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[Maciej Płaszewski](#) * and Karol Płaszewski

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Review

ICF-Based Assessment of Functioning—State-of-the-Art and Challenges: A User's Perspective

Maciej Płaszewski ^{1,2,*} and Karol Płaszewski ³

¹ Faculty of Physical Education and Health in Biała Podlaska, Józef Piłsudski University of Physical Education in Warsaw, Biała Podlaska, Poland

² Independent Public Healthcare Institution, District Hospital, Międzyrzec Podlaski, Poland

³ Zagłębiów Clinical Hospital, Czeladź, Poland

* Correspondence: maciej.plaszewski@awf.edu.pl

Abstract: WHO International Classification of Functioning Disability and Health provides a biopsychosocial paradigm for understanding, describing, and measuring health. It is both a framework and a system for classifying functioning. In this narrative review, we focus on the ICF-based assessment tools of functioning. First, we introduce the term, as it is defined in the ICF approach, within the ICF model, and we highlight the importance of the assessment of functioning, as the third indicator of health, along with morbidity and mortality. The aim is to provide a picture of the achievements, but also to highlight state-of-the-art and current developments. We focus on the difficulties, doubts, and uncertainties clinicians may face when trying to settle on how, and with the use of which measurement tools, the functioning of their patients should, or could, be measured in accordance with the principles of the WHO approach. We present ICF-based instruments, such as core sets, other WHO tools, connected to the ICF, such as the WHODAS 2.0 and Model Disability Survey, other approaches, based on, and corresponding with, the ICF, e.g. CLINFit, as well as conventional measures of functional independence, and their connections with the ICF approach. Finally, we signal some future challenges and perspectives.

Keywords: ICF; functioning; disability; measurement; ICF-based assessment; conventional measures of functioning

1. Introduction

This narrative review addresses the use of the International Classification of Functioning, ICF, and, specifically, the ICF-based measures and tools, for assessing of human functioning, as defined in the ICF approach. The report addresses almost a quarter of a century of ICF-based assessment of functioning, present in clinical practice.

1.1. The Biopsychosocial Model of Care

In 2001, when the ICF was introduced, it represented a new medical and a new approach to the understanding and describing disability: [1–3], as well as measuring health and disability [4]. Earlier the dominant model of disease was biomