

In What Daily Activities Do Patients Achieve Independence after Stroke?

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Background: The aim of the study is to determine the probability of achieving independence and the related prognostic factors with regard to single activities of daily living after 3 months of rehabilitation following stroke. *Methods:* This longitudinal observational study, conducted in a neurorehabilitation unit of a research and health care institute, involved 435 subjects who were affected by stroke (age, 68 ± 14 years, 230 men).

Barthel index (BI) scores were recorded at admission and dismissal 3 months later.

Results: The highest improvement after rehabilitation was observed for bowel and bladder function and transfer and mobility, whereas the lowest improvement was seen in bathing, grooming, dressing, and stair climbing. *Conclusions:* Severity of stroke, presence of unilateral neglect, age, gender, and onset-to-admission interval (OAI) were significant prognostic factors for 6 of 10 activities, as assessed by BI subscores. Feeding was influenced only by neglect and OAI, whereas OAI did not affect bowel or bladder function recovery. *Practice:* Patients and their relatives could be informed about the specific activities in which patients will be expected to be independent after rehabilitation and the specific needs that they might have on returning home. *Implication:* Our results might help optimize the management of the rehabilitative process. **Key Words:** Stroke—rehabilitation—outcomes—prognostic factors—activity of daily living.

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After stroke, patients and their relatives have the prospect of recovery and independence when they return home and, eventually, to work.¹ Several prognostic factors of rehabilitative outcomes after stroke have been identified.² An early and accurate prediction of independence level after discharge is crucial in facilitating the return of stroke patients to their home³ with regard to

planning eventual home and work adjustments in a timely manner, the presence of a professional caregiver, and familiar support.⁴ Clinically, the prediction of rehabilitative outcomes might aid allocating resources and identifying causes of unsuccessful rehabilitation, which has many implications for the cost of care.

There are many tools that are used to determine the independence level of a person in activities of daily living (ADLs). The most common methods are 2 clinical scales: the Barthel index (BI) and the functional independence measure (FIM).⁵ Feeding, bathing, grooming, dressing, bowel function, bladder function, toilet use, transfers (bed to chair and back), mobility (walking on level surfaces), and stair climbing are the 10 activities that are assessed in the BI, which is the sum of the scores on each of these items. Similar activities are measured in the FIM: eating, bathing, grooming, dressing, personal hygiene, transfers, walking, and stair climbing.⁶

Older age and high initial grade of paresis are the most common negative prognostic factors for independence in ADLs.^{2,7-11} Severe impairment, hemineglect, global

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aphasia, and depression have been highlighted as other prognostic factors of low treatment efficacy by BI.¹² Gender was found to be related primarily to mobility, wherein more men than women achieved independence in stair climbing (odds ratio [OR] = 3.22) and ADLs (OR = 1.90), experiencing greater response and effectiveness in terms of mobility. Conversely, more women usually needed a cane, even for level walking (OR = 1.69).¹³

Furthermore, the side of hemiparesis—and hence, the contralateral side of the cerebrovascular accident—was related mainly to its potentially causing hemineglect or aphasia.¹⁴ At the end of rehabilitation, patients with neglect had significantly lower final motor scores and thus lower independence compared with those with aphasia, who had lower cognitive levels. The BI score at admission is a good predictor of independence in ADLs at dismissal.^{15,16} Functional status at 6 months is a predictor of mortality at 5 years,¹⁷ and the number of dependent ADLs at discharge is an independent risk of mortality at 1 year after stroke.¹⁸

However, the clinical value of the identification of these prognostic factors has been questioned: information about average recovery patterns might have little relevance for a patient or even an individual clinician.¹ Past research has tended to focus on global scores rather than BI or FIM subscores on individual items, paying little attention to independence in single ADLs. But, patients and their relatives need individual and specific predictions of independence level in managing their return to home and, eventually, to work.¹ For example, a patient who lives in a 2-storey house will know whether he is likely to recover the ability to climb stairs—a factor that is less important for other patients. Thus, beyond a general percentage of patients who become independent in ADLs, patients and their families are likely to know the tasks in which they risk remaining dependent or will be autonomous.

Few studies have analyzed independence in single ADLs. Twenty-five years ago, Wade and Hower reported good recovery for bowel and bladder function and grooming and poor recovery of bathing, stair climbing, and dressing. They found urinary incontinence, low initial BI score, older age, low mental function, reduced sitting balance, and decreased arm motor function at admission to be negative prognostic factors of global BI score.¹⁹ Recently, Gialanella et al examined the influence of single FIM subscores in 241 patients at admission as predictors of functional outcome after rehabilitation. They found that subscores on grooming and dressing, with Fugl-Meyer score at admission, presence of neglect, and social interaction level, predicted global FIM score at discharge, whereas bowel control and memory were predictors of discharge destination.²⁰ Neither of these studies investigated factors that could be prognostic for independence in single ADLs.

The aims of our study were to measure improvements after rehabilitation in each of the 10 ADLs in the BI and identify their prognostic factors.

Materials and Methods

Independence in ADLs was assessed in patients at admission and on discharge from our rehabilitation hospital by BI. Demographic data (age and gender) were collected at admission. Clinical data on etiology of stroke (ischemic versus hemorrhagic), side of hemiparesis (right versus left), and presence of unilateral spatial neglect (yes versus no) were also recorded. Unilateral spatial neglect was defined as scoring below the cutoff value in 3 of a standardized battery of 4 tests, comprising the letter cancellation test, the barrage test, the sentence-reading test, and the Wundt–Jastrow area illusion test.²¹

The inclusion criteria were patients who recovered in our rehabilitation hospital, first-ever stroke, and subacute phase of stroke. Exclusion criteria were missing data (eg, because the patient was transferred for a medical emergency before the end of the planned rehabilitative pathway or because of death) and the presence of severe comorbidities, independent of stroke.

Patients received 2 daily sessions of neuromotor rehabilitation (each lasting 40 minutes) 5 days per week and 1 rehabilitative session on the sixth day, for approximately 3 months. When necessary, patients underwent a third hour of daily therapy that focused on speech, individual training for swallowing, recovery of bowel and bladder function, or recovery of spatial awareness if it was impaired by neglect.

Assessments were performed by clinicians on admission and discharge from our hospital per the Minimal Protocol for Stroke, as defined by the Italian Society of Physical Medicine and Rehabilitation,^{15,22} including the administration of the BI²³ and Canadian Neurological scales.²⁴

The effectiveness of rehabilitative intervention on BI scores and each subitem, assessed at admission and discharge, was measured as the improvement that was achieved, expressed as a percentage of maximum improvement:

$$\text{effectiveness} = (\text{score at discharge} - \text{score at admission}) / (\text{maximum possible score} - \text{score at admission}) \times 100. \text{ }^{25-28}$$

Based on this formula, an effectiveness of 100% corresponds to the achievement of maximum improvement, which, with regard to the BI score and subscores, reflects independence.

Because of the nominal or ordinal nature of the data, nonparametric statistics were used for inferential analyses. Wilcoxon signed-rank test was used to analyze the significance of changes between admission and dismissal subscores, and Friedman analysis was used to determine the significance of differences between these changes. Statistically significant results by Friedman

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