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Assessment instruments used in acute stroke considering the International Classification of Functioning, Disability, and Health (ICF) as reference: a scoping review

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Dissertação apresentada(o) para cumprimento dos requisitos necessários à obtenção do grau de Mestre em **Fisioterapia** – Ramo/Área de Especialização em **Neurologia** pela Escola Superior de Saúde do Instituto Politécnico do Porto.

Resumo

Introdução: Os instrumentos que avaliam indivíduos com acidente vascular encefálico agudo encontram-se restritas à função/estrutura do corpo e a domínios de atividade. Assim, compreender as medidas utilizadas potencializará uma avaliação rigorosa, monitorizando os défices neurológicos.

Objetivo: Analisar os instrumentos utilizados na avaliação da incapacidade do AVE agudo, considerando a CIF como referência. Rever as propriedades psicométricas dos instrumentos mais utilizados.

Métodos: A metodologia foi realizada de acordo com as recomendações de *Joana Briggs Institute*. Utilizaram-se as bases de dados *PubMed*, *PEDro* e *Web of Science* em março de 2022 e estudos *randomized controlled trials*, *non-randomized controlled trials*, *cohort study*, *case-control study* e *cross-sectional analytic study.* Incidiram-se sobre o conceito de instrumentos de avaliação numa população adulta com AVE agudo.

Resultados: 94 dos 223 estudos, cumprem os critérios de inclusão. Destes, 125 medidas de avaliação foram extraídas, as medidas mais utilizadas foram *National Institute Health Stroke Scale*, *Barthel Index*, *Functional Independence Measure*, *Modified Rankin Scale, Mini-Mental State Examination* e *Fugl-Meyer Assessment*. Estas ferramentas foram medidas baseadas no desempenho e apresentaram-se válidas e fiáveis.

Conclusão: Foi clarificado que a avaliação no AVE agudo se torna pertinente, porém a maior parte dos instrumentos não esclareceu o avaliador. As medidas mais utilizadas apresentaram-se válidas e confiáveis.

Palavras-chave: acidente vascular encefálico agudo; medidas de avaliação; classificação internacional de funcionalidade; *scoping review*.

Abstract

Introduction: The instruments that assess individuals with acute stroke are restricted to body function/structure and activity domains. Thus, understanding the measures used will enhance a rigorous assessment, monitoring neurological deficits.

Objective: Analyzing the instruments used in the evaluation of acute stroke disability, considering the ICF as a reference. Review of the psychometric properties of the most used instruments

Methods: The methodology was carried out according to the recommendations of Joana Briggs Institute. We used the PubMed, Pedro and Web of Science databases in March 2022 and randomized controlled trials, non-randomized controlled trials, cohort study, case-control study, and cross-sectional analytic study. It was focused on the concept of assessment tools in an adult population with acute stroke.

Results: 94 of the 223 studies met the inclusion criteria. From these, 125 assessment measures were extracted, the most used measures were National Institute Health Stroke Scale, Barthel Index, Functional Independence Measure, Modified Rankin Scale, Mini-Mental State Examination and Fugl-Meyer Assessment. These tools were performance-based measures and were found to be valid and reliable.

Conclusion: It was clarified that the assessment in acute stroke becomes pertinent, however most of the tools did not clarify the assessor. The most used measures were valid and reliable.

Keywords: acute stroke; assessment measures; international classification of functioning; scoping review.

Index

1. Introduction

Stroke is the second leading cause of death in the world and the main cause of death and disability in Portugal, occurring predominantly in elderly adults (Wafa, Wolfe, Emmett, Roth, Johnson & Wang, 2020). Every hour three subjects suffer a stroke, one of them does not survive and half will have disabling sequelae. Until December 2021, 5.816 of stroke patients referred to Via Verde (VVAC) were registered by the National Emergency Medical Institute (INEM), while until march 2022 1,295 cases were reported by the same entity (Silva & Gouveia, 2012).

The stroke condition is characterized as a disorder that causes focal brain injuries, producing dysfunctions in the distributed brain interconnection area (Griffis, Metcalf, Corbetta, & Shulman, 2019). The reduced activity, usually measured by the cerebral blood flow and neuronal metabolism, causes depression in uninjured brain areas who are interconnected with the damaged one - diaschisis (Cheng, Aswendt, & Steinberg, 2016). In the first 24-48 hours after the stroke the increase of the inflammatory cytokines should be also considered (Coleman, et al., 2017; Li et al., 2016). Thus, it is important to understand the spatial and temporal progression of the neural circuit dynamics and identify motor control neuroplastic phenomena for physiotherapy specialized recovery actuation (Kleim & Jones, 2008).

The evaluation is the first and most important stage of the rehabilitation process and it is also the beginning of the clinical reasoning, on which the achievement of short and long-term objectives and the choice of therapeutic interventions is based (Williams, Rushton, Lewis & Philips, 2019).

To understand what really changes during stroke recovery, the recovery of bodily functions (restitution) must be taken into account (Veerbeek et al., 2014) and consequently the role of adaptation and perceptual learning and its links with plasticity. Thus, learning tasks and activities (movement experience) in stroke recovery and in the context of neurorehabilitation is linked by plasticity enabling cortical reorganization (Carey et al., 2019). Some studies explain that the behavioural recovery is related to the resolution of diaschisis, restitution of brain activity in these non-injured areas that are distant, but connected to the site of infarction (Hara, 2015).

The Stroke Rehabilitation Evidence-Based Review (SREBR) is a tool achieving the best-available scientific evidence for the effectiveness of stroke rehabilitation (Salter et al., 2013). However, there is lack of consensus on the selection of measures to best address and balance the needs and values of stakeholders in stroke rehabilitation (Salter et al., 2013). The International Classification of Functioning, Disability, and Health (ICF) was developed by the WHO over the past two decades to describe and measure health and disability (WHO, 2001), complemented by some

measures like Health Stroke Scale (NIHSS), Barthel Index (BI), Modified Rankin Scale (mRS) (Harrison, McArthur, & Quinn, 2013; Tempest, Harries, Kilbride, & Souza, 2013). In the ICF model, functionality has become a broad term that includes the interaction of positive aspects among the 3 main domains: (a) body structure and function, (b) activity and participation and (c) environment and personal factors. Both personal and environmental factors can act to facilitate or inhibit performance in daily activities and participation in the various aspects of daily life (OMS, 2004).

Thonnar and Penta (2007) performed a review of literature to identify the assessment tools used by physical therapists to evaluate patients with different adverse health conditions, including acute stroke, and found that the evaluations were restricted to the body functions and structures and activity domains. Thus, the individuals with motor disorder resulting from a stroke are not evaluated in a complete fashion, since not all the ICF components are considered in the evaluation process.

Therefore, understanding the assessment that has been performed in the acute phase is useful for monitoring patients' neurologic deficits, considering the continuum of care, and helps to determine the appropriateness of specific treatments (Tadi & Lui, 2022).

In order to obtain a more rigorous evaluation, it is pertinent to consider the psychometric properties of each instrument. In this sense, the analysis of parameters such as reliability and validity become essential, since reliability refers to an instrument's ability to reproduce a result consistently, and validity to an instrument's ability to measure exactly what it claims to measure (Souza, Alexandre & Guirardello, 2017).

This scoping review aims to summarize the tools used in the assessment of acute stroke disability considering ICF as a framework. After this summarization the psychometric properties were reviewed in order to know in detail the instruments for their application.

2. Research question

Fitting with the objective previously stated, the main research question of this study is: Which assessment tools/measures have been used for acute stroke, according to domains of ICF?

This leads to the following sub-research questions:

- When are the assessments tools usually administrated?
- Who applies the evaluation tools?
- What are the psychometric properties of the most used assessment tools?

3. Inclusion criteria

As proposed by the Joana Briggs Institute (JBI) (Peters et al., 2020), the mnemonic PCC referring to population, concept and context framework was adopted to guide the identification and inclusion of the studies, lined up with the research question.

3.1. Type of participants

Adult patients (≥18 years old) with an ischemic or hemorrhagic acute or subacute stroke in the early rehabilitation phase. Any study approaching other pathologies or without rehabilitation phase characterization was excluded. The definition of the rehabilitation phase was based on Stroke Roundtable Consortium recommendations. The first 24h were classified as the hyperacute phase, the first 7 days as the acute phase and the first 3 months as the early sub-acute phase (Grefkes & Fink, 2020).

3.2. Concept

The concept of interest in this review is the assessment instruments of acute post-stroke patients addressing the ICF dimensions. Therefore, to be included the studies should address instruments directed to assess: body functions (eg, mental functions, sensory functions and pain, voice and speech functions); body structures (eg, structures of the nervous system, structures related to movement); activities and participation (eg, communication, mobility, self-care, community, and social life); and/or environmental factors (eg, support and relationships). Studies that focused on evaluation outside the acute phase were excluded.

3.3. Context

This review was focused on the acute context of rehabilitation in which the patients have been inserted in a clinical, ambulatory, or acute care unit in early phase/acute poststroke.

3.4. Type of evidence sources

Randomized and non-randomized controlled trials, cohort study, case control study and cross-sectional analytic study were included. Case studies were the only qualitative study included. Any type of review (narrative, systematic, umbrella), thesis, conference proceedings, letter editorials and technical reports were excluded. To be included, the full-text publication must have been

written in English or Portuguese, without a specific time frame, given the limited research in this area.

4. Methods

The scoping review is one of the new approaches to synthesize the evidence in a more coherent and rigorous way. Therefore, with this kind of study it is possible to map and identify in the existing literature the assessment instruments used in the acute phase poststroke, allowing to clarify and disseminate what's being made and under what reason. 5 As advised, a protocol involving the objectives, inclusion criteria and all the remaining methodology for the scoping was defined. This protocol was developed using the JBI guideline (Peters et al., 2020).

4.1. Search Strategy

The research strategy outlined, search carried out in march 2022, aimed to find published studies and for this purpose, an electronic search was carried out in the PubMed, PEDro and Web of Science databases without time frame. First, a pilot search was conducted in the databases to list the most used words in the titles and abstracts of articles developed in the intended scientific area. The final search was discussed and peer-reviewed by others (JP and AS.). Then, the words and terms included were combined in a unique search strategy, adapted according to the specificities of each database used in the review (cf. Appendix I). The final search strategy for the PubMed database is presented in Appendix II.

4.2. Selection Process

After this analysis, the search results were exported to the reference manager Mendeley Desktop (version 1.19.4), and duplicates were removed by a library technician (cf. Appendix III).

Studies were screened based on the title and abstract, to verify the eligibility of the documents. This process was developed by two independent reviewers (JP and MD) that read the studies separately and then discussed and compared answers. Any disagreement was resolved with a third element (AS).

All documents that followed the previously established eligibility criteria, were subject to the full text analysis process by the same two authors and, again, in case of disagreements, the third author was consulted.

4.3. Data collection process

Data was extracted from papers included in the scoping review by one independent reviewer using a data extraction tool developed by the reviewer and the table was shared for discussion. The data extracted specific details about the author, year of publication, study design, time of stroke onset, target population characterization, measures administered, ICF domain, the rater, time of measurement application.

Psychometric properties were searched later and only for the most used measures.

4.4. Analysis and presentation of results

The results are presented in three tables (Tables 1, 2 and 3). Table 1 shows the overview of the articles, accompanied by the author, year of publication, study design, time of stroke onset, target population characterization, measures administered, ICF domain, the rater, time of measurement application and psychometric properties. Table 2a-2c and Table 3a-3f present the classification of the content of the questionnaires (Based in ICF) and psychometrics properties of instruments more used in the acute phase of stroke, respectively.

