

Validation of extended international classification of functioning, disability and health (ICF) core set for stroke in post-acute stroke rehabilitation using FIM Scoring

Roohi Abbas¹, Arshad Nawaz Malik², Hina Gul³

Abstract

Objective: To validate the extended International Classification of Functioning, Disability and Health core sets for stroke in the functional assessment of post-acute stroke patients.

Method: The validation, cross-sectional study was conducted from January to July 2020 in the Physiotherapy departments of selected private and public hospitals located in Lahore, Pakistan including Ghurki Trust and Teaching Hospital, Ittefaq Hospital, Shalamar Hospital and the National Hospital, Lahore. Stroke patients of either gender aged at least 18 years 3 days post-diagnosis were recruited, general information regarding patient demographics, category of stroke, and the involved side was documented, while data about function and disability was gathered using semi a structured questionnaire based on the International Classification of Functioning, Disability and Health core sets categories of "Activity and Participation" through interviews. The functional independence measure was administered during the interview. Data was analysed using SPSS 22.

Results: Of the 82 patients with mean age 62.13 ± 9.40 years, 60(73.2%) were males and 22(26.8%) were females. Internal consistency of International Classification of Functioning, Disability and Health core sets with total score had a Cronbach's alpha value of 0.847 for cognitive, 0.911 for motor, 0.817 for communication and 0.728 for social scores. The correlation value between International Classification of Functioning, Disability and Health core sets and functional independence measure total score was strongly negative (-0.735).

Conclusion: The International Classification of Functioning, Disability and Health core sets for stroke could be used as a valid assessment tool to assess the functional status of post-acute care stroke patients.

Keywords: International Classification of Functioning, Disability and Health, Stroke, Stroke rehabilitation, Post-acute care. (JPMA 75: 1095; 2025) DOI: <https://doi.org/10.47391/JPMA.20659>

Introduction

The International Classification of Functioning, Disability and Health (ICF) is the new-fangled and modern disablement model that not only classify different levels of function and disability, but has also been a proven assessment tool for quantifying functional status and effectiveness of a rehabilitation programme.^{1,2} ICF provides a common language and a set of terminologies for a particular health status of any individual which is accepted and can be compared to any study internationally, and that is why this model is gaining significance in research, education and policymaking in healthcare.³

ICF is an amended and derived classification from the previous International Classification of Impairment Disability and Handicap (ICIDH), shifting the focus from disability and handicap to the "abilities" of an individual in

terms of what one can do and what one cannot do.⁴

The World Health Assembly in May 2001 inscribed and validated the ICF World Health Organisation (WHO)'s ICF, and it has since emerged as a systemised substructure for delineating a language that is common for all healthcare workers to characterise functionality and disability.⁵

Given the fact that the ICF is difficult to use in a clinical context because it contains more than 1,400 categories, ICF core sets have been developed with a view to improving clinical practicability by way of selected ICF categories describing the problems in the functioning of patients with specific health conditions.⁶ ICF core sets represent a concise practicable catalogue that expresses efficiently the important aspects of functioning or dysfunctioning, or any experience related to health or disability.⁷ While utilising these ICF core set across many disciplines and sub-specialities of healthcare, including rehabilitation, the centre of interest is the regard for patients' values and autonomy, enhancing their participation in the whole process of rehabilitation, which is often extraneous and tediously protracted.⁸

Since stroke is the third major cause of morbidity and

^{1,2}Riphah International University, Lahore, Pakistan; ³Lahore College of Physical Therapy, Lahore, Pakistan.

Correspondence: Roohi Abbas. e-mail: roohiwaqas@gmail.com

ORCID ID: 0000-0003-2121-8335

Submission completed: 07-05-2024 **1st Revision received:** 19-07-2024

Acceptance: 10-05-2025

Last Revision received: 09-05-2025

second major cause of mortality, particularly in underdeveloped countries, the “disease burden” imposed by stroke in these developing countries is expanding over time.⁹ The incidence of stroke, especially in people aged 45-65 years, is up to 10 times greater in South Asian countries, like Pakistan, India, Bangladesh and China.¹⁰

Rehabilitation concerning stroke is rather challenging, and requires substantial efforts to ensure quality assessment process, intervention and outcome measures.¹¹ Since comprehensive examination is an integral component of any rehabilitation protocol, there is a variety of literature on the extensive role of examination and assessment in order to achieve the desired outcomes.¹²

