



STANDARDIZED FUNCTIONAL ASSESSMENT TOOLS IN STROKE REHABILITATION: CLINICAL APPLICABILITY AND FUNCTIONAL OUTCOMES

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ABSTRACT

Introduction. Stroke represents a major public health issue, being one of the leading causes of mortality and morbidity both globally and nationally. According to the World Health Organization, stroke affects millions of people each year; a significant proportion of whom remain with severe motor, cognitive, and functional impairments, which profoundly impact quality of life. Assessing the consequences of stroke on patients' functional independence and quality of life is essential for understanding the multidimensional impact of the disease on the individual. *Materials and Methods.* The literature describes numerous validated clinimetric instruments, easily applicable in clinical practice. The present study was conducted on a patient diagnosed with stroke, evaluated at three distinct stages: before initiation of treatment, immediately after its completion, and at a later follow-up. The evaluation was carried out using clinimetric scales, with the purpose of quantifying neurological, functional, and quality of life changes throughout the recovery process. *Results.* The patient's evaluation revealed a significant reduction in the severity of neurological deficit and an improvement in functional independence. The post-treatment assessment demonstrated notable improvements in motor functions and self-care capacity, while the follow-up evaluation confirmed the maintenance of these gains and a trend toward stabilization of the achieved benefits. *Conclusions.* The systematic use of clinimetric instruments in the evaluation of stroke patients contributes to the objectification of the diagnostic process and the monitoring of clinical evolution, while also facilitating the individualization of therapeutic and rehabilitation strategies. These scales may be applied individually or in combination, depending on the evaluation objectives and the specific characteristics of each patient.

Keywords: neurological disability, functional assessment approaches, quality of life, functional independence

Introduction

Stroke is an acute neurological condition caused by the interruption of cerebral blood flow through either ischemic or hemorrhagic mechanisms, leading to neuronal injury and focal neurological deficits. Globally, stroke represents a major cause of disability and the second leading cause of mortality, accounting for approximately five million deaths annually and leaving another five million individuals with severe long-term disabilities (1,2).

Prospective studies indicate a continuous annual increase in both the incidence and prevalence of stroke. The World Health Organization estimates that by 2030, stroke will become the leading cause of death worldwide. In Romania, the annual incidence ranges between 200 and 300 new cases per 100,000 inhabitants, while in Europe it varies between 100 and 200 new cases per 100,000 inhabitants, representing a substantial economic burden (4). Furthermore, socioeconomic disparities influence access to healthcare services, with individuals of higher

financial status benefiting from improved therapeutic resources and consequently demonstrating better functional outcomes (5).

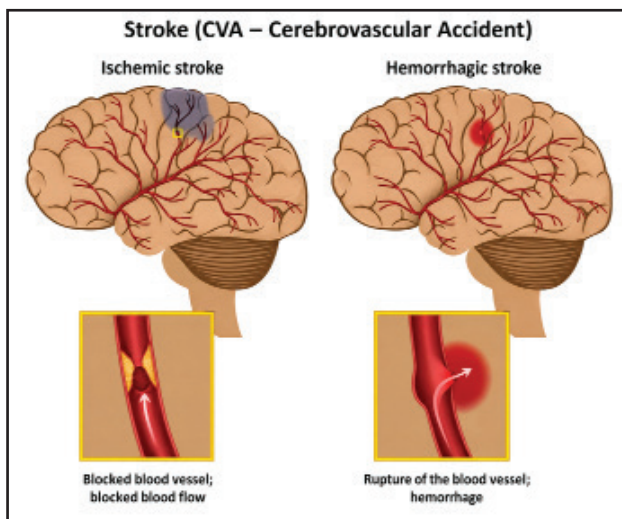


Figure 1. Main Types of Stroke (3)

The consequences of stroke include motor, cognitive, sensory and functional impairments that significantly affect patient independence and quality of life. Neurological and functional recovery depends on the initial severity of the lesion, early therapeutic intervention, and the implementation of an appropriate rehabilitation program.

Objective clinical assessment is essential for quantifying neurological deficits and monitoring rehabilitation progress. In this context, standardized clinimetric instruments provide validated methods for evaluating neurological severity, functional independence and quality of life.

The use of these instruments allows objective quantification of neurological impairment, monitoring of patient evolution, evaluation of therapeutic effectiveness and individualization of rehabilitation programs.

The Barthel Index is widely used to monitor functional progress in stroke patients. It assesses the patient's ability to perform ten basic activities of daily living, including feeding, personal hygiene, mobility. Scores range from 0 (complete dependence) to 100 (complete independence) (6).

The modified Rankin Scale (mRS) is one of the most commonly used tools for assessing functional independence and the ability to

perform daily activities. Originally developed by British neurologist John Rankin and subsequently modified, it remains a standard outcome measure in stroke research and clinical practice (7).

The National Institutes of Health Stroke Scale (NIHSS) is used to assess stroke severity in the acute phase. Developed by the U.S. National Institutes of Health, it evaluates level of consciousness, response to commands, visual fields, facial and motor function, coordination and language. Scoring is interpreted as follows: 0 = normal; 1–4 = minor stroke; 5–15 = moderate stroke; 16–20 = moderate to severe stroke; >21 = severe stroke (8).

The EQ-5D (EuroQol) is a standardized instrument for assessing health-related quality of life across five domains: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. It also includes a visual analogue scale (EQ-VAS), in which patients rate their overall health status on a scale from 0 (worst imaginable health state) to 100 (best imaginable health state) (9).

The SF-36 (Short Form-36 Health Survey) was developed to evaluate the physical, emotional and social impact of disease. It comprises 36 questions assessing eight domains: physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems and mental health. Scores range from 0 (severely impaired functioning) to 100 (optimal functioning) for each domain (10).

The Stroke Impact Scale (SIS) assesses the multidimensional impact of stroke on quality of life and functional status. It measures physical functioning, daily activities, social participation, emotional well-being, and overall health perception in post-stroke patients (11).

The Stroke-Specific Quality of Life Scale (SS-QoL) focuses on domains such as emotional functioning, social relationships and mobility. It consists of 49 items organized into 12 domains, each rated on a Likert scale from 1 (worst functioning) to 5 (best functioning) (12).

The Activities of Daily Living (ADL) Scale evaluates independence in fundamental activities, including bathing, dressing, toileting, transfers, continence and feeding. One point is awarded for independent performance and zero

points if assistance is required (13).

The Instrumental Activities of Daily Living (IADL) Scale assesses more complex functional abilities, including telephone use, shopping, meal preparation, housekeeping, laundry, transportation, medication management and financial management. One point is assigned for independent performance and zero points if partial or total assistance is needed (14).

The Functional Independence Measure (FIM) evaluates functional independence across 18 domains (13 motor and 5 cognitive). Each item is scored from 1 (total assistance) to 7 (complete independence), with total scores ranging from 18 to 126 (15).

Materials and Methods

The aim of this study was to demonstrate the clinical applicability and usefulness of standardized clinimetric instruments in assessing functional recovery and quality of life in a patient with ischemic stroke.

We evaluated patient PMD, a 60-year-old retired male from an urban area, diagnosed with right spastic hemiplegia following an ischemic stroke in the territory of the left middle cerebral artery (December 2024). The initial neurological deficit consisted of right hemiplegia, mixed aphasia, severe locomotor impairment and complete dependence in activities of daily living. The patient's medical history included grade III arterial hypertension and dyslipidemia. Written informed consent was obtained for clinical evaluation and publication. The patient underwent a structured rehabilitation program for 10 consecutive days, which included local thermotherapy (paraffin applications), electrotherapy (TENS), neuromuscular electrical stimulation, magnetotherapy, and individualized kinesiotherapy sessions. Clinimetric assessment was performed using the following validated instruments: the Barthel Index, modified Rankin Scale (mRS), National Institutes of Health Stroke Scale (NIHSS), EQ-5D and EQ-VAS, SF-36 Health Survey, Stroke Impact Scale (SIS) and Stroke-Specific Quality of Life Scale (SS-QoL). Assessments were conducted at three time points: baseline (initial evaluation), immediately post-treatment and at 3-month follow-up after stroke.