5. Results

5.1. Search results

After the main search, 223 records were identified (197 from Pubmed, 21 from PEDro and 5 from Web of Science). Of these, 3 were removed before screening by Mendeley software after detecting duplicated records. The titles and abstracts were screened by two independent reviewers considering the inclusion criteria and, of 220 reports, 43 were excluded. Of the 183 reports left sought for retrieval, 6 were not retrieved, being excluded. The remaining 177 were assessed for eligibility in full text. In this phase, studies were mostly excluded because: 1) didn't describe the time of assessment post-stroke, did not describe the time of acute stroke, or this time was more than 3 months (N=85); 2) included other pathologies and other topics (N=14); or included participants aged below 18 years old (N=11). Some reports were also excluded because of study design adopted (N=9) or were 7 written in languages other than Portuguese and English (N=1). Ninetyfour (N=94) were considered eligible for this review (Figure 1).

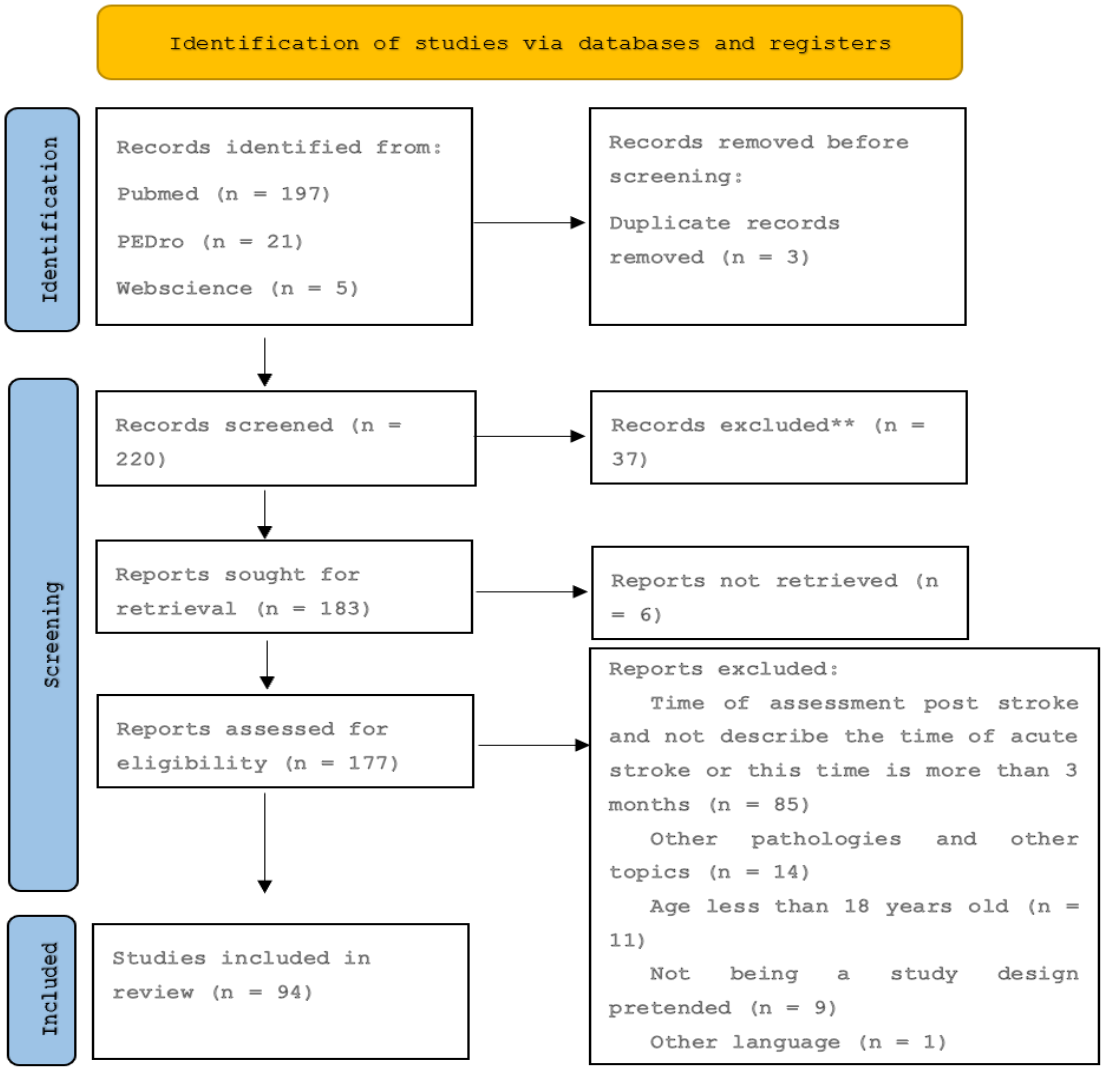

Figure 1– *Flow-chart - Details the flow of information through the different phases of the review; maps out the number of records identified, included, and excluded, and the reasons for their exclusion (adapted from the PRISMA flowchart in* (Page et al., 2021)).

5.2. Inclusion of sources evidence

The sources of evidence included can be consulted on Table 1 (Appendix V). The sources included focus on assessment measures on acute stroke, taking into account ICF domains where adult stroke patients were observed in the acute setting or the first assessment after baseline was not after 12 weeks (>3 months) post-stroke, therefore being able to review questions.

In Table 1 the general characteristics of the sources of evidence included are presented. All of the 94 studies discriminated (studies no. 1 to 94) that have met the scoping review eligibility criteria are intervention studies and most are randomized clinical trials (n=36), 18 were prospective studies, 13 were retrospective studies, 7 were cross-sectional studies, 6 were pilot studies, 4 were pilot studies and observational studies, 2 were preliminary studies and 2 were other design of studies. The publication date of the studies ranged from 1997 (Rodgers, et al. (1997) to 2021 (Chen, et al. 2021; Basagni, et al. 2021; Carvalho, et al. 2021; Zhou, et al. 2021; Yamauchi, et al. 2021; Tung, et al. 2021; Fugino, et al. 2021). The sample size varied from 6 (Pierella, C., et al. 2020) to 5475 (Zhou, et al. 2021). All subjects were adults aged between 18 and 100 years old and both genders were considered but not in a consistent way. This means that, in 67 studies only male patients have been evaluated, in 7 studies (studies no. 16, 17, 37, 38, 45, 74 and 76) differences in gender distributions were verified between the compared groups, in 2 studies (studies 44 and 58) gender was equally distributed and in 2 studies (studies no. 75 and 92) gender was not defined.

The assessment measures were applied within the first 24 hours and no longer than 3 months. One to two health professionals, namely a physical therapist, occupational therapist, speech therapist, + and/or neurologist, were involved in the evaluation in 31 studies, 11 mentioned the physical therapist as the only evaluator and 4 the occupational therapist. In the remaining articles (n=48) there is no reference to this aspect or there is no specific rater.

5.3. Review findings

Table 2a-2c demonstrates an overview of the 125 assessment tools that were screened from the articles. From the instruments assessing structure and functions (n=46), 6 were self-reported and 40 were performance-based. From those that evaluate activity and participation (n=62), 12 were self-reported measures and 50 were performance-based.

From evaluating both domains (n=16), 6 were self-reported and 10 were performance-based and, lastly, from those who evaluate both domains plus environment and personal factors was self-reported one instrument of assessing.

In general, the most used questionnaire was the NIHSS, which was applied in more than 45 studies, followed by BI (39 studies), FIM (23 studies), mRs (21 studies), MMSE (20 studies) and FMA (16 studies). All the other instruments were used in less than 6 studies (10% of the included studies)

Table 2a. *Classification of the content of the questionnaires (Based in ICF)*

DOMAINS OF ICF	Self-reported measures	Performance-based measures			
(a)Structure and Function	1. HADs 2. GHQ/GHQ–12 item 3. Wakefield Depression Inventory 4. Self-Rating Anxiety 5. SCL-90 6. GDS	7. MMSE /Modified MMSE (3MS) 8. TMSE 9. NIHSS/ NIH/ SMS-NIHSS/ NIHSS-T 10. FMA 11. VFSS 12. BSA 13. MoCA 14. GCS/ Glasgow Outcome Score 15. Grip force with dynamometer 16. OCSP 17. Fug-M	18. Hand movement Scale 19. Ohs 20. Oxfordshire Stroke Classification 21. MI Arm subtest / MI 22. FOIS 23. MASA 24. Goodglass and Kaplan Scale 25. TCT 26. FAST 27. AS/ Modified AS 28. BIT 29. Medical Research Council	30. Keyboard Tapping 31. Pegboard Tasks 32. Neuropsychological test battery 33. OPS 34. Cognitive Log 35. VMIQ 36. MTS 37. CCAT 38. BAS	39. Motor-Free Visual Perception Test 40. Active finger extension 41. SA 42. SS 43. Spontaneous speech 44. Oral comprehension 45. Retelling 46. Naming

Legend: *1.Hospital Anxiety and Depression Scale; 2. General Health Questionnaire; 5. Symptoms Checklist 90; 6. Geriatric Depression Scale; 7. Mini-Mental State Examination; 8. Thai Mental State Examination; 9. National Institutes of Health Stroke Scale/ National Institute of Health/ Supplementary motor scale NIHSS/ NIHSS-Thai; 10. Fugl-Meyer Assessment; 11. Videofluroscopic swallowing study; 12. Bedside swallowing assessment; 13. Montreal Cognitive Assessment; 14. Glasgow Coma Scale; 15. Force with dynamometer; 16. Oxfordshire Community Stroke Project; 17. Fugl-Meyer arm test; 19. Ohs; 21. Motricity Index; 22. Functional Oral Intake Scale; 23. Mann Assessment of Swallowing Ability; 25. Trunk Control Test; 26. Frenchay Aphasia Screening Test; 27. Ashworth scale; 28. Behavioral Inattention Test; 33. Orpington Prognostic Score; 35. Vividness of Movement Imagery Questionnaire; 36. Modified Tardieu Scale; 37. Chinese Aphasia Test; 38. Brunnstrom assessment score; 41. Shoulder abduction; 42. Shoulder shrug.*

Table 2b. *Classification of the content of the questionnaires (Based in ICF)*

DOMAINS OF ICF	Self-reported measures	Performance-based measures			
(b)Activities and Participation	47. SIS 48. EQ-5D 49. NHP 50. Nottingham Extended Activities of Daily Living (ADL) 51. Self-Perceived Burden Scale 52. Stroke Self-management Scale 53. SS-QoI 54. ADL / IADL's 55. CES-D 56. VAS 57. FSS 58. Center for Epidemiologic Studies Depression Scale-Thai version	59. BI/ Modified BI / Modified BI-T/ Korean-Modified BI 60. FIM 61. WMFT 62. mRS 63. Aphasia Quotient 64. LMCA 65. Walking Speed over 10 meters 66. Frenchay Social Activity Index 67. Extended Katz Index 68. MAS 69. Oxford Handicap Scale 70. ESS 71. FAC	72. Scandinavian Stroke Scale 73. RMI 74. SULCS 75. FES(S) 76. BBS 77. TUG 78. ARAT 79. 6MWT 80. FIST 81. Balance Scale 82. Walking over 50 meters 83. The 6-Clicks Mobility Measure 84. MSS	85. MSAS 86. LIND-MOB 87. SAQOL-39g 88. Longshi Scale 89. Albert's Test 90. 10-Meter Walk Test 91. 5-Meter Walk Test 92. Chedoke Arm and Hand Activity Inventory 93. Frenchay Arm Test 94. TOAST 95. Accelerometery 96. IPA	97. Household 98. Cooking 99. Shopping Tasks 100. CTT 101. Lawton–Brody IADL Scale 102. MAL 103. Line bisection test 104. Star cancellation test 105. 10MWT 106. ST 107. PASS 108. Thumb-Finding Test

Legend*: 47. Stroke Impact Scale; 48. Health-related quality-of-life index; 49. Notthingham Health Profile; 53. Stroke-specific Quality of Life questionnaire; 54. Activities of Daily Living / Instrumental activities of daily living scale; 55. Centers for Epidemiologic Studies Depression Scale; 56. Visual Analog Scale; 57. Fatigue Severity Scale; 59. Barthel Index/ Modified Barthel Index/ Modified BI-Thai;*

60. Functional Independence Measure; 61. Wolf Motor Function; 62. Modified Rankin Scale; 64. Lindmark Motor Capacity Assessment; 68. Motor Assessment Scale; 70. European Stroke Scale; 71. Functional Ambulation Category; 73. Rivermead Mobility Index; 74. Stroke Upper Limb Capacity Scale; 75. The Falls Efficacy Scale, Swedish version, 76. Berg Balance Scale; 77. The Timed Up & Go test; 78. Action Research Arm Test; 79. 6-Minute Walk Test; 80. Function In Sitting Test; 84. Motor Status Scale; 85. Mobility Scale for Acute Stroke Patients; 86. Lindmark and Hamrin Motor Assessment; 87. Stroke and Aphasia Quality of Life scale – 39 item generics; 100. Color Trails Test; 102. Motor activity log; 105. 10-Minute Walk Test; 106. Stars Test; 107. Postural Assessment Scale for Stroke.