Shaheen Pasha holds the credit for being the primary researcher in Pakistan who in 2009 introduced ICF in the domain of special education to address the specific demands of children with disabilities, as she believed the categories of functions explained by ICF were of utmost importance in meeting their needs according to their level of function and dysfunction.⁴

When referring to neurological conditions, specially stroke, the assessment of functioning and disability using a standardised tests is essential for examining the problems of stroke patients, and the ICF core sets for stroke were formulated in 2004 to facilitate its use in clinical practice.¹³ Since then, the ICF core sets for stroke are widely used internationally and are validated for their responsiveness in a large number of studies, Unfortunately in the local settings, the knowledge regarding ICF categories and core sets is scarce, and there is a need to validate the core sets in the local settings to determine their applicability as extensive literature on these type of validation studies comes from Europe.¹⁴ Only two recent studies from Pakistan have utilized brief ICF core sets for children and youth in patients with cerebral palsy and autism spectrum disorders, with the conclusion that the ICF core sets can be used as an inclusive and supple tool to asses functional status of patients well beyond the criteria for diagnosis of cerebral palsy and autism spectrum disorders, asserting the need for further validation in other neurological conditions.^{15,16}

The two ICF categories of “Activity and Participation”, denoted as “d”, for core sets related to stroke need to be evaluated for their correlation with the Functional Independence Measure (FIM), which is a standardised function assessment tool in stroke rehabilitation.¹⁷ FIM serves as a chief measure of functional status used in rehabilitation settings and research whose validity and reliability are comprehensively endorsed, and is commonly used as the gold standard in validation studies.^{18,19}

the current study was planned to validate the extended ICF core sets for stroke in the functional assessment of post-acute stroke patients using FIM scoring.

Materials and Methods

The validation, cross-sectional study was conducted from January to July 2020 in the physiotherapy departments of selected private and public hospitals located in Lahore, Pakistan after approval from Research ethics review committee Ref. No. REC/RCRS/20/2023. The sample size was estimated based on previous studies having a similar study design, effect size and population characteristics.^{17,20} The sample was raised using consecutive, non-probability convenience sampling technique from Ghurki Trust and Teaching Hospital, Ittefaq Hospital, Shalamar Hospital and the National Hospital Lahore. The sample comprised stroke patients of either gender aged at least 18 years 3 days post-diagnosis. All other categories of patients with brain injury other than vascular origin, and patients with moderate to severe cognitive impairment were excluded.

Tools used were ICF core sets for stroke and FIM. A quantitative paradigm was used. General information regarding patients’ demographics, category of stroke, involved side was documented, while data about function and disability was gathered using a semi-structured questionnaire based on ICF categories of “Activity and Participation” (d) from the extended stroke core sets, and then the ICF core sets were filled in on basis of the interview, which contained questions related to cognitive-domain, motor-related domain, and participation-related domain. Inter-rater reliability ICF core sets for stroke between three experts of the field was determined using intra-class correlation coefficient (ICC). ICF qualifiers for 51 questions related to cognitive, motor and social domains (0=no difficulty, 1=mild, 2=moderate, 3=severe, and 4=complete difficulty) were linked to FIM utilising already established standard for scoring FIM as 0=independent, 1=1 person required for set up or supervision, 2=moderate assistance, 3=maximal assistance, and 4=total assistance by an expert assessor with prior experience and training.

Data was analysed using SPSS 22. Concurrent validity was analysed using Pearson correlation coefficient to assess correlation between the number of problem categories of “Activity and Participation” and the FIM total score. $P < 0.05$ was considered significant.

Results

Of the 100 patients, 18(18%) refused to participate, and the response rate was 82(82%); 60(73.2%) males and 22(26.8%) females. The overall mean age was 62.13 ± 9.40 years, The mean length of hospital stay since the patient was first admitted in acute stage was 12.2 ± 5.9 days, and the mean

level of pain at discharge was 2.4 ± 1.9 on the visual analogue scale (VAS). The mean number of rehabilitation sessions received by the patients was 6.8 ± 3.2 (Table 1).

The mean for the cognitive domain was 1.122 ± 0.807 , and

Table-1: Clinical characteristics.