Results

Clinimetric assessment demonstrated a progressive improvement in neurological and functional status during the rehabilitation process.

Table 1. Assessment Based on Standardized Scales

Scale	Baseline	Post-treatment	3-months Follow-up
Barthel Index	25	60	85
mRS	4	3	2
NIHSS	13	6	3
EQ-5D	15	12	10
EQ-VAS	35	65	80
SF-36	325	450	625
SIS	35	58	83
SS-QoL	2	3	4

The results indicate a progressive improvement across all evaluated scales. Functional independence increased substantially, as reflected by the Barthel Index score, which rose from 25 at baseline to 85 at the 3-month follow-up. Neurological deficit severity decreased during the observation period, with the NIHSS score declining from 13 at baseline to 3 at follow-up. Similarly, the modified Rankin Scale showed a reduction from 4 to 2, suggesting improved functional outcomes (Figure 2).

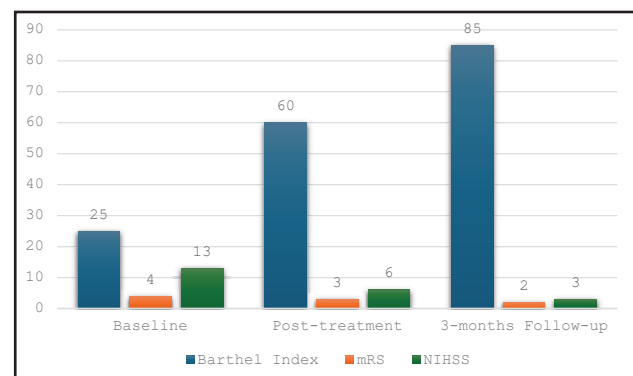


Figure 2. Evolution of functional assessment scores (Barthel Index, mRS, and NIHSS) at baseline, post-treatment, and 3-month follow-up

Quality-of-life measures also improved over time. Both general health-related quality-of-life instruments (EQ-5D, EQ-VAS, and SF-36) and stroke-specific scales (SIS and SS-QoL) demonstrated higher scores at post-treatment and follow-up assessments (Figure 3).

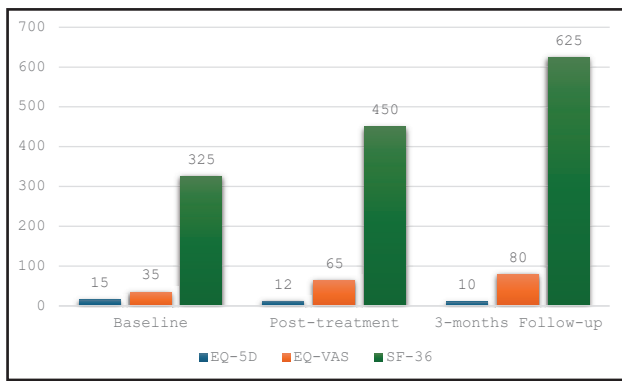


Figure 3. Evolution of quality-of-life scores (EQ-5D, EQ-VAS, and SF-36) at baseline, post-treatment, and 3-month follow-up.

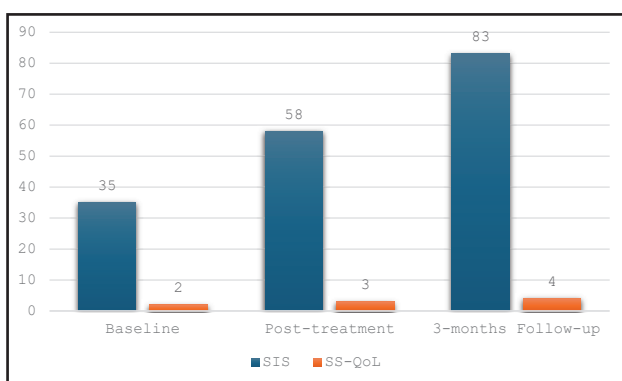


Figure 4. Evolution of stroke-specific quality-of-life scores (SIS and SS-QoL) at baseline, post-treatment, and 3-month follow-up.