Table 2b. *Classification of the content of the questionnaires (Based in ICF)*

DOMAINS OF ICF	Self-reported measures	Performance-based measures	
(a) + (b)	109. DCGH 110. SF-36 111. Medical Outcomes Studies Social Support Survey 112. Catherine Bergego Scale 113. EQ-6D 114. HRQOL	115. Chedoke McMaster 116. NHPT 117. SMES 118. STREAM/Simplified STREAM 119. BBT	120. Gait speed 121. CNS 122. SIAS 123. SARA 124. Trunk Impairment Scale
(a)+(b)+(c) Environment and Personal Factors	125. FAD	126.	127.

Legend: *109. Dartmouth Coop Global Health; 110. Short-Form 36; 113. EuroQol 6D; 114. Health-related quality of life; 116. Nine-Hole Peg Test; 117. Sodring Motor Evaluation Scale; 118. Stroke Rehabilitation Assessment of Movement; 119. Box and Block Test; 121. Canadian Neurological Scale; 122. Stroke Impairment Assessment Set; 123. Scale for Assessment and Rating of Ataxia; 125. Family Assessment Device.*

The psychometric properties of the most used instruments presented in Table 3a-3f are in the acute phase of stroke. With respect to the reliability of the measures (test/retest and inter rater/intra rater) all are found to be excellent, with the exception of BI which the interrater is rated as adequate to excellent. Generally, performance-based measurements have excellent criterion validity and only the FIM instruction has no effect on the floor or ceiling at any time. Ultimately, NIHSS, BI, and the FMA are very responsive to change, the FIM shows better change detection compared to the mRS, and the MMSE is not useful for assessing memory problems or general cognitive impairment after stroke.

Table 3a. *Properties psychometrics of NIHSS in acute phase of stroke.*

NIHSS	**Psychometric properties**
Reliability	Test/Retest: Excellent (ICC=0.93). Interrater/Intrarater: Excellent (ICC 0.998/ICC 0.969).
Criterion validity	Predictive validity Poor correlation with length of stay (r=0.276) / Adequate correlation with hospital charges (r=0.320) / Adequate correlation with discharge destination (home or elsewhere) (r=-0.355). Concurrent validity Adequate to Excellent correlations with diffusion weighted MRI lesion volumes (r=0.48 right, r=0.58 left) and perfusion weight hypoperfusion volumes (r=0.62 right, r=0.60 left).
Responsiveness	"NIHSS scores were compared to infarction size (measured by computed tomography) on 65 patients at 1-week post-stroke. 10 items demonstrated an average of 25% change over 7 days. However, changes in limb ataxia and best gaze may been overstated".

Table 3b. *Properties psychometrics of BI in acute phase of stroke.*

BI	**Psychometric properties**
Reliability	**Interrater/Intrarater:** Adequate to Excellent item level agreement among raters (kappa value range, 0-53-0.94) Excellent total score agreement (ICC=0.94).
Criterion validity	**Predictive validity:** Excellent correlation between the FIM motor and 10 item BI at both admission and discharge (r>0.92). **Concurrent validity:** Excellent between the modified BI and measure of motor ability using the Motricity Index (r=0.73 to 0.77).

	Adequate to Excellent correlations with diffusion weighted MRI lesion volumes (r=0.48 right, r=0.58 left) and perfusion weight hypoperfusion volumes (r=0.62 right, r=0.60 left).
Floor celling	A floor effect was observed at 18.2% and 4.7% at admission and discharge, respectively.
Responsiveness	The BI and BI-5 are highly responsiveness in detecting changes.

Table 3c. *Properties psychometrics of FIM in acute phase of stroke.*

FIM	Psychometric properties
Reliability	**Test/Retest:** Excellent (ICC=0.93) **Interrater:** Excellent (ICC=0.94)
Criterion validity	**Predictive Validity:** Patients with FIM total scores of 37 to 72 at admission showed higher gains (37-15) than patients who scored >73 (20+10) or < to 36 (29+23). **Concurrent Validity:** Excellent correlation between the FIM Motor Subscale and the 10-item version of the BI (r=0.92 (at admission) – 0.94 (at discharge)). **Construct Validity** Adequate correlation with length of hospital stray (r=0.39)/ Adequate to Excellent correlation with Brunnstrom's at admission and discharge (r=0.51-0.68).
Responsiveness	Motor subscale: large effect size with standardized response mean= 1.3.

Table 3d. *Properties psychometrics of mRS in acute phase of stroke.*

mRS	Psychometric properties
Reliability	**Test/Retest:** Excellent (Kappa w=0.95) **Interrater/Intrarater:** Excellent (Kappa w=0.95)/ Excellent (Kappa range 0.75-0.96
Criterion validity	**Concurrent validity:** Excellent with: BI (r= - 0.81); Frenchay Activities Index (r=-0.80) and EQ-56 (r= 0.68). **Construct validity:** Excellent convergent validity with: BI (p=0.87); NIHSS (p=0.86) and Glasgow Scale (p=0.94).
Floor Effects	Adequate in 18% of stroke sample at admission to rehabilitation.
Responsiveness	Poor at detecting change compared to the FIM (C=0.59)

Table 3e. *Properties psychometrics of MMSE in acute phase of stroke.*

MMSE	Psychometric properties
Reliability	Excellent reliability (ICC=0.67–0.93)
Criterion validity	**Predictive Validity:** Adequate for cognitive impairment after stroke (area under the curve of ROC was 0.84). **Construct Validity:** MMSE scores were found to significantly correlate with BI, MADRS and Zung Depression Scale (p> 0.05).

Ceiling Effects	Compared to the MoCA, a more pronounced ceiling effect was noted for the MMSE.
Responsiveness	The MMSE was not useful to assess memory problems or overall cognitive impairment after stroke.

Table 3f. *Properties psychometrics of FMA in acute phase of stroke.*

FMA	**Psychometric properties**
Reliability	**Test/Retest:** Excellent (ICC=0.97)
Criterion validity	**Predictive/Concurrent validity** Excellent FMA & Motor Assessment Scale (MAS) total score correlations (r=0.96)/ Poor FMA & MAS sitting balance item correlation (r= -0.10)/ Motor ad sensory FMA scores 5 days post-stroke was the strongest predictor of motor recovery 6 months post stroke. **Construct Validity:** Excellent correlation between modified balance scale on FMA and the Barthel Index (r= 0.86 – 0.89).
Ceiling Effects	Have been observed with the sensation subscore.
Responsiveness	Excellent on the modified version of the FMA Balance score: between assessments at 14-, 30-, 90- and 180-days post-stroke. / Responsiveness decreased as the time between stroke and assessments increased.

6. Discussion

This scoping review identified several assessment measures of acute stroke and demonstrated which are the most used by those evaluating the disability. Disability support can also be intensified through the use of the ICF. The ICF was developed with the standard objective of understanding and measuring impairment in functioning and disability and is not seen as a questionnaire or a research instrument (WHO, 2001). It is recognized that it is quite complex to measure disability, and, in this sense, it will be impossible to create a single measure, as well as a questionnaire, which encompasses all the 1454 categories that the ICF encompasses. However, it is possible for a measure to encompass all dimensions of the ICF (body function/structure; activities/participation and environmental and personal factors) and, if this does not happen, it is likely to cause underestimation of the prevalence and influence of disability (Yang, Ding & Dong, 2014). In this scope, the NIHSS, BI, FIM, mRS, MMSE and FMA were the most popular tools used. When analyzed according to the ICF framework, 39 assessment instruments measured "structure and function" (36.8%), 71 measured "activities and participation" (49.6%), 14 measured both domains (12.8%) and only a measure (Family Assessment Device - 0.8%) measured these

two domains plus the domain of “environmental and personal factors”. After analyzing the measures that were most used, half measured "structure and function" (NIHSS, MMSE and FMA) and the other half "activities and participation" (BI, FIM and mRS).

On the other hand, the measurement of disability can also be presented in two types of information: self-reported and performance-based. In the present study, twenty-one percent (21%) of the measures were based on the interviewees' perception of their own functioning (cognitive, mental, cultural, educational, or even language) which can sometimes be underestimated or overestimated – self-reported measures. Despite being low cost and easy to use compared to performance measures, performance-based measures better test the real, unperceived ability of respondents, in addition to having excellent validity, reproducibility and being sensitive to changes (Rozzini, et al. 1997). However, Mayhew et al. (2020) reports that both self-reported and performance-based measures are associated with disability after adjusting for the other domains and tests. The risk of disability was higher when the number of self-report domains and performance-based limitations increased. Thus, 79% were representative of performance-based measures and encompassed measures representative of more than 10% of articles, such as NIHSS, BI, FIM, mRS, MMSE and FMA.

Therefore, although the NIHSS is a widely used measure to evaluate the severity of neurological dysfunction in the acute context of stroke, its isolated use as a measure of post-stroke outcome is not recommended. This means that when applied early (1 to 3 hours after the stroke) the score will tend to be higher than when applied one week after the stroke, since the variations in the patient's clinical status are variable in the first 24 hours. In this sense, this variable tends to decrease over time and as such has an increase in predicting the patient's prognosis (Adams, 1999).

On the other hand, when discriminating different degrees of disability of the patient, the mRS scale overcomes a limitation of the BI scale, since it allows measuring several components of disability (deficit of body functions or structures, limitations to activity and participation), not limited to the activities of daily living (ADL). Therefore, the mRS scale has proven to be more useful than the BI in assessing post-stroke outcome, particularly in patients with mild degrees of disability, since the latter cannot discriminate differences in disability between patients with mild degrees of disability (Silva, 2013). The FIM (another measure of functional independence) was also developed to address the issues of sensitivity and comprehensiveness that were criticized as being problematic with the BI (McDowell & Newell, 1996). However, Wallace, Duncan & Lai

(2002) reports that both show a similar response to change when it comes to patients recovering from stroke between 1 to 3 months.

The MMSE is a reliable screening rather than diagnostic measure that quantitatively assesses cognitive impairment in adults. Nevertheless, its best-known limitation is that it is less sensitive to impairment in executive functioning and attention, memory, abstract reasoning, and visuospatial abilities. It becomes relevant, being that stroke can cause impairment in any of these cognitive domains (Weaver et al., 2021).

In contrast, FMA was designed to be used for patients with post-stroke and to assess motor functioning, balance, sensation and joint functioning (Glastone, Danells & Black, 2002). According to Sullivan, et al. (2011), this measure can be used in clinical practice or in future investigations of post-stroke structural integrity, severity of disability, and responsiveness to therapeutic interventions for post-stroke recovery.