Clinical Characteristics	Mean \pm SD/n (%)
Mean Age (years) at admission	62.1341 \pm 9.40
Gender	
Male	60(73.2)
Female	22(26.8)
Right Handedness	82(100)
Education	
No education	20(24.4)
Matric	15(18.3)
Bachelors	26(31.7)
Higher studies	21(25.6)
Type of Stroke	
Thrombotic	66(80.5)
ICH	8(9.8)
Sub-Arachnoid Haemorrhagic	8(9.8)
Total rehabilitative sessions received	6.8 \pm 3.2
Length of hospital stays(days)	12.2 \pm 5.9
Pain level at discharge(VAS)	2.4 \pm .63
ICF score at discharge	26.532 \pm 7.147
FIM score at discharge	15.28 \pm 3.14

ICH: Intracerebral haemorrhage, ICF: International Classification of Functioning, Disability and Health, FIM: Functional independence measure, SD: Standard deviation.

Table-2: Internal consistency of ICF core sets with the total score.

ICF Core Sets	Pearson Correlation with total Score	Cronbach's Alpha
Cognitive Score	0.830	0.847
Motor Score	0.832	0.911
Communication Score	0.825	0.817
Social Score	0.513	0.728

Table-3: Inter-rater reliability.

	Rater 1	Rater 2	Rater 3
ICF	0.84	0.78	0.89
	(0.80-0.88)	(0.72-0.82)	(0.85-0.95)
<i>p</i> -value	0.001	0.000	0.000

ICF: International Classification of Functioning, Disability and Health.

Table-4: Correlation between ICF core sets and FIM score.

ICF Score Set	FIM				
	Total Score	Cognitive Score	Motor Score	Communication Score	Social Score
Cognitive Score	-0.254	-0.368	-0.814	-0.362	-0.031
Motor Score	-0.626	-0.338	-0.793	-0.332	-0.338
Communication Score	-0.598	-0.276	-0.261	-0.711	-0.431
Social Score	-0.463	-0.281	-0.644	-0.208	-0.622
Total Score	-0.735	-0.436	-0.487	-0.533	-0.536

ICF: International Classification of Functioning, Disability and Health, FIM: Functional independence measure.

it was 17.0488 ± 4.578 for motor domain, 4.1098 ± 2.601 for communication, and 8.2927 ± 2.390 for the social domain. The corresponding mean FIM values were 23.20 ± 6.9 , 48.4 ± 15.32 , 9.7 ± 3.337 and 3.42 ± 1.122 .

Internal consistency of ICF core sets with total score had a Cronbach's alpha value of 0.847 for cognitive, 0.911 for motor, 0.817 for communication and 0.728 for social scores (Table 2)

Inter-rater reliability of total ICF core sets of "Activity and Participation" component among the three raters was 0.84, 0.78 and 0.89 ($p < 0.05$) (Table 3).

The correlation value between ICF core sets and FIM was strongly negative (-0.735). The correlation individual of ICF core sets domains and FIM score was also negative (Table 4).

Discussion

The current study concurrently validated extended ICF core sets for stroke patients in sub-acute care and compared it with FIM, reporting an overall strong negative correlation, and confirming the status of ICF as a valid neuro-assessment tool. A 2016 study in Japanese hospitals concluded that the "Activity and Participation" component of ICF core sets for stroke could be a valid scale for assessing functional status of stroke patients in sub-acute settings.¹⁷ Like the current study, the Japanese study also proved a strong correlation between the number of problem categories of ICF core sets for stroke and that of FIM.¹⁷

To ascertain the role of ICF as an assessment tool to be used in clinical settings, a study in 2023 focussed on primary healthcare settings, using ICF core sets for musculoskeletal conditions, and concluded that there was a potential role of ICF scores in the assessment and goal-setting in sub-acute musculoskeletal problems, and, in addition to rehabilitation settings, it could easily be assimilated into primary healthcare facilities.¹

Since not much research has been conducted on exploring ICF as a valid assessment tool in Pakistan, Pasha in 2009 emphasised the role of standardised and homogenised methods of assessments, like the ICF, in special education sector, and concluded that the importance of ICF could not be denied in the assessment and planning of rehabilitation.⁴ Only two recent studies in the local settings have reported the use of ICF core sets as a valid tool for assessing functional level in patients with cerebral palsy and autism spectrum disorder.^{15,16}

A study similar to the current one in 2013 proved that the ICF could be an integrant of outcome measures, reporting an agreement of problem categories of ICF and

inter-rater and intra-rater reliability in comparison with the same problem categories of FIM. It concluded that the inter-rater and intra-rater reliability and the agreement of ICF "Activities of Daily Living" (ADL) categories were equivalent, and even one step ahead of the corresponding FIM categories.²¹