Discussion

The present case study illustrates a progressive improvement in neurological status, functional independence, and health-related quality of life following a structured rehabilitation program in a patient with stroke. The observed increase in the Barthel Index score from 25 at baseline to 85 at the three-month follow-up suggests a transition from severe dependency to a significantly higher level of functional autonomy. Such functional gains are consistent with previous evidence indicating that early and targeted rehabilitation interventions can substantially improve functional outcomes in stroke survivors. Large epidemiological analyses have highlighted the considerable global burden of stroke and the importance of effective rehabilitation strategies in reducing disability and long-term care dependency (16,17).

The reduction in neurological deficit

severity observed in the present case, as reflected by the decrease in the National Institutes of Health Stroke Scale (NIHSS) score from 13 to 3, further supports the beneficial impact of structured rehabilitation. The NIHSS remains one of the most widely used clinical instruments for evaluating neurological impairment in acute stroke and monitoring recovery over time (8). Improvements in the modified Rankin Scale score from 4 to 2 additionally indicate better global functional outcomes and reduced disability. These findings align with previous research emphasizing the reliability and clinical utility of standardized neurological and functional scales in stroke management (7,8).

An important aspect highlighted by this study is the use of multiple standardized assessment tools to capture different dimensions of rehabilitation. Stroke has a complex impact that extends beyond neurological deficits, affecting functional capacity, psychosocial well-being, and social participation. Consequently, the combined use of instruments such as the Barthel Index, modified Rankin Scale and NIHSS allows clinicians to evaluate neurological impairment and functional disability from complementary perspectives. The reliability of these measures has been well documented in the literature, particularly the Barthel Index, which remains one of the most widely used instruments for assessing activities of daily living in stroke patients (6).

In addition to functional rehabilitation, improvements were also observed in health-related quality-of-life measures, including EQ-VAS, SF-36 and stroke-specific scales such as the Stroke Impact Scale and SS-QoL. Stroke often results in long-term limitations affecting emotional well-being, social integration and overall life satisfaction. Therefore, evaluating rehabilitation outcomes solely through neurological measures may underestimate the broader impact of rehabilitation. Previous studies have emphasized the importance of incorporating patient-reported outcome measures when assessing rehabilitation effectiveness, as these instruments provide valuable insights into patients' perceptions of their health status and functional capacity (10-12).

Another relevant consideration is the role of multidisciplinary rehabilitation in

optimizing functional outcomes. Stroke rehabilitation typically involves coordinated interventions delivered by rehabilitation physicians, physiotherapists, occupational therapists, speech therapists and psychologists. Previous studies have shown that integrated rehabilitation approaches are associated with better functional recovery and improved long-term outcomes compared with fragmented or delayed interventions (18).

Despite the encouraging findings observed in this case, several limitations should be acknowledged. The present study involves a single patient and lacks a control group. In addition, the follow-up period was relatively short, preventing evaluation of long-term functional sustainability. Nevertheless, this case highlights the practical value of systematic clinimetric assessment in monitoring rehabilitation progress and guiding therapeutic decision-making. Future research involving larger patient cohorts and longer follow-up periods is needed to further clarify the role of standardized functional assessment tools in optimizing stroke rehabilitation outcomes.

Future directions in post-stroke assessment and rehabilitation research include the integration of digital technologies and telemedicine, which enable remote patient monitoring and facilitate rapid access to functional evaluations. These approaches can help optimize continuity of care and allow real-time adaptation of therapeutic interventions.

Another important aspect is the standardization of assessment tools through the use of uniform scales, which ensures comparability of results across different medical centers and patient populations.

The integration of biomarkers and advanced imaging techniques may further enhance understanding of neurological recovery mechanisms and support personalized treatment planning.

Conclusions

Standardized clinimetric tools play a key role in the assessment and monitoring of stroke patients, enabling objective evaluation of neurological deficits, functional independence, and recovery progression. Structured

rehabilitation programs contribute significantly to functional improvement and enhanced quality of life after stroke. The systematic implementation of standardized clinimetric assessment is recommended in clinical neurological rehabilitation practice.

Conflict of Interest

The authors declare that they have no conflict of interest.

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