It should be noted that all measures are easy to apply but may take some time to administer. In this sense, factors such as the rater and the period of application of the assessment measure are also potential influencers of the disability estimate.

Administration of the BI and mRS require no training and have been shown to be equally reliable when administered by skilled and unskilled individuals (Collin, Wade, Davies & Horne (1988); Zeltzer (2008), respectively). However, the NIHSS, FIM, MMSE require a trained interviewer and the FMA specifically requires a physical therapist, occupational therapist or other rehabilitation professional in its application. For example, Schmülling et al. (1998) demonstrated in 22 stroke patients that the NIHSS has excellent inter-rater reliability only when raters are trained and knowledgeable in how to administer this measure correctly. Although these scales mentioned present excellent inter-rater reliability, not all studies mention whether assessment was performed by specialists.

In view of the fact that the condition of stroke patients during the acute phase appears to be unstable, most studies find that assessment of patients should last for several days, or longer (Duncan, Lai & Keighley, 2000). On the other hand, having it last longer does not mean that an assessment done within the first 3 months of stroke is devalued, in the sense that it will have benefits in the diagnosis, treatment, and prognosis of the patient (Branco, et al. 2019).

In light of the information discussed, researchers should consider the intended purpose of measurement, the content, the context and the application (eg, the rater and the time of

administration) before selecting appropriate questionnaires from this scoping review. The psychometric properties become indispensable once a potential questionnaire has been chosen.

7. Limitations

There were some biases in the review process. First, although we adhered to strict scoping review methods, we included only publications in English and Portuguese. This language may cause a selection bias. On the other hand, in this review, a criterion was set in which only measures that comprised more than 10% of the articles were validated as "most used". Measures such as the Berg Balance Scale, Short-Form-36 Modified/Ashworth Scale that, despite having been cited in a higher number than the others, had to be excluded because they did not include 10% of the articles. This method might also induce selection bias.

8. Conclusion

This review identified performance-based disability measures that were developed for assessment of acute stroke. The most frequently used tools were the NIHSS followed by the BI, FIM, mRS, MMSE and FMA. The rater of the measures and the content and format of the questionnaires varied, but the dimensions of the ICF covered all of the questionnaires. The more applied measures were equally divided by the ICF domains and their psychometric properties have been shown to be reliable and valid.

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Appendix

***Appendix I** – Strategy for electronic database searches*

Database	Search terms
Pubmed	("acute stroke" [Title/Abstract] OR "AVC" [Title/Abstract] OR "acute cerebrovascular accident" [Title/Abstract]) AND ("surveys and questionnaires" [MeSH Terms] OR "survey*" [Title/Abstract] OR "questionnair*" [Title/Abstract] OR "Weights and Measures" [MeSH Terms] OR "Weights and Measures" [Title/Abstract] OR "scales" [Title/Abstract]) AND ("disability evaluation" [MeSH Terms] OR "disability evaluation" [Title/Abstract] OR "disabilit*" [Title/Abstract] OR "evaluation*" [Title/Abstract] OR "disabled persons" [MeSH Terms] OR "handicap*" [Title/Abstract] OR "Functional Status" [MeSH Terms] OR "Functional Status" [Title/Abstract] OR "Functional independence" [Title/Abstract]

	OR "Functional capacity" [Title/Abstract] OR "Functional performance" [Title/Abstract] OR "International Classification of Functioning, Disability and Health" [MeSH Terms] OR International Classification of Functioning, Disability and Health [Title/Abstract] OR "Functional assessment*" [Title/Abstract] OR "physical assessment*" [Title/Abstract] OR "physical examination"[MeSH Terms] OR "health status" [MeSH Terms] OR " health status" [Title/Abstract] OR "health status indicators" [MeSH Terms] OR "health status indicators" [Title/Abstract]) AND ("Neurological Rehabilitation" [MeSH Terms] OR "Neurological Rehabilitation" [Title/Abstract] OR "Neurorehabilitation" [Title/Abstract] OR "ambulatory care" [MeSH Terms] or "ambulatory care" [Title/Abstract] OR "Hospitals, Rehabilitation" [MeSH Terms] OR "Hospitals, Rehabilitation" [Title/Abstract] OR "Rehabilitation Hospitals" [Title/Abstract]) NOT ("Letter" [Publication Type] OR "Correspondence as Topic" [MeSH Terms] OR "Personal Narrative" [Publication Type] OR "Personal Narratives as Topic" [MeSH Terms] OR "Academic Dissertations as Topic" [MeSH Terms] OR "Clinical Conference" [Publication Type] OR "Review" [Publication Type] OR "review literature as topic" [MeSH Terms] OR "Systematic Review" [Publication Type] OR "Systematic Reviews as Topic" [MeSH Terms] OR "systematic review" [Title/Abstract]) Filters: Free full text, Adult: 19+ years, English and Portuguese
PEDro	acute stroke; function; health; rehabilitation
Web of Science	TS= (“acute stroke” OR “AVC” OR “Acute cerebrovascular accident”) AND TS=(“surveys and questionnaires” OR “survey*” OR “questionnaire*) OR “weights and measures” OR “scale”) AND TS=(“disability evaluation” OR "disability evaluation" OR "disabilit*" OR "evaluation*" OR "disabled persons" OR "handicap*” OR "Functional Status" OR "Functional Status" OR "Functional independence" OR "Functional capacity" OR "Functional performance" OR “International Classification of Functioning, Disability and Health” OR "Functional assessment*" OR "physical assessment*" OR "physical examination" OR "health status" OR " health status OR "health status indicators") AND TS=(“Neurological Rehabilitation” OR "Neurorehabilitation” OR "ambulatory care" MeSH Terms] OR "ambulatory care” OR "Rehabilitation Hospitals”) NOT TS=("Letter" OR "Personal Narrative" OR "Academic Dissertations" OR "Clinical Conference" OR "Review" OR "Systematic Review")

Appendix II *– Complete search strategy for PubMed*

Search: **("acute stroke" [Title/Abstract] OR "AVC" [Title/Abstract] OR "acute cerebrovascular accident" [Title/Abstract]) AND ("surveys and questionnaires" [MeSH Terms] OR "survey*" [Title/Abstract] OR "questionnair*" [Title/Abstract] OR "Weights and Measures" [MeSH Terms] OR "Weights and Measures" [Title/Abstract] OR "scales" [Title/Abstract]) AND ("disability evaluation" [MeSH Terms] OR "disability evaluation" [Title/Abstract] OR "disabilit*" [Title/Abstract] OR "evaluation*" [Title/Abstract] OR "disabled persons" [MeSH Terms] OR "handicap*" [Title/Abstract] OR "Functional Status" [MeSH Terms] OR "Functional Status" [Title/Abstract] OR "Functional independence" [Title/Abstract] OR "Functional capacity" [Title/Abstract] OR "Functional performance" [Title/Abstract] OR "International Classification of Functioning, Disability and Health" [MeSH Terms] OR International Classification of Functioning, Disability and Health [Title/Abstract] OR "Functional assessment*" [Title/Abstract] OR "physical assessment*" [Title/Abstract] OR "physical examination"[MeSH Terms] OR "health status" [MeSH Terms] OR " health status" [Title/Abstract] OR "health status indicators" [MeSH Terms] OR "health status indicators" [Title/Abstract]) AND ("Neurological Rehabilitation" [MeSH Terms] OR "Neurological Rehabilitation" [Title/Abstract] OR "Neurorehabilitation" [Title/Abstract] OR "ambulatory care" [MeSH Terms] or "ambulatory care" [Title/Abstract] OR "Hospitals, Rehabilitation" [MeSH Terms] OR "Hospitals, Rehabilitation" [Title/Abstract] OR "Rehabilitation Hospitals" [Title/Abstract]) NOT ("Letter" [Publication Type] OR "Correspondence as Topic" [MeSH Terms] OR "Personal Narrative" [Publication Type] OR "Personal Narratives as Topic" [MeSH Terms] OR "Academic Dissertations as Topic" [MeSH Terms] OR "Clinical Conference" [Publication Type] OR "Review" [Publication Type] OR "review literature as topic" [MeSH Terms] OR "Systematic Review" [Publication Type] OR "Systematic Reviews as Topic" [MeSH Terms] OR "systematic review" [Title/Abstract])** Filters: **Free full text, Adult: 19+ years, English, Portuguese**

Appendix III *– Results of Mendeley*

Database	Data coverage	Data of search	Number of results
PubMed	2004-2022	04/06/2022	52
PEDro	---------	04/06/2022	21
Web of Science	1996-2022	04/06/2022	5
Duplicates	1		
Total records	77		

Appendix IV – *Characteristics of included sources of evidence*

Table 1 *– Characteristics of included sources of evidence*

No	Author/year of publication	Study design	Sample size	Time since stroke	Target population characterization and sample size	ICF domains	Measures administered	The rater	Time of measurement application
1	Saposnik, G., Cohen, L., Mamdani, M., Pooyania, S., Ploughman, M., Cheung, D., Shaw, J., Hall, J., Nord, P., Dukelow, S., nilanant, Y., Rios, D., Olmos, L., Levin, M., Teassel, M., Cohen, A., Thorpe, K., Laupacis, A., & Bayley, M. (2016)	Randomised, multicentre, single-blind, controlled trial.	VRWii (n=67) Recreational activity (n=70)	VRWii Mean (SD) 27.0 (9.0) days Recreational activity Mean (SD) 24.5 (10.0) days (Within 3 months of stroke)	WRWii 46M/25F Recreational activity 48M/22F Mean age 62 years (Range 18-85 years)	(a) Structure and function (b) Activities and participation	(a) and (b) Chedoke-McMaster. (a) Hospital Anxiety and Depression Scale (HADs). (b) Wolf Motor Function (WMFT), Box and Block Test (BBT), Stroke Impact Scale (SIS), Functional Independence Measure (FIM), Barthel Index (BI) and Modified Rankin Scale (mRS).	The trained outcome assessor.	Chedoke-McMaster, HADs and mRS are inclusion criteria. The other measures, including mRS, were applied at baseline (randomisation), at 2 weeks (post-intervention) and at 4 weeks (follow-up).
2	Holmqvist, W., Koch, L., Kostulas, V., Holm, M., Widsell, G., Tegler, H., Johansson, K., Almazán, J., & Pedro-Cuesta, J. (1998)	RCT	HRG (n=41) RRG (n=40)	Range: 5-7 days after stroke onset	HRG 22M/19F RRG 22M/18F Mean age 72 years	(a) Structure and function (b) Activities and participation	(a) and (b) Nine-Hole Peg Test (NHPT). (a) Mini-Mental State Examination (MMSE). (b) Aphasia Quotient (AQ), Lindmark Motor Capacity Assessment, Walking Speed over 10 meters, Frenchay Social Activity Index, and BI.	Physical therapist.	One week after stroke After discharge After 3 months post-stroke.
3	Chaiyawat, P., Kulkantrakorn, K., & Sritipsukho, P. (2009).	RCT	Intervention group (n=30) Control group (n=30)	3 days after stroke onset	Intervention group Mean age 67 years 14M/16F Control group Mean age 66 years 13M/17F	(a) Structure and function (b) Activities and participation	(a) Thai Mental State Examination (TMSE), HADs and National Institutes of Health Stroke Scale (NIHSS) (b) The health-related	Evaluator accredited.	NIHSS was applied only at baseline. The others are applied at baseline and after 3 months.

