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Review Article

Measuring Multidomain Impairment After Acquired Brain Injury in Adults: A Critical Review of Available Instruments and the Case for an Integrated Impairment Profile

Vaidya Bala[1*]

[1]*Senior Staff Specialist in Rehabilitation and Brain Injury Medicine, The Illawarra and Shoalhaven Local Health District Hospitals, Australia*

***Correspondence:** Bala V, Senior Staff Specialist in Rehabilitation and Brain Injury Medicine, The Illawarra and Shoalhaven Local Health District Hospitals, Australia; E-mail: vaidya.balasubramaniam@health.nsw.gov.au

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Abstract

Acquired brain injury (ABI) produces impairment simultaneously across cognitive, communicative, motor, sensory, neurobehavioural, somatic, and participation domains, yet clinicians typically characterise this breadth by combining several separate instruments. This narrative review asks a focused question: how well do existing validated instruments capture the full profile of impairment after ABI in a way that is feasible for routine specialist-clinic use and longitudinal tracking, and what is required to close any remaining gap? Drawing on the International Classification of Functioning, Disability and Health (ICF) and consensus outcome frameworks, the review appraises global outcome measures, comprehensive brain-injury instruments, and domain-specific tools against contemporary measurement standards. Validated instruments exist for most individual domains and for global outcome, and at least one comprehensive measure profiles multiple domains with strong psychometric support. However, no single, concise, ICF-aligned instrument has been established for routine multidomain *impairment* profiling and serial tracking across the full range of ABI aetiologies in the specialist clinic. The review argues that this feasibility-and-integration gap-rather than any absence of validated components-is the principal unmet need, and it outlines a staged programme to develop and validate an integrated ABI impairment profile as a future direction. The review is conceptual; any new instrument requires full psychometric validation before clinical use.

Keywords: Acquired brain injury, Traumatic brain injury, Outcome measurement, Impairment, Rehabilitation, Psychometrics, International classification of functioning

Introduction

Acquired Brain Injury (ABI)-encompassing traumatic, vascular, hypoxic-ischaemic, infective, and other causes-is a leading contributor to long-term disability worldwide. Its hallmark is not impairment in a single system but concurrent disturbance across many: attention and memory, language and communication, movement and coordination,

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sensation, mood and behaviour, somatic symptoms such as fatigue and headache, and the downstream disruption of everyday activity and social participation. Specialist clinicians must therefore describe a multidimensional picture, quantify its severity, and follow it over time to plan care and judge whether interventions are working.

The measurement tools available to do this are numerous but fragmented. In practice, clinicians assemble a battery-one instrument for cognition, another for mood, another for participation-each validated for its own purpose but not designed to sit together as a coherent, comparable impairment profile. This fragmentation raises practical and methodological questions about feasibility, comparability across domains, and the burden of serial assessment. Accordingly, this review addresses one guiding question: How well do existing validated instruments capture the full profile of impairment after ABI in a way that is feasible for routine specialist-clinic use and longitudinal tracking, and what is required to close any remaining gap?

Review Approach

This is a narrative, critical review rather than a systematic review. Instruments were selected for discussion on the basis of their prominence in ABI research and rehabilitation practice, their inclusion in consensus outcome frameworks, and their relevance to multidomain impairment. They are appraised against the conceptual scaffold of the ICF [1] and against contemporary measurement standards, in particular the consensus taxonomy and quality criteria articulated by the COSMIN initiative [2,3] and best-practice guidance for scale development [4]. The aim is to characterise what the current toolkit does well, where it falls short of the guiding question, and what a solution would need to demonstrate.

A framework for multidomain impairment: The ICF

The ICF provides the dominant conceptual model for describing functioning after ABI, distinguishing body functions and structures (the level of impairment), activities, and participation, all situated within environmental and personal context [1]. For traumatic brain injury specifically, consensus ICF Core Sets have been derived to identify the categories most relevant to describing functioning, offering an internationally agreed content map for multidisciplinary assessment. Parallel efforts to harmonise measurement-most notably the interagency Common Data Element recommendations for outcome assessment in traumatic brain injury-have converged on a set of outcome domains spanning global function, neuropsychological impairment, psychological status, injury-related symptoms, and social participation [5]. Together these frameworks establish both the breadth a comprehensive impairment measure should cover and the expectation that its content be justified against an explicit model rather than assembled ad hoc.

Global outcome and disability measures

At the broadest level, global measures summarise recovery in a single ordinal judgement. The Glasgow Outcome Scale–Extended (GOSE) classifies overall outcome from death to upper good recovery and, administered through a structured interview, is a standard endpoint in traumatic brain injury research [6]. The Disability Rating Scale tracks change across a wider band of severity, from coma to community, and remains a durable rehabilitation outcome

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measure [7]. These instruments are efficient and comparable across studies, and they anchor an individual's overall trajectory. Their strength-compression of a complex picture into a single value-is also their limitation for the present question: a global score cannot express the pattern of impairment across domains that clinical management depends upon.

