based Rehabilitation in a Large Cohort of Patients Disabled by Cerebrovascular Accident: Evidence of a Dose-Response Relationship



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Abstract

Objectives: To (1) assess the effectiveness of home- and community-based rehabilitation (HCBR) in a large cohort of individuals with disabilities secondary to cerebrovascular accident (CVA); and (2) evaluate the responsiveness to treatment of the Mayo-Portland Adaptability Inventory (MPAI-4) to changes resulting from HCBR in this patient group.

Design: Retrospective analysis of program evaluation data for treatment completers and noncompleters.

Setting: HCBR conducted in 7 geographically distinct U.S. cities.

Participants: Individuals with CVA (n=738) who completed the prescribed course of rehabilitation (completed course of treatment [CCT]) compared with 150 individuals who were precipitously discharged (PD) before program completion.

Intervention: HCBR delivered by certified professional staff on an individualized basis.

Main Outcome Measures: Mayo-Portland Adaptability Inventory (MPAI-4) completed by professional consensus on admission and at discharge.

Results: With the use of analysis of covariance, MPAI-4 total scores at discharge for CCT participants were compared with those of PD participants, with admission MPAI-4, age, length of stay, and time since event as covariates. CCT participants showed greater improvement than PD participants ($F=99.48$, $P<.001$) with a moderate effect size (partial $\eta^2=.10$). Group differences and effect sizes were similar for the 3 index scores: Ability ($F=75.96$, $P<.001$; partial $\eta^2=.08$), Adjustment ($F=99.67$, $P<.001$; partial $\eta^2=.10$), and Participation ($F=69.15$, $P<.001$; partial $\eta^2=.07$).

Conclusions: Individuals in the CCT group who received the entire planned course of HCBR showed greater improvement on all MPAI-4 indexes than those in the PD group who were discharged before completing the prescribed program. This dose-response relationship provides evidence of a causal relationship between treatment and outcome.

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Decreasing length of stay for inpatient rehabilitation has ushered in the development of brain injury rehabilitation programs that can be provided in residential facilities or in the community. Evidence-based reviews¹⁻⁴ of such programs have generally reported positive results. However, most previous studies were not rigorously

controlled and included samples with acquired brain injury (ABI) exclusively or predominantly caused by trauma (traumatic brain injury [TBI]). As a result of their systematic review of multidisciplinary rehabilitation for individuals with ABI, Turner-Stokes et al⁵ recommended that patients with ABI have access to outpatient and community service according to their needs, but also pointed out that additional research using a diversity of appropriate methodologies is needed. Guertsen et al⁶ arrived at conclusions similar to those of other systematic reviews and advocated for more rigorous research using standardized measures, particularly randomized controlled trials (RCTs), but also recognized the practical and ethical challenges to conducting large-scale RCTs.

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In a prior study⁷ of more than 600 cases with TBI, we reported superior outcomes on the Mayo-Portland Adaptability Inventory (MPAI-4) for participants who completed the entire planned program (completed course of treatment [CCT]) of home- and community-based rehabilitation (HCBR) compared with participants who were precipitously discharged (PD) before completing the prescribed rehabilitation program. Although in the prior report we did not refer to a dose-response relationship, this term appears appropriately applied since the PD group received a lower “dose” of the planned treatment than the CCT group.

This brief report describes a replication of this prior study with individuals admitted to the same national multisite rehabilitation system subsequent to cerebrovascular accident (CVA). Although the MPAI-4 has been validated with mixed groups of individuals with ABI, its responsiveness to a rehabilitation treatment effect has not been specifically evaluated with individuals with CVA. The MPAI-4 has been shown to retain good psychometric qualities when used with individuals with stroke.⁸ Objectives were (1) to assess the effectiveness of HCBR in a large cohort of individuals with disabilities secondary to CVA, and (2) to evaluate the responsiveness to treatment of the MPAI-4 to changes resulting from HCBR in this patient group. Our hypothesis was simply that individuals who completed a planned program of HCBR would demonstrate greater improvement at discharge on the MPAI-4 than those receiving a lesser dose. Effect size of the treatment was computed to evaluate the responsiveness of the MPAI-4 to HCBR (objective 2). This study was not designed to assess whether the MPAI-4 is more sensitive than other measures to this type of treatment.