							quality-of-life index (EQ-5D), Extended Katz Index, BI and mRS.		
4	Langhammer, B., & Stanghelle, J. (2000)	Double-blind study.	Group 1 (n=33) Group 2 (n=28)	Range: 21-34 days	Group 1 20M/13F Group 2 16M/12F Mean 78 years (Range 49–95 years)	(a) Structure and function (b) Activities and participation	(a) and (b) Sodring Motor Evaluation Scale (SMES). (b) Motor Assessment Scale (MAS), Notthingham Health Profile (NHP) and BI.	Not described.	BI was applied at 3 days after hospital admission and 3 months post-stroke. NHP applied only at 3 months post-stroke. The other measures were applied 3 days after admission, after 2 weeks and 3 months post-stroke.
5	Langhammer, B., & Stanghelle, J. (2011)	RCT	Motor Relearning group (n=33) Bobath group (n=28)	Range: 21-34 days	Group 1 20M/13F Group 2 16M/12F Mean 78 years (Range 49–95 years)	(a) Structure and function (b) Activities and participation	(a) and (b) SMES. (b) NHP, MAS and BI.	Not described.	BI was applied 3 days after hospital admission and 3 months post-stroke. NHP applied only 3 months post-stroke. The other measures applied 3 days after admission, after 2 weeks and 3 months post-stroke.
6	Rodgers, H., Soutter, J., Kaiser, W., Pearson, P., Dobson, R., Skilbeck, C., & Bond, J. (1997).	RCT	Early sypported discharge (n=46) Convencional care (n=46)	Between 5 and 19 at 72 hours post-stroke	Early supported discharge 26M/20F Convencional care 24M/22F Mean age 73 years	(a) Structure and function (b) Activities and participation	(a) e (b) Dartmouth Coop Global Health. (a) General Health Questionnaire (GHQ) and Wakefield Depression Inventory. (b)Nottingham Extended Activities of	Research associated (JS).	BI and Oxford Handicap Scale were inclusion criteria. BI was applied at 7 day post-stroke. Oxford Handicap Scale, Nottingham

							Daily Living (ADL), Oxford Handicap Scale and BI.		Extended ADL, Dartmouth Coop Global Health Status, GHQ and Wakefield Depression Inventory at 3 months post-stroke.
7	Chen, Q., Shen, W., Sun, H., Shen, D., Cai, X., Ke, J., Zhang, L., & Fang, Q. (2021).	RCT	Test group (n=15) Control group (n=15)	7th day post-stroke onset	Test group Mean age 54.60 years 9M/6F Control group Mean age 58.13 years 8M/7F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) Aphasia Quotient (AQ), spontaneous speech, oral comprehension, retelling, naming and mRS.	Experienced neurologist.	At baseline After treatment 12-week follow-up.
8	Chen, L., Fang, J., Ma, R., Gu, X., Chen, L., Li, J., & Xu, S. (2016).	Multicenter RCT.	Acupuncture (AG) (n=125) No acupuncture (NAG) (n=125)	Range: 2-7 days onset of stroke	AG Mean age 62.52 years 74M/51F NAG Mean age 64.06 years 74M/51F	(a) Structure and function	(a) MMSE, Fugl-Meyer Assessment (FMA), Videofluroscopic swallowing study (VFSS), Bedside swallowing assessment (BSA), NIHSS and Montreal Cognitive Assessment (MoCA).	Not described.	BSA was applied at week 0 (at baseline). VFSS was applied at week 0 and week 7 follow-up). FMA, MMSE and MoCA were applied at week 0, week 3 (after treatment) and week 7. NIHSS was applied at all stages.
9	Liu, N., Cadilhac, D., Andrew, N., Zeng, L., Li, Z., Li, J., Yu, X., Mi, B., Li, Z., Xu, H., Chen, Y., Wang, J., Yao, W., Li, K., Yan, F., & Wang, J. (2014).	RCT	Very Early Rehabilitation (VER) (n=122) Standard Care (n=121)	VER - 48 hours stroke onset Standard Care - after 7 days stroke onset	VER Mean age 58.5 years 67M/55F Standard Care Mena age 59.1 years 70M/51F	(a) Structure and function (b) Activities and participation	(a) and (b) SF-36 (a) Self-Rating Anxiety and NIHSS. (b) BI.	Research staff.	NIHSS and BI were applied at baseline. BI, SF-36 and Self-Rating Anxiety were applied 3 months post-stroke.

10	Wu, D., Guo, M., Gao, Y., Kang, Y., Guo, J., Jiang, X., Chen, F., & Liu, T. (2012).	RCT	Trial (n=60) Control (n=60)	48 hours post-stroke	Trial Mean age 56.10 years 30M/20F Control Mean age 56.70 years 32M/28F	(a) Structure and function (b) Activities and participation	(a) Symptoms Checklist 90 (SCL-90), and Glasgow Coma Scale (GCS). (b) Europ Stroke Scale (ESS) and BI.	Psychologists.	GCS is an inclusion criteria in this study. SCL-90 and ESS were applied at day 3 and day 21 BI was applied on day 90.
11	Teixeira da Cunha Filho, I., Lim, P. A. C., Qureshy, H., Henson, H., Monga, T., & Protas, E. J. (2001).	Pilot study.	Regular (n=6) Supported treadmill ambulation training (STAT) (n=6)	Regular 14.33 ± 6.06 days STAT 15.67 ± 7.66 days (less than 6 weeks post event)	Regular Mean age 59.67 years 6M STAT Mean age 57.83 years 6M	(a) Structure and function (b) Activities and participation	(a) MMSE, National Institute of Health (NIH). (b) Functional Ambulation Category (FAC) and FIM.	Not described.	MMSE and FAC are inclusion criteria in this study. MMSE and NIH were applied at baseline. FAC and FIM-L were applied at baseline and the post-intervention.
12	Hinkle, J. L. (2001).	Descriptive study.	n= 100	The first 24h of care	Mean age 65 years 51M/49F	(a) Structure and function (b) Activities and participation	(a) MMSE and NIHSS. (b) FIM.	Neurologist applied the MMSE and NIHSS and investigator underwent training applied the FIM.	Within 24 hours of admission.
13	Pierella, C., et al. (2020).	RCT	n=6	Range: 2-6 weeks of the stroke onset	Mean age 68.6 years (Range 34-82 years) 2M/4F	(a) Structure and function (b) Activities and participation	(a) FMA and grip force with dynamometer.	Therapist not directly involved in the study.	Two weeks (A1, baseline), one week (A2) before the beginning of the training, final two assessment sessions were completed one week after the end of the training (A3) and one month after the end of the training (A4).
14	Jammali-Blasi, A., McInnes, E., Markus, R., Faux, S., O'Loughlin, G., Dale,	Cluster RCT	n=54	≤48h hours post-stroke	Mean age 74.6 years (Range 43-100 years) 31M/23F	(a) Structure and function	(a) Oxfordshire Community Stroke Project (OCSP) (b) Scandinavian Stroke Scale (SSS).	Stroke unit staff.	At baseline.

	S., & Middleton, S. (2011).								
15	Smania, N., et al. (2007).	Observacional study.	n=48	At 7 days after stroke	Mean age 74.39 years 22M/21F	(a) Structure and function (b) Activities and participation	(a) Fugl-Meyer arm test (FugM), Hand movement scale, NHPT and Motricity Index arm subtest (MI) (b) Active finger extension (AFE) , shoulder abduction (SA) and shoulder shrug (SS).	Not described.	The AFE, SS, SA and HMS (all performed 7 days after stroke) and NHPT, FugM and MI at different times poststroke (14, 30, 90 days after stroke)
16	Johansson, B. B., et al. (2001)	RCT	Acupuncture (n=48) TENS (n=51) Subliminal (n=51)	Range: 5-10 days after stroke	Acupuncture Mean age 76 years 29M/19F TENS Mean age 77 years 23M/28F Subliminal Mean age 76 years 25M/26F	(a) Structure and function (b) Activities and participation	(a) and (b) NHPT. (b) NHP, BI and Rivermead Mobility Index (RMI).	Not described.	In the hospital at randomization and at follow-up at 3 months after onset of stroke.
17	Tang, W. K., Lau, C. G., Mok, V., Ungvari, G. S., & Wong, K. S. (2013).	Cross-sectional study.	Apathy (n=36) Nonapathy (n=355)	Within 7 days prior to admission.	Apathy Mean age 68.3 years 16M/20F Nonapathy Mean age 65.9 years 216M/139F	(a) Structure and function	(a) NIHSS and MMSE.	Trained research assistant.	At admission.
18	Branco, J. P., Oliveira, S., Sargento-Freitas, J., Laíns, J., & Pinheiro, J. (2019)	Prospective observational study.	n=131	Up to 3h of symptom onset	Range between 18-85 years 65M/66F	(a) Structure and function (b) Activities and participation	(b) Stroke Upper Limb Capacity Scale (SULCS) mRS and FIM.	Neurologist.	At 48h, 3 weeks and 12 weeks after the stroke.
19	Pickering, R. L., Hubbard, I. J., Baker, K. G., & Parsons, M. W. (2010).	Observational study.	n=25	Range: 2.75–6.0 days after stroke onset	Mean age 69.96 years 14M/11F	(b) Activities and participation	(b) upper limb subscale of the Motor Assessment Scale (UL-MAS).	Occupational therapists and physiotherapists.	At admission and at 1-month post-stroke

20	Carnaby, G., Sia, I., & Crary, M. (2019).	Cross-sectional period-prevalence study.	n=96	Range: 24h to 3.1 days post-stroke	Mean age 62.5 years 58M/38F	(a) Structure and function (b) Activities and participation	(a) Mann Assessment of Swallowing Ability (MASA), Functional Oral Intake Scale (FOIS), NIHSS and GCS. (b) BI and mRS.	Not described.	MASA, NIHSS and GCS were applied only at baseline. FOIS, mRS and BI were applied at admission and at discharge.
21	Engberg, W., Lind, A., Linder, A., Nilsson, L., & Sernert, N. (2008).	Observational study.	Group 1 (n=30) Group 2 (n=30)	Within 5 days after the onset of stroke	Group 1 Mean age 71 years (Range 44–84 years) 22M/8F Group 2 Mean age 73 years (Range 56-88 years) 19M/11F	(b) Activities and participation	(b) The Falls Efficacy Scale, Swedish version (FES(S)), Berg Balance Scale (BBS) and The Timed Up & Go test (TUG).	Physiotherapists.	Within 5 days after the onset of stroke
22	Fan, Y. T., Lin, K. C., Liu, H. L., Chen, Y. L., & Wu, C. Y. (2015).	Prospective study.	n=10	Time from stroke onset was 46.8 days (Range: 17–69 days)	Mean age 52.7 years (Range 42-61 years) 8M/2F	(a) Structure and function (b) Activities and participation	(a) FMA upper limb and MMSE. (b) WMFT Functional Ability Scale (WMFT-FAS) and FIM.	Not described.	FMA upper limb and MMSE are inclusion criteria in this study. All were applied at pre- and post-treatment.
23	Da Costa, F. A., Damasceno Bezerra, I. F., De Araujo Silva, D. L., De Oliveira, R., & Da Rocha, V. M. (2010).	Longitudinal study.	n=42	Range: 7-90 days after stroke	Mean age 65.26 years (Range between 40-90 years) 18M/24F	(a) Structure and function	(a) NIHSS and MMSE.	Two physiotherapists.	At admission time (baseline-A1) and after 3 months (A2).
24	Rabadi, M. H., Rabadi, F. M., Edelstein, L., & Peterson, M. (2008).	Retrospective cohort study.	n=668	Time from stroke onset to admission was 11.95 days, (≤4wk)	Mean age 70.30 years (Range 22-96 years) 311M/357F	(a) Structure and function (b) Activities and participation	(a) MMSE. (b) FIM.	Occupational, physical, and speech-language therapies.	MMSE applied at admission. FIM applied at admission and discharge.
25	Rabadi, M. H., & Rabadi, F. M. (2006)	Prospective study.	n=104	Time of stroke onset to admission 16 days (within 2 weeks of stroke onset)	Mean age 72 years 43M/61F	(a) Structure and function (b) Activities and participation	(a) NIHSS and FMA (b) Action Research Arm Test (ARAT)	Not described.	NIHSS is an inclusion criteria in this study. FIM and ARAT were applied within 72 hours of patient admission to the rehabilitation