Comprehensive measures of brain-injury sequelae

Closer to a multidomain impairment profile are the comprehensive brain-injury measures. The Mayo-Portland Adaptability Inventory (MPAI-4) is the most developed of these, indexing ability, adjustment, and participation across many items, with strong psychometric support including Rasch analysis, sensitivity to rehabilitation, and the flexibility to be rated by clinicians, significant others, or patients [8]. It is recommended within consensus outcome frameworks and is freely available, making it the closest existing instrument to a validated, multidomain profile of brain-injury sequelae. The Functional Independence Measure combined with the Functional Assessment Measure similarly extends functional-status rating into cognitive and psychosocial areas relevant to ABI. These instruments demonstrate that a multidomain measure is both feasible and psychometrically defensible. They are, however, oriented primarily toward outcome and adaptability rather than a concise, impairment-level profile designed for rapid characterisation and repeated tracking in a standard consultation, and their structures were not built around the ICF body-function level as an explicit organising principle.

Domain-specific and symptom measures

Beneath these comprehensive tools sits a rich layer of validated, domain-specific instruments. Cognition is assessed with screens and neuropsychological batteries; mood and psychological status with widely validated symptom measures; participation and community reintegration with dedicated scales; and health-related quality of life with disorder-specific instruments such as the Quality of Life after Brain Injury measure [9]. Post-traumatic amnesia is quantified prospectively with established scales, and, at the lowest levels of arousal, the Coma Recovery Scale–Revised provides a standardised neurobehavioural assessment for disorders of consciousness with strong measurement characteristics and diagnostic utility [10]. Each of these instruments is defensible within its niche and often represents the reference standard for its construct. Precisely because each is optimised for one construct, however, assembling them into a coherent, comparable, and repeatable multidomain profile is left to the individual clinician.

Appraisal: Strengths and gaps

Viewed against contemporary standards, the existing toolkit has genuine strengths. Several instruments have undergone rigorous development and evaluation, including modern approaches to structural validity, and consensus frameworks now specify both the content and the psychometric evidence a measure should provide [2-4]. Global measures give efficient, comparable endpoints; comprehensive measures show that multidomain assessment is achievable; and domain-specific tools offer depth where a single construct is decisive.

The gaps are those of integration and feasibility rather than of missing components. First, routine multidomain characterisation typically requires combining several instruments, increasing administration burden and impeding

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comparison across domains on a common metric. Second, the comprehensive instruments that do exist are oriented toward outcome and participation more than toward a concise, ICF-anchored impairment profile intended for rapid, repeatable use in the specialist clinic across the full range of ABI aetiologies. Third, the evidence base is heterogeneous: measurement properties are unevenly reported across instruments and populations, and interpretability aids such as minimal important change are not uniformly available. The answer to the guiding question is therefore qualified: existing validated instruments capture the domains of ABI impairment well individually, but no single, concise, ICF-aligned instrument has been established for feasible multidomain impairment profiling and serial tracking across aetiologies in routine specialist practice.

Future Directions: Toward an integrated ABI impairment profile

The implication is not that a further instrument is self-evidently required-an important preliminary step is a systematic, COSMIN-based review to determine whether an existing measure, adapted, could meet the need. Where that step confirms a genuine gap, a staged development-and-validation programme is proposed as a future direction.

Such a programme would begin by deriving an item set from the ICF and Common Data Element conceptual base and establishing content validity through an expert panel and target-population cognitive interviews, quantified with item- and scale-level content validity indices [4,11,12]. It would then evaluate structural validity using modern psychometric methods suited to ordinal items, internal consistency, test–retest and inter-rater reliability, measurement error, construct validity through pre-specified convergent and known-groups hypotheses tested against the validated comparators reviewed above, and responsiveness with an anchor-based estimate of minimal important change, all reported to COSMIN standards [2,3]. Two principles would govern the work: items must be derived independently rather than reproduced from existing copyrighted instruments, and any resulting measure must complete this validation before any clinical or consequential use. The intended contribution is a concise, ICF-anchored impairment profile that complements-rather than replaces-the validated domain-specific and global instruments that remain the reference standards for their constructs.

Conclusion

Adults with ABI present with impairment across many domains at once, and clinicians need to describe and track that breadth efficiently. The current toolkit supplies validated measures for each domain and for global outcome, and demonstrates that multidomain assessment is feasible, but it does not yet offer a single, concise, ICF-aligned instrument for routine multidomain impairment profiling and serial tracking across the full range of ABI aetiologies. Closing that gap-if a systematic review confirms it-will require not another isolated scale but a carefully validated, integrative instrument developed to contemporary measurement standards. That programme of work is the natural next step, and it is one the present author intends to pursue.

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Author Note

Vaidya Bala holds a conjoint appointment at the University of Wollongong.

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