

# Study of the Recovery Patterns of Elderly Subacute Stroke Patients in an Interdisciplinary Neurorehabilitation Unit

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*Background:* This study seeks to establish the facts of the improvement over time in elderly poststroke patients. *Methods:* A retrospective study was performed with regard to 106 subacute stroke patients aged older than 65 years, who were treated in an interdisciplinary neurorehabilitation unit. Three assessment points were established (on admission, 6 months post-onset, and 12 months post-onset), with the scores relative to 10 assessment scales having been collected at each point. *Results:* By means of a principal component analysis, a first component was obtained, which is taken to represent a combined index of the 10 scales and to express the overall health status of the patient. An analysis of variance of this first component enabled a clear improvement trend to be identified, with this being more marked during the first 6-month period (72.7%) than the second 6-month period (27.3%). *Conclusions:* The elderly stroke patients underwent an interdisciplinary rehabilitation program lasting 1 year, experimented an initial period of rapid recovery during the first 6 months followed by a less marked period of improvement. However, no stabilization period in the patients' progress was found. **Key Words:** Elderly people—stroke—rehabilitation—outcome assessment scales.

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## Introduction

The prevalence of stroke continues to be high in western countries, despite the advances made in prevention and acute-phase care.<sup>1</sup> Because of the aging population, this pathology is most frequent among elderly patients. Approximately 75% of strokes occur in patients older

than 65 years, with incidence progressively increasing for each 10-year period from 55 years onward.<sup>2</sup>

Various studies have examined the rate of progress of patients recovering from a stroke and their response to rehabilitation.

Although a great deal is known about the neurophysiological mechanisms responsible for recovery from neurologic deficits, involving brain reorganization and the mechanism of neuroplasticity,<sup>3</sup> a variety of functional recovery patterns have been described for patients with stroke sequelae by a range of authors.<sup>4-11</sup>

Moreover, despite the great impact that strokes have on the elderly population, little research has focused on the functional recovery pattern of the elderly specifically and it is, therefore, necessary for this to be clarified.

It is also essential to be able to call on assessment tools of proved effectiveness whose psychometric properties have been successfully tested on stroke patients. At the current time, a wide variety of measurements are used in poststroke assessment. However, there is as yet no consensus regarding the most suitable assessment scale

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or scales, with debate continuing with regard to the advantages and drawbacks of the different options available.<sup>12,13</sup> Taking the foregoing into account, it seems that, to study patients' progress over time, a combined system of measurement, which enables the global assessment of the patient, is required.

Thus, this study seeks to establish the facts of the improvement over time of elderly stroke patients and, to do so, it makes use of a global assessment scale, which can enable patient progress to be evaluated more precisely.

## Materials and Methods

A total of 106 patients were selected for participation in this study (although 37 of them stopped receiving treatment for various reasons before the study was finished), 54.7% men and 45.3% women, with 67.9% having an ischemic stroke and 32.1% a hemorrhagic stroke. The median age of the sample was 69 (most patients were between 65 and 75 years) and the median chronicity was 82 days. The mean values of the modified Barthel Index (Barthel) and Functional Independence Measure (FIM) indices were  $30.20 \pm 2.73$  (range 0-99) and  $46.45 \pm 2.35$  (range 18-116), respectively, and the modified Rankin Scale (mRS) values ranged between 3 and 5.

The patients included in this study were 65 years or older and in a stable clinical condition, having previously either an ischemic or hemorrhagic stroke in any area of the brain, but who had now overcome the acute phase of the illness. Patients with a diagnosis of congenital, perinatal or infantile hemiplegia, or hemiplegia secondary to intoxication or a brain tumor were excluded. Patients in a very serious neurologic condition (a vegetative or minimally conscious state according to the Coma Recovery Scale—Revised) were also excluded. Patients having cerebellar syndrome or associated aphasia, as a consequence of the brain injury, were not excluded.

All those patients included in this study had been referred to the specialized rehabilitation service for brain injuries at the Hospital Valencia al Mar (part of the Hospitales Nisa group) from 2000 to 2010, having first been treated at various other hospitals, where a stroke had been diagnosed and where the patients had received acute phase treatment as part of a standard stroke treatment protocol.

### *Procedure and Instruments*

Treatment was provided to each patient by a multidisciplinary neurorehabilitation program at the hospital for at least a year. This facility provides organized stroke rehabilitation across a continuum of care, from the acute stroke service to return to home and community life. Our activity includes different programs focused on stroke rehabilitation across setting (acute hospital, inpatient rehabilitation facility, outpatient facility) and different professional rehabilitation disciplines (physical therapy,

neuropsychology, occupational therapy, speech and language pathologist, etc.). The program usually includes acute and postacute intensive inpatient multidisciplinary rehabilitation (up to 4-6 h/d of therapy) and chronic low-intensity and/or home-based therapies, combined with specific community integration programs.

All patients admitted to our facility were assessed by a multidisciplinary team of clinicians with a standardized battery of 10 assessment tools, which cover stroke-induced impairment, function, and activities of daily living (ADLs), at 3 assessment times. This battery was administered at admission and 6 and 12 months after admission. The complete battery included the following assessment scales (the range of possible values for each scale is shown in brackets, along with the name used to refer to them in the statistical analysis): Barthel (score 0-100), Lawton-Brody Instrumental Activities of Daily Living (IADL) scale (score 0-8), FIM (score 18-126), UK FIM + Functional Assessment Measure (FAM) (score 30-210), Differential Outcome Scale (score 4-20), Glasgow Outcome Scale-Extended (score 1-8), Care and Needs Scale (score 1-8), mRS (score 0-6), International Co-operative Ataxia Rating Scale (score 0-100), and National Institutes of Health Stroke Scale (NIHSS), specifically the version, which includes the assessment of the function of the hand (0-46).

Included scales were selected considering current guidelines and recommendations from national and international associations with special interest on neurorehabilitation, previous studies focused on stroke outcomes, and the existence of validated versions in Spanish population. All assessments were administered by licensed clinicians with more than 2 years of experience in neurorehabilitation who had been trained on these assessments and complete annual competencies on them.

The subjects of this study have signed their informed consent, and the study protocol has been approved by the institute's committee on human research and it conforms to the Declaration of Helsinki.

### *Statistical Methods*

Statistical analyses of the data were carried out using the Statgraphics Plus 5.1 software (Statpoint Technologies, Inc., Warrenton, VA).

First of all, a normalized principal component analysis (PCA) was carried out to synthesize the diversity of information provided by the 10 assessment scales and define a small number of components, which were able to characterize the greater part of this diversity. The objective was to be able to establish, for each assessment, a global health status measurement or index, which was not conditioned by the nature of a single type of scale and which could then be used to examine the stroke patients' progress over time.

Thus, the normalized components represent the weight each assessment scale takes in calculating the linear

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