									unit and within 24 hours before discharge.
26	Ren, X. R., et al. (2020).	Longitudinal observational study.	n=203	Time of stroke onset between 1 and 3 months	Mean age 69.69 years (Range 60–89 years) 132M/71F	(a) Structure and function (b) Activities and participation	(b) Self-perceived burden scale (SPBS), Stroke Self-management Scale and BI.	Not described.	BI is an inclusion criteria. SPBs and stroke self-management scale were applied 1 month and 3 months after stroke.
27	Sritipsukh, P., Riewpaiboo, A., Chaiyawa, P., & Kulkantrakor, K. (2010).	RCT	Intervention Group (n = 28) Control Group (n = 30)	3 days after stroke onset	Intervention group Mean age 67 years 14M/16F Control group Mean age 66 years 13M/17F	(a) Structure and function (b) Activities and participation	(a) NIHSS, TMSE and HADs. (b) BI, mRS	Not described.	All measures were applied at baseline. BI and mRs were applied 3 months post-stroke.
28	Basagni, et al. (2021).	Prospective multicentric study.	n=118	Mean time from event 10.5 days (within 30 days)	Mean age 77 years (≥ 18 years old) 64M/54F	(a) Structure and function	(a) NIHSS and Oxford Cognitive Screen heart test (Ohs).	NIHSS was administered by a neurologist or physiatrist medical doctor and Ohs was administered by a neuropsychologist.	At admission.
29	Ng, S. S. M., Lai, C. W. K., Tang, M. W. S., & Woo, J. (2016)	RCT	Transcutaneous electrical nerve stimulation (TENS) + Task-oriented balance training (TOBT) (n=37) Placebo-stimulation (P-STIM) +TOBT (n=39)	Mean time from stroke 6.2 days (Range 3-11 weeks post-stroke onset)	TENS+TOBT Mean age 72.6 years 24M/13F P-STIM +TOBT Mean age 69.3 years 25M/15F	(a) Structure and function (b) Activities and participation	(a) SF-36. (b) BBS, RMI, TUG and 6-Minute Walk Test (6MWT).	Not described.	Before treatment (baseline), after eight sessions, after 16 sessions.

30	Kurokawa, N., Kai, C., Hokotachi, Y., Hasegawa, M., & Amagai, T. (2018).	Retrospective observational chart review.	Low (n=40) High (n=75)	Low Length of stay 7 days after stroke High Length of stay 4 days after stroke	Low Mean age 72 years 30M/10F High Mean age 70 years 48M/27F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) FIM.	Physical therapist or occupational therapist.	On admission
31	Gorman, S. L., Radtka, S., Melnick, M. E., Abrams, G. M., & Byl, N. N. (2010)	Pilot study.	n=31	≤3 months	Mean age 61.5 years (Range 42-86 years) 21M/10F	(b) Activities and participation	(b) mRS and Function In Sitting Test (FIST)	Not described.	mRS is an inclusion criteria. FIST was applied at admission.
32	Ahmed, S., Mayo, N. E., Higgins, J., Salbach, N. M., Finch, L., & Wood-Dauphinée, S. L. (2003).	Longitudinal cohort study.	Participants (n=63) Nonparticipants (n=122)	One week	Participants Mean age 67 years (Range 25-95 years) 39M/24F Nonparticipants Mean age 70 years (Range 34-100 years) 67M/55F	(a) Structure and function (b) Activities and participation	(a) and (b) Stroke Rehabilitation Assessment of Movement (STREAM) and Canadian Neurological Scale (CNS). (b) Balance Scale, BI, TUG, BBT and gait speed.	Investigators.	Initial evaluation, 5-week and 3 months evaluation.
33	Appel, C., Mayston, M., & Perry, L. (2011).	RCT	Intervention (n=6) Control (n=7)	Within 10 days of stroke onset	Intervention group Mean age 71.3 years 4M/2F Control group Mean age 63.3 years 5M/2F	(a) Structure and function (b) Activities and participation	(a) and (b) NHPT (a) FMA arm. (b) MAS and Stroke-specific Quality of Life questionnaire (SS-QoL).	Therapists.	At baseline and 1, 2, 3 and 5 weeks later. A stroke-specific Quality of Life questionnaire was applied at 6 and 12 weeks post-stroke.
34	Bernhardt, J., et al. (2016).	RCT	n=2104	Median 18.2 days (Range 12.3–21.8 days)	Median 72.5 years (Range 62.9-80.3 years) 1286M/818F	(a) Structure and function (b) Activities and participation	(a) NIHSS and Oxfordshire Stroke Classification. (b) mRS and walking over 50 meters.	Not described.	At baseline and 3 months post-stroke.
35	Bernhardt, J., et al. (2015).	RCT	Very early mobilisation (n=1054) Usual care (n=1050)	18h after stroke onset	Very early mobilisation Mean age 72.3 years (Range 62.3-80.3 years)	(a) Structure and function (b) Activities and participation	(a) NIHSS and Oxfordshire Stroke Classification. (b) mRS and walking over 50 meters.	Not described.	At baseline and 3 months post-stroke.

					643M/411F Usual care Mean age 72.7 years (Range 63.4–80.4 years) 463M/407F				
36	Bruno, A., Lin, C., Shah, N., Switzer, J. A., & Akinwuntan, A. E. (2012).	Preliminary study.	n=26	Mean time from stroke onset 19.5 hours (Range 2–45 hours)	Mean age 60 years 7M/19F	(a) Structure and function (b) Activities and participation	(a) NIHSS and Geriatric Depression Scale (GDS).	Not described.	NIHSS was applied at baseline and 3 months post-stroke. Geriatric Depression Scale was applied 3 months after the stroke.
37	Carvalho, L. B., Chambers, B., Borschmann, K., Kaffenberger, T., Churilov, L., Thijs, V., & Bernhardt, J. (2021).	Retrospective study.	Neurovascular substudy (n=191) AVERT trial (n=2104)	≤1 week	Neurovascular substudy Mean age 74.5 years (Range 65.4–81.6 years) 17M/74F AVERT trial Mean age 72.5 years (Range 62.9–80.3 years) 1286M/818F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) mRS.	Not described.	NIHSS is an inclusion criteria. mRS was applied 3-month post-stroke.
38	Cichoń, N., Rzeźnicka, P., Bijak, M., Miller, E., Miller, S., & Saluk, J. (2018).	RCT	Control (n=34) Study group (n=23)	Up to 4 weeks	Control Mean age 70.9 years 12M/22F Study Group Mean age 68.9 years 15M/9F	(a) Structure and function (b) Activities and participation	(a) MMSE, NIHSS and GDS. (b) Activities of Daily Living (ADL).	GDS was administered by a psychologist.	Before treatment, after 10, and after 20 rehabilitation treatments
39	Cosgrave, L., Bernhardt, J., Churilov, L., Indredavik, B., & Cumming, T. (2013).	Prospective study.	n=274	Mean 6.3 days post-stroke (Range 0–14 days)	Mean age 71.4 years 157M/117F	(a) Structure and function (b) Activities and participation	(a) NIHSS.	Not described.	At admission.
40	Covert, S., Johnson, J. K., Stilphen, M., Passek, S., Thompson, N. R., & Katzan, I. (2020).	Retrospective cohort study.	At home (n=829) In IRF (n=194) In SNF (n=520)	At home Mean 4 days (Range 2–6 days) In IRF	Mean age 66.4 years 783M/760F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) The 6-Clicks Mobility Measure.	Not described.	At admission and discharge.

				Mean 6 days (Range 4–10 days) In SNF Mean 8.5 days (Range 5–14 days)					
41	da Costa, F. A., da Silva, D. L. A., & da Rocha, V. M. (2011).	Descriptive study.	n=40	Range: 1–90 days post-stroke	Mean age 65.9 years (Range 40–90 years) 18M/22F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) FIM.	Physical therapist.	At admission.
42	, P. W., Bode, R. K., Lai, S. M., & Perera, S. (2003).	RCT	n=696	1 month post-stroke	Mean age 68.6 years 386M/310F	(a) Structure and function (b) Activities and participation	(a) NIHSS and OCSP. (b) mRS and SIS.	Not described.	mRS is an inclusion criteria. NIHSS and OCSP were applied at baseline. SIS was applied 1 and 3 months poststroke.
43	Epstein-Lubow, G. P., Beevers, C. G., Bishop, D. S., & Miller, I. W. (2009).	Cross-sectional study.	n=192	Within 2 weeks of the stroke	Mean age 65.6 years (Range 19–92 years) 110M/82F	(a) Structure and function (b) Activities and participation	(a) and (b) SF-36. (a) NIHSS, Modified MMSE (3MS) and GDS. (b) FIM, Frenchay Activities Index, Centers for Epidemiologic Studies Depression Scale (CES-D) and Family Assessment Device (FAD)	Not described.	At baseline.
44	Duret, C., Courtial, O., & Grosmaire, A. G. (2016).	Observational study.	n=38	Time since stroke 55 days	Mean age 56 years (Range 19–87 years) 19M/19F	(a) Structure and function (b) Activities and participation	(a) FMA. (b) Motor Status Scale (MSS).	Physical and occupational therapists.	Before and after the 16 training sessions.
45	Le Heron, C., Fang, K., Gubbi, J., Churilov, L., Palaniswami, M., Davis, S., & Yan, B. (2014).	Pilot study.	Patient (n=20) Control (n=10)	Median 54 hours (Range 47–100 hours)	Patient Mean age 77 years (Range 59–82 years) 11M/9F) Control Mean age 64 years	(a) Structure and function	(a) NIHSS.	Neurologist.	At baseline and at 1, 2, 4 and 24 hours later.

					(Range 48–71 years) 2M/8F				
46	Koh, G. C. H., et al.. (2012).	Retrospective cohort study.	(n =2810)	Range: 1–6 days	Mean age 71.0 years (Adults) 1345M/1464F	(a) Structure and function (b) Activities and participation	(b) BI.	Occupational therapists.	At admission and discharge.
47	Leira, E. C., Coffey, C. S., Jorge, R. E., Morton, S. M., Froehler, M. T., Davis, P. H., & Adams, H. P. (2013).	Multidisciplinary Recovery Trials.	n=1281	Within 24 h of onset of stroke.	Mean age 65.4 years (Adults) 785M/496F	(a) Structure and function (b) Activities and participation	(a) Supplementary motor scale NIHSS (SMS–NIHSS), NIHSS and Glasgow Outcome Score. (b) BI	Investigators.	GOS and BI were applied at 3 months. NIHSS and SMS–NIHSS were applied at baseline, 4 h, 24 h, daily from day 2 to 7, and at 3 months post event.
48	Simondson, J. A., Goldie, P., & Greenwood, K. M. (2003).	Retrospective study.	n=106	At two weeks post–stroke.	Mean age 69 years (Range 39 to 91 years) 67M/39F	(b) Activities and participation	(b) Mobility Scale for Acute Stroke Patients (MSAS), MAS, FAC, FIM and BI	Physical therapist.	Up to 2 weeks post–stroke.
49	Lombardi, B., Orioli, A., Casavola, D., & Paci, M. (2017).	Evaluation of the psychometric properties.	n=41	Time since stroke 13.1 days (within 30 days from onset)	Mean age 68.8 years (Range 18–89 years) 16M/25F	(a) Structure and function (b) Activities and participation	(a) Goodglass and Kaplan Scale, FMA and Trunk Control Test (TCT) (b) BI and Lindmark and Hamrin Motor Assessment (LIND–MOB)	Physical therapist.	Goodglass and Kaplan Scale is inclusion criteria. FMA and BI were applied at admission. The others were applied after randomization.
50	Ferriero, G., Franchignoni, F., Benevolo, E., Ottonello, M., Scocchi, M., & Xanthi, M. (2006).	Prospective study.	n=85	Mean 22 days for admission.	Mean age 70 years (Range 39–87 years) 41M/44F	(a) Structure and function	(a) FIM.	The interview or paramedical personnel.	Within the first 48h of admission and at discharge.