Methods

Participants

The sample in this retrospective study consisted of consecutive admissions to HCBR after CVA with admission and discharge MPAI-4 data. Detailed diagnostic information about the CVA was recorded in the patient’s clinical record but not practically available for research. Participants were admitted to HCBR using the following admission criteria: (1) medically stable enough to participate in rehabilitation and had medical supports in place to maintain stability in the proposed living environment; (2) potential to achieve specified rehabilitation goals in the home and community setting; (3) reside in a safe and accessible environment with adequate supervision and support so that they are not at risk when therapists are not on site; (4) behaviors are manageable in the proposed treatment environment; and (5) able to consent by self or proxy to admission/treatment. A potential participant’s ability to meet the above criteria was determined through a preadmission screening assessment conducted by a qualified

evaluator through a face-to-face interview and a review of available medical records. Participants or their proxies signed consent forms on admission to allow their data to be included in this study. Although consent for data use was obtained from each participant, data collection was originally planned only for program evaluation purposes; that is, this was not a prospective research study. Institutional review board (IRB) approval through an Indiana University IRB for retrospective analysis of these deidentified data was obtained subsequent to data acquisition.

At discharge, participants were classified as CCT or PD according to the following definitions:

- **CCT:** Participant received services as initially targeted toward 1 or more functional outcome goals (eg, independent living status, independence in personal activities of daily living) with at least 2 clinical disciplines other than clinical coordination.
- **PD:** Any discharge that allowed less than 1 week of preparation time before discharge or was unanticipated. This included situations in which participant, family, physician, payer, and/or program staff decided to discharge before reaching agreed-on outcome goals in the plan of treatment. However, if the discharge was planned for and goals were set accordingly, it was not considered a precipitous discharge even if goals were not met.

Demographic and injury-related variables for both groups are displayed in [table 1](#). Statistical comparisons showed no difference between groups with regard to sex ($\chi^2=.28$, $P=.59$), chronicity (time since event: $t=-1.11$, $P=.27$), or age ($t=-1.82$, $P=.07$). As expected, the CCT group ($n=738$) had longer lengths of stay in the program ($t=-9.72$, $P<.001$) than the PD group ($n=150$). Seventeen potential CCT and 8 PD subjects were not included in the study because of missing admission or discharge MPAI-4 data. This small amount of lost data appeared unsystematic (ie, random) and was not believed to bias results.

Outcome measure

The MPAI-4, a measure with well-established psychometric properties,^{9,10} was completed on program admission and at discharge by consensus of the rehabilitation team working with the participant. Telephone follow-up 3 and 12 months postdischarge was conducted by clinical staff using the Participation Index only.

Procedures

All study participants were actively involved in an individualized HCBR program, accredited by the Commission on Accreditation of Rehabilitation Facilities, in 1 of 7 geographically diverse states owned by a single rehabilitation corporation (Rehab Without Walls). The program, services and procedures, and quality assurance for administration of the MPAI-4 are more completely described in Altman et al.⁷ As in the original study, it was not possible to determine in this retrospective study precisely why individuals, their families, or their physicians decided to terminate the program precipitously. It appeared that, in most cases, discharge occurred precipitously because of factors beyond the participant’s control, such as lack of funding, transportation, changes in the living situation, or the family’s ability to provide support. As in the original study, rating clinicians were not aware that a retrospective study would be conducted to analyze differences among patient groups.

List of abbreviations:

ABI	acquired brain injury
ANCOVA	analysis of covariance
CCT	completed course of treatment
CVA	cerebrovascular accident
HCBR	home- and community-based rehabilitation
IRB	institutional review board
MPAI-4	Mayo-Portland Adaptability Inventory
PD	precipitously discharged
RCT	randomized controlled trial
TBI	traumatic brain injury

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