While discussing international efforts to prove the practicability of ICF core sets for various musculoskeletal and neurological conditions, a systematic review in 2023 also highlighted the importance of integrating ICF core sets in various patient-reported outcome measures (PROMs) to measure disability in adolescents with back pain, concluding that although ICF core sets thoroughly covered the patients' problems and addressed them, there was a need to elaborate further to prove their validity and practicability, just as is the case with various neurological conditions, including stroke.²² ICF core sets are fairly attuned with frequently used assessment tools and outcome measure for musculoskeletal and neurological outpatient facilities.^{6,23} A 2021 study highlighted limited availability of literature regarding ICF core sets from non-European developing countries, and conducted a research in Nepal to validate the ICF core sets for multiple conditions, including stroke, spinal cord injury, musculoskeletal problems, and reported the ICF core sets to be a valid tool in clinical practice.²⁴

The current study may prove valuable for the implementation of ICF in stroke rehabilitation and a guide for future studies in this regard. However, the present study has limitations as, owing to time constraints, it explored only one domain of the extended ICF core sets, leaving out other domains, like Body Structure, Body Function and environmental factors, that are yet to be validated.

Conclusion

There was a strong correlation between problem categories of extended ICF core sets for stroke and problem categories of FIM, indicating that the extended ICF core sets for stroke can be used as a valid assessment tool to assess the functional status of post-acute care stroke patients.

Disclaimer: The text is based on an MS thesis.

Conflict of Interest: None.

Source of Funding: None.

References

- Hernandez-Lazaro H, Mingo-Gómez MT, Ceballos-Laita L, Medrano-de-la-Fuente R, Jimenez-del Barrio S. Validation of the international classification of functioning, disability, and health (ICF) core sets for musculoskeletal conditions in a primary health care setting from physiotherapists' perspective using the Delphi method. *Disabil Rehabil* 2023;45:2458-68. doi: 10.1080/09638288.2022.2099922.
- Karhula M, Saukkonen S, Xiong E, Kinnunen A, Heiskanen T, Anttila H. ICF personal factors strengthen commitment to person-centered rehabilitation—A scoping review. *Front Rehabil Sci* 2021;2:709682. doi: 10.3389/fresc.2021.709682.
- Karlsson E, Gustafsson J. Validation of the international classification of functioning, disability and health (ICF) core sets from 2001 to 2019 – a scoping review. *Disabil Rehabil* 2021;44:3736-48. doi: 10.1080/09638288.2021.1878562.
- Pasha S. Scope of ICF in special education in Pakistan. *J Res Reflex Educ* 2009;3:34-48.
- Barradell S, Scholten I. How, and to what end, is the WHO-ICF framework represented in physiotherapy? Insights from a qualitative research synthesis. *Physiother Theory Pract* 2024;40:1-18. doi: 10.1080/09593985.2024.2370345.
- Wiśniowska-Szurlej A, Sozańska AB, Brożonowicz J, Wilmowska-Pietruszyńska A, Sozański B. Value of using the ICF core set for patients with musculoskeletal conditions in outpatient rehabilitation facilities in South-Eastern Poland. *Ann Agric Environ Med* 2024;31:1-7. doi: 10.26444/aaem/187408.
- Oliveira NSC, Monteiro IO, Ruaro JA, de Sousa Dantas D, Lima NMFV, Fernandes ABGS, et al. Assessment of the concurrent validity of the ICF core set to classify the physical health of community-dwelling older adults in relation to self-rated health. *J Geriatr Phys Ther* 2023;46:71-81. doi: 10.1519/JPT.0000000000000352.
- Bólte S, Alehagen L, Black MH, Hasslinger J, Wessman E, Lundin Remnélius K, et al. The gestalt of functioning in autism revisited: first revision of the International Classification of Functioning, Disability and Health core sets. *Autism* 2024;28:1-12. doi: 10.1177/13623613241228896.
- Prust ML, Forman R, Ovbiagele B. Addressing disparities in the global epidemiology of stroke. *Nat Rev Neurol* 2024;20:207-21. doi: 10.1038/s41582-024-00850-7.
- Tan KS, Pandian JD, Liu L, Toyoda K, Leung TWH, Uchiyama S, et al. Stroke in Asia. *Cerebrovasc Dis Extra* 2024;14:58-75. doi: 10.1159/000538346.
- Barbosa PM, Szrek H, Ferreira LN, Cruz VT, Firmino-Machado J. Stroke rehabilitation pathways during the first year: a cost-effectiveness analysis from a cohort of 460 individuals. *Ann Phys Rehabil Med* 2024;67:101824. doi: 10.1016/j.rehab.2024.101824.
- Egan M, Kessler D, Gurgel-Juarez N, Chopra A, Linkewich E, Sikora L, et al. Stroke rehabilitation adaptive approaches: a theory-focused scoping review. *Scand J Occup Ther* 2024;31:1-13. doi: 10.1080/11038128.2023.2261564.
- Bland MD, Holleran CL, Newman CA, Fahey M, Nordahl TJ, DeAngelis TR, et al. ICF classification of therapeutic goals for outpatient episodes of neurorehabilitation in post-stroke and Parkinson disease. *Disabil Rehabil* 2023;45:1-7. doi: 10.1080/09638288.2023.2222222.
- Karlsson E, Gustafsson J. Validation of the international classification of functioning, disability and health (ICF) core sets from 2001 to 2019—a scoping review. *Disabil Rehabil* 2022;44:3736-48. doi: 10.1080/09638288.2021.1878562.
- Tahir S, Maqbool S, Farid A, Ali A, Ullah E, Azhar H. Evaluation of children with autism spectrum disorder by using common brief core sets of International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY). *Pak Armed Forces Med J* 2023;73:853-7.
- Hina A, Maqbool S, Azhar H, Fatima S, Farid A, Ullah E. Assessment of children with cerebral palsy using common brief core set of International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY). *Pak Armed Forces Med J* 2023;73:159-63.
- Kinoshita S, Abo M, Miyamura K, Okamoto T, Kakuda W, Kimura I, et al. Validation of the "activity and participation" component of ICF