51	Hilari, K. (2011).	RCT	People without aphasia (n=55) People with aphasia (n=32)	(± one week)	Mean 69.7 years (Range 18–91 years) 52M/35F	(a) Structure and function (b) Activities and participation	(a) and (b) Medical Outcomes Studies Social Support Survey. (a) NIHSS, General Health Questionnaire–12 item (GHQ-12). (b) Frenchay Aphasia Screening Test (FAST), BI, Frenchay Activities Index, Stroke and Aphasia Quality of Life scale – 39 item generic (SAQOL-39g).	The interviewer.	At baseline (2 weeks) and three months.
52	Zhou, M., et al. (2021).	Multicenter cross-sectional study.	n=5475	Mean 8 days (Range 2-30 days)	Mean 61.56 years (over 18 years old) 3483M/1992F	(b) Activities and participation	(b) mRS, BI and Longshi Scale.	Not described.	At baseline.
53	Hidler, J. M., Carroll, M., & Federovich, E. H. (2007).	RCT	Stroke survivors (n=10) Control (n=9)	Onset less than six weeks prior to testing.	Mean 58.4 years Stroke survivors 7M/3F Control 5M/4F	(a) Structure and function (b) Activities and participation	(a) FMA.	Not described.	Át admission.
54	Pong, Y. P., Wang, L. Y., Wang, L. Y., Leong, C. P., Huang, Y. C., & Chen, Y. K. (2009).	RCT	The low Brunnstrom stage (LBS) (n=21) The high Brunnstrom stage (HBS) (n=13)	LBS mean duration of stroke at admission was 17.9 days AND 16.3 days in the HBS group (>24h of initial symptoms)	LBS Mean age 61.9 years 15M/6F HBS Mean age 74.2 years 10M/3F (Range 42-85 years)	(a) Structure and function	(a) Ashworth scale.	Not described.	At baseline.

55	Oh-Park, M., Hung, C., Chen, P., & Barrett, A. M. (2014).	Prospective observational study.	n=31	Within 2 months after stroke.	Mean age 60 years (Range 18-100 years) 16M/15F	(a) Structure and function (b) Activities and participation	(a) and (b) Catherine Bergego Scale. (a) Behavioral Inattention Test (BIT) and GDS. (b) BI.	Therapists and rehabilitation researchers.	At admission.
56	Ilett, P. A., Brock, K. A., Graven, C. J., & Cotton, S. M. (2010).	Prospective multicenter audit.	n=616	< 3 days after stroke.	Mean age 72.2 years (Range 22-98 years) 326M/290F	(b) Activities and participation	(b) MSAS and Modified BI.	Physical therapist.	MSAS and Modified BI were collected between 3-5 days post-stroke.
57	Scott, P. A., et al. (2010).	Retrospective observational study.	Community tPA (n=273) NINDS tPA (n=312) NINDS Placebo (n=312)	Range: 90-270 minutes post-stroke.	Community tPA Mean age 68 years 150M/123F NINDS tPA Mean age 68 years 178M/134F NINDS Placebo Mean age 66 years 184M/128F (Range 63-80 years)	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) mRS.	Not described.	At admission and post-treatment (day 0, 30, 60 and 90)
58	Khedr, E. M., Abdel-Fadeil, M. R., Farghali, A., & Qaid, M. (2009).	RCT	1 Hz group (n=12) 3 Hz group (n=12) Sham group (n=12)	Mean interval from stroke onset 17.1 days. Range: 7-20 days	1 Hz group Mean age 54.7 years 7M/5F 3 Hz group Mean age 59 years 6M/6F Sham group Mean age 60 years 6M/6F (Adults)	(a) Structure and function (b) Activities and participation	(a) Medical Research Council, NIHSS and Keyboard Tapping and Pegboard Tasks. (b) BI.	Not described.	Pre- and post-sessions, first, second and third month after stroke.
59	Salbach, N. M., Mayo, N. E., Higgins, J., Ahmed, S., Finch, L. E., & Richards, C. L. (2001).	Prospective cohort study.	n=50	Within 8 days of stroke	Mean age 68 years (Range 34-95years) 19M/31F	(a) Structure and function (b) Activities and participation	(a) and (b) STREAM. (a) CNS. (b) Albert's Test, Five-meter and 10-meter walk test, BBS, BI and TUG.	Physical and occupational therapists.	CSN and ALbert's TEst were applied at baseline. Other measures were applied 2 times (mean of 8 and 38 days poststroke).

60	Keren, O., Motin, M., Heinemann, A. W., O'Reilly, C. M., Bode, R. K., Semik, P., & Ring, H. (2004).	Preliminary study.	n=50	Mean of 14 days (Range 3–51 days stroke onset).	Mean age 63 years (Range 39–83 years) 32M/18F	(a) Structure and function (b) Activities and participation	(a) and (b) Stroke Impairment Assessment Set (SIAS). (a) MMSE and NIHSS and (b) FIM.	Occupational, physical, and speech–language therapies.	At admission to rehabilitation.
61	Nakao, S., et al. (2010).	Prospective study.	n=78	3 weeks after onset.	Mean age 73 years (Range 64–79 years) 46M/32F	(a) Structure and function (b) Activities and participation	(a) and (b) SF–36 and SIAS. (a) GCS, Ashworth scale and OCSP. (b) FIM, mRS and BI.	Occupational, physical, speech–language therapies and nursing care.	At admission and discharge.
62	Heruti, R. J., et al. (2002).	Nonconcurrent prospective study.	n=366	Range 0–55 days	Mean age 75.3 years (Range 60–94 years) 181F/134F	(a) Structure and function (b) Activities and participation	(a) MMSE. (b) FIM.	A nurse, a physiotherapist, an occupational therapist and a speech therapist.	Within 72 hours after admission. FIM was applied 3 days before discharge (mean, 46.1 days)
63	Sale, P., et al. (2014).	RCT	Control group (n=9) Experimental group (n=11)	30 days after the event onset.	Control group Mean age 72.56 years 6M/3F Experimental group Mean age 67 years 8M/3F (Range 18–80 years)	(a) Structure and function (b) Activities and participation	(a) FMA, Medical Research Council Scale, Motricity Index and Ashworth Scale. (b) BI.	Physical therapist.	At baseline (T0), after 20 sessions (end of treatment) (T1) and at the 3–month follow–up (T2). Barthel Index was assessed only at T0 and T1
64	Mateen, B. A., Baker, K., & Playford, E. D. (2019)	Observational cohort.	n=125	Mean time from stroke to assessment was 3 weeks (less than 12 weeks post–stroke).	Mean age 62.7 years (Range 18–80 years) 74M/51F	(a) Structure and function (b) Activities and participation	(a) and (b) STREAM. (b) Chedoke Arm and Hand Activity Inventory.	Investigator.	At admission.
65	Masiero, S., Armani, M., Ferlini, G., Rosati, G., & Rossi, A. (2014).	RCT	Experimental Group (n=14) Control Group (n=16)	Time between stroke and treatment start in days, mean (SD) Experimental group	Experimental Group Mean age 65.60 years 10M/4F Control Group Mean age 66.83 years 10M/6F (Range 18–85 years)	(a) Structure and function (b) Activities and participation	(a) Modified MMSE, Ashworth Scale, Medical Research Council, FMA (b) FIM, Frenchay Arm Test, BBT and Visual Analog Scale (VAS).	Not described.	Before treatment starts (baseline) and 5 weeks after treatment start (time T1).

				8 days Control group 10 days (within 15 days after stroke)					
66	Machner, B., Könemund, I., Sprenger, A., Von Der Gablentz, J., & Helmchen, C. (2014)	RCT	Treatment (n=11) Control (n=10)	Treatment Mean 3 days Control Mean 5 days (<14 days after stroke)	Treatment Mean age 69 years 8M/3F Control Mean age 69 years 6M/4F (>18 years)	(a) Structure and function (b) Activities and participation	(a) and (b) Catherine Bergego Scale. (a) NIHSS and Neuropsychological test battery. (b) BI and mRS.	Not described.	Baseline (day 1), post treatment (day 8), and follow-up (day 30)
67	Hilari, K., Northcott, S., Roy, P., Marshall, J., Wiggins, R. D., Chataway, J., & Ames, D. (2010).	Prospective study.	n=87	± one week	Mean age 69.7 years (Range 18-91 years) 52M/32F	(a) Structure and function (b) Activities and participation	(a) NIHSS, General Health Questionnaire-12 (b) BI, FAST, Frenchay Activities Index and SAQOL-39g.	Aphasia-specialist speech.	At baseline and three months post-stroke.
68	Kanai, M., Nozoe, M., Izawa, K. P., Takeuchi, Y., Kubo, H., Mase, K., & Shimada, S. (2017).	Pilot study.	n=22	48h from stroke onset	Mean age 62.5 years (> 80 years) 15M/7F	(a) Structure and function (b) Activities and participation	(a) MMSE (b) mRS, BBS, Walking speed test and Trial of ORG 10172 in Acute Stroke Treatment (TOAST).	Physical therapy and occupational therapy.	MMSE and mRS were inclusion criteria. At baseline and post-intervention.
69	Ovbiagele, B., Liebeskind, D. S., Kim, D., Ali, L. K., Pineda, S., & Saver, J. L. (2011).	Prospective study.	n=434	Lasting more than 24 hours	Mean age 66.5 years (20 years and older) 202M/232F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) mRS and trial of ORG 10172 in Acute Stroke Treatment (TOAST).	Physical therapist.	TOAST was an inclusion criteria. NIHSS applied at baseline and discharge. mRS was applied only at discharge.
70	Yamauchi, K., Kumagae, K., Goto, K., Hagiwara, R., Uchida, Y., Harayama, E., Tanaka, S., Kuroyama, S., Koyanagi, Y., & Arakawa, S. (2021).	Retrospective study.	n= 120	Evaluation of 7 days of onset	Mean age 76 years (Range 66-81 years) 74M/46F	(a) Structure and function (b) Activities and participation	(a) and (b) Scale for Assessment and Rating of Ataxia (SARA). (a) NIHSS.	Not described.	7 days after onset and at discharge.

71	Schlegel, D. J., Tanne, D., Demchuk, A. M., Levine, S. R., & Kasner, S. E. (2004).	Cohort study.	n=546	Within 3 hours of stroke onset	Mean age 65.6 years (Range 24-92 years) 307M/239F	(a) Structure and function (b) Activities and participation	(a) NIHSS.	Not described.	At admission and discharge.
72	König, I. R., Ziegler, A., Bluhmki, E., Hacke, W., Bath, P. M. W., Sacco, R. L., Diener, H. C., & Weimar, C. (2008).	RCT	Original data (n=1754) VISTA data (n=5843)	Within 6 hours after stroke	Original data Mean age 68.1 years 1038M/716F VISTA data Mean age 68.8 years 3260M/2583F (≥66 years)	(a) Structure and function	(a) NIHSS. (b) BI.	Not described.	NIHSS applied at baseline assessment within 24 hours of stroke onset. BI was applied one month after the stroke.
73	Wright, C. J., Swinton, L. C., Green, T. L., & Hill, M. D. (2004).	Prospective study.	n=277	Mean 8 days (Range 5-13 days)	Mean age 70.6 years (Range 60.4-79.8 years) 70M/174F	(a) Structure and function	(a) Orpington Prognostic Score (OPS) and NIHSS.	Not described.	NIHSS was applied at baseline and at 24hours. OPS was applied within the first seven days of admission and at 14 days after admission
74	Jeyaseelan, R. D., Vargo, M. M., & Chae, J. (2015).	Retrospective study.	No dysphagia (n=202) Dysphagia (n=88)	24-48 hours of admission	No dysphagia Mean age 63.2 years (Adults) 106M/96F Dysphagia Mean age 67.1 years (Adults) 37M/51F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) FIM.	Physiotherapist, occupational therapist or psychiatrist and/or speech-language pathologist.	NIHSS at the first point of contact; FIM was compiled and documented within 24-48 hours of admission
75	Verbunt, J. A., Seelen, H. A. M., Ramos, F. P., Michielsen, B. H. M., Wetzelaer, W. L., & Moennekens, M. (2008).	RCT	n=145	Post-stroke time of 2–6 weeks	Range 18-85 years (the gender is not described)	(a) Structure and function (b) Activities and participation	(a) and (b) The EuroQol 6D (EQ-6D). (a) Cognitive Log, Vividness of Movement Imagery Questionnaire (VMIQ), FMA and Modified Tardieu Scale (MTS) (b) Frenchay Activity Index, BI, WMFT, Frenchay Arm Test,	NIHSS score was calculated by the attending neurologist and at times by the medical personnel in emergency care; FIM was compiled and docu- mented by trained rehabilitation staff.	At baseline (T0).

							Accelerometery, The Impact on Participation and Autonomy (IPA) and SS-Qol.		
76	Liu, Chan, Lee, & Hui-Chan. (2004)	RCT	Mental imagery group (n=26) Functional Retraining (n=20)	Mental imagery Duration of stroke 12.3 days Functional Retraining Duration of stroke 15.4 days	Mental imagery group Mean age 71 years 11M/15F Functional Retraining Mean age 72.7 years 11M/9F (60 years of age or older)	(a) Structure and function (b) Activities and participation	(a) FMA. (b) Household, Cooking, Shopping tasks, FIM and Color Trails Test (CTT).	Therapy.	FMA is an inclusion criteria. The other measures were applied across the 3-week program.
77	Tung, Y. J., Huang, C. T., Lin, W. C., Cheng, H. H., Chow, J. C., Ho, C. H., & Chou, W. (2021).	Retrospective and single-center study.	n=253	Acute onset of stroke in the previous 30 days.	Mean age 63.07 years (Range 26-91 years) 117M/76F	(a) Structure and function (b) Activities and participation	(a) MMSE, FOIS, FMA and Chinese Aphasia Test (CCAT). (b) EQ-6D, Lawton–Brody IADL Scale, mRS, BI, BBS, 6MWT and Motor activity log (MAL).	Occupational therapists.	Before and after post-acute care program.
78	Tang, W. K., Lu, J. Y., Chen, Y. K., Mok, V. C., Ungvari, G. S., & Wong, K. S. (2011).	Cross-sectional study.	n=458	Within 7 days before admission.	Mean age 66.2 years (18 years or older) 282M/176F	(a) Structure and function (b) Activities and participation	(a) and (b) SF-36 and Health-related quality of life (HRQOL) (a) NIHSS, GDS and MMSE (b) Fatigue Severity Scale (FSS), BI and Instrumental activities of daily living scale (IADL's).	Not described.	NIHSS was applied at admission and other measures at 3 months poststroke.
79	Shen, H. C., et al. (2011).	Cross-sectional study.	n=483	48h post-stroke.	Mean age 70.7 years (over 50 years) 313M/170F	(a) Structure and function (b) Activities and participation	(a) NIHSS. (b) BI.	FSS were assessed by psychiatric and NIHSS by nurse.	At admission and discharge.

80	Huang, K. L., Liu, T. Y., Huang, Y. C., Leong, C. P., Lin, W. C., & Pong, Y. P. (2014).	RCT	Tradicional Swallowing (TS), (n=11) Neuromuscular electrical stimulation (NMES) group (n=8) Combined NMES/TS group (n=10)	Mean 22.4 days (Range 5-50 days)	TS group Mean age 67 years (± 10.1) 6M/5F NMES group Mean age 64.5 years (±14.4) 5M/3F Combined NMES/TS group Mean age 68.9 years (±9.8) 9M/1F	(a) Structure and function (b) Activities and participation	(a) and (b) SIAS. (a) FOIS, VFSS, MMSE and NIHSS. (b) FIM.	Not described.	NHISS and MMSE are inclusion criteria. Before and after treatment.
81	Tan, W. S., Heng, B. H., Chua, K. S. G., & Chan, K. F. (2009).	Retrospective cohort study.	n=491	Lasting more than 24 hours.	Mean age 61.3 years (Range 53-71 years) 289M/202F	(b) Activities and participation	(b) FIM.	Speech therapist.	72 hours of admission and at weekly intervals.
82	Koositamongkol, S., Sindhu, S., Pinyopasakul, W., Nilanont, Y., & Redman, R. W. (2013).	Prospective observational study.	n=141	3th day of stroke onset.	Mean age 61.98 years (Range 30-90 years) 81M/60F	(a) Structure and function (b) Activities and participation	(a) NIHSS-Thai (NIHSS-T). (b) Modified BI-Thai (BI-T) and Center for Epidemiologic Studies Depression Scale-Thai version (CES-D-T).	Not described.	Third day and seventh day after stroke onset.
83	Huynh, W., Vucic, S., Krishnan, A. V., Lin, C. S. Y., & Kiernan, M. C. (2016).	Prospective longitudinal study.	n=31	Mean 6 days (Range 1-18 days)	Mean age 64.3 years (Range 28-36 years) 15M/16F	(a) Structure and function (b) Activities and participation	(a) FMA and NIHSS. (b) BI and mRS.	Not described.	At admission.
84	Fujino, Y., Fukata, K., Inoue, M., Okawa, S., Okuma, K., Kunieda, Y., ... Fujiwara, T. (2021).	Retrospective cohort study.	Cluster 1 (n=167) Cluster 2 (n=54) Cluster 3 (n=73)	Within 24 h of symptom onset.	Cluster 1 Mean age 69 years (Range 57-75 years) 53M/114F Cluster 2 Mean age 71 years (Range 61-79 years) Cluster 3	(a) Structure and function (b) Activities and participation	(a) NIHSS and TCT. (b) BI.	Not described.	NIHSS was applied at the initiation of rehabilitation. BI and TCT were applied on the first day out of bed after admission and at discharge.

					Mean age 68 years (59-76 years) 28M/45F				
85	Gosman-Hedström, G., & Blomstrand, C. (2004).	Longitudinal study.	n=173	3 days after stoke onset.	Mean age 81 years (70 years or older) 62M/111F	(b) Activities and participation	(b) FIM and BI.	Physiotherapist, occupational therapist and speech-language therapy.	BI was applied the first 3 days after stroke onset. FIM was applied at 0 – 3 days, 3 weeks and 3 months.
86	Jiang, S., You, H., Zhao, W., & Zhang, M. (2021).	RCT	Robot-assisted therapy (RT) group (n=23) Convencional rehabilitation (CR) group (n=23)	Mean 20 days (less than 30 days since stroke)	RT group Mean age 62.43 years 14M/9F CR group Mean age 66 years 15M/7F (Range 35-85 years)	(a) Structure and function (b) Activities and participation	(a) Brunnstrom assessment score, MMSE, FMA, Motricity Index, and Modified Ashworth Scale. (b) FIM and BI.	Occupational therapists.	assessment score, and MMSE are inclusion criteria. The others were applied before treatment (T0) and at 2 weeks (T1) and 1 month follow-up (T2).
87	Yang, Yang & He. (2018)	RCT	Control group (n=23) Experimental group (n=21)	CG Mean duration since stroke 28.5 days Experimental group Mean duration since stroke 28 days (stroke onset within 3 months)	Control Group Mean age 62.2 years 15M/8F Experimental Group Mean age 60.4 years 15M/6F (> 30 year)	(a) Structure and function (b) Activities and participation	(a) Modified Ashworth Scale and FMA. (b) BI, SS-Qol and VAS.	Occupational and physical therapies.	Before and after treatment.
88	Kim, B. R., Chun, M. H., Kim, D. Y., & Lee, S. J. (2013).	Sham-Controlled Trial.	Low-frequency rTMS (n=9) High-frequency rTMS (n=9) Sham Stimulation (n=9)	Duration from stroke onset to the time of initial evaluation Low-frequency 14.2 days High-frequency 14.3	Low-frequency Mean age 68.6 years 5M/4F High-frequency Mean age 64.1 years 4M/5F Sham Stimulation 68.3 years Mean age	(a) Structure and function (b) Activities and participation	(a) and (b) Catherine Bergego Scale (a) Motor-Free Visual Perception Test (b) Line bisection test, star cancellation test and Korean-Modified BI.	Physical therapist.	Pre- and post-treatment.

				days Sham Stimulation 16.4 days	6M/4F (Range 62.8–71.2 years)				
89	Nikamp, C. D. M., Buurke, J. H., Van Der Palen, J., Hermens, H. J., & Rietman, J. S. (2017).	RCT	Early (n=16) Delayed (n=17)	Time since stroke at Week 1 Early 32 days Delayed 30.8 days (maximal 6 weeks poststroke)	Early Mean age 56.9 years 10M/6F Delayed Mean age 57.5 years 10M/7F (≥ 18 years)	(a) Structure and function (b) Activities and participation	(a) MMSE and Motricity Index. (b) BBS, FAC, RMI, 10 and 6MWT, BI, TUG and Stars Test (ST).	Occupational therapist.	At inclusion (week 1) and eight weeks later (week 9).
90	Yen, H. C., Jeng, J. S., Chen, W. S., Pan, G. S., Chuang, PT, BS, W. Y., Lee, Y. Y., & Teng, T. (2020).	RCT	Standard early rehabilitation (SER) (n=30) Early mobilization (EM) (n=30)	Within 24 to 72 hours of stroke onset.	SER Mean age 69.33 years 22M/8F EM Mean age 58.77 years 21M/9F (Range 10–80 years)	(a) Structure and function (b) Activities and participation	(a) NIHSS (b) FIM, Postural Assessment Scale for Stroke (PASS) and FAC.	Physiotherapists.	NIHSS is an inclusion criteria. Other measures were applied at baseline, at 2 weeks, 2 weeks and 3 months after stroke onset.
91	Likhi, M., Jidesh, V. V, Kanagaraj, R., & George, J. K. (2013).	Cross-sectional study.	n=23	Within 24 to 48 hours of the onset of stroke.	Mean age 58.74 years (Range 50–75 years) 15M/8F	(a) Structure and function (b) Activities and participation	(a) and (b) Trunk Impairment Scale and Simplified STREAM and CNS. (b) FIM.	Not described.	At admission.
92	Fink, J. N., Frampton, C. M., Lyden, P., & Lees, K. R. (2008).	Prospective Study.	n=1644	within 24 hours of stroke onset	Mean age 79 years (Range 21–94 years) (the gender is not described)	(a) Structure and function	(a) NIHSS.	Nurse and physiotherapist.	At admission.
93	Kwakkel, G., Kollen, B. J., Van der Grond, J. V., & Prevo, A. J. H. (2003).	Prospective Study.	n=102	Within 14 days after stroke onset.	Mean age 65.4 years (Range 30–80 years) 61M/41F	(a) Structure and function (b) Activities and participation	(a) MMSE, OCSP, GCS, OPS, FMA (b) BI, Thumb-Finding Testa and ARAT.	Not described.	The measure was weekly during the first 10 weeks of the study.

94	Vlcek, M., Schillinger, M., Lang, W., Lalouschek, W., Bur, A., & Hirschl, M. M. (2003).	Retrospective study.	n=372	24 hours after the stroke.	Mean age 70 years (Range 54–82 years) 189M/183F	(a) Structure and function (b) Activities and participation	(b) mRS.	Not described.	On days 5 to 7.