- core sets for stroke patients in Japanese rehabilitation wards. *J Rehabil Med* 2016;48:764-8. doi: 10.2340/16501977-2136.
18. Arcolin I, Godi M, Giardini M, Guglielmetti S, Bellotti L, Corna S. Minimal clinically important difference of the functional independence measure in older adults with hip fracture. *Disabil Rehabil* 2024;46:812-9. doi: 10.1080/09638288.2022.2101234.
 19. Kowalski RG, Hammond FM, Weintraub AH, Nakase-Richardson R, Zafonte RD, Whyte J, et al. Recovery of consciousness and functional outcome in moderate and severe traumatic brain injury. *JAMA Neurol* 2021;78:548-57. doi: 10.1001/jamaneurol.2021.0123.
 20. Alguren B, Lundgren-Nilsson Å, Sunnerhagen KS. Functioning of stroke survivors—a validation of the ICF core set for stroke in Sweden. *Disabil Rehabil* 2010;32:551-9. doi: 10.3109/09638280903186305.
 21. Kohler F, Connolly C, Sakaria A, Stendara K, Buhagiar M, Mojaddidi M. Can the ICF be used as a rehabilitation outcome measure? A study looking at the inter- and intrarater reliability of ICF categories derived from an ADL assessment tool. *J Rehabil Med* 2013;45:881-7. doi: 10.2340/16501977-1172.
 22. Silva TFC, Nunes ACL, Barreto MCA, Castro SS, Jesus-Moraleida FR. Questionnaires that assess disability in children and adolescents with low back pain adhere to the concepts of the International Classification of Functioning, Disability and Health (ICF), but lack validity for this population: a systematic review. *Disabil Rehabil* 2024;46:1979-89. doi: 10.1080/09638288.2022.2134567.
 23. Hassani Mehraban A, Fallahzadeh Abarghuei A, Lajevardi L, Shamili A. The effect of ICF-core set-based occupational therapy interventions on the function and satisfaction of individuals with chronic stroke: a randomized clinical trial. *Occup Health Care* 2024;38:177-95.
 24. Pathak A, Abbott HJ, Sharma S, Ribeiro DC, Heinemann AW. Content validity of the brief and comprehensive ICF core sets for common disabling conditions in a developing country. *Int J Rehabil Res* 2021;44:159-65. doi: 10.1097/MRR.0000000000000456.

Author Contribution:

RA: Concept, design, drafting and data acquisition.

ANM: Critically revision.

HG: Statistical analysis, data interpretation and agreement to be accountable for all aspects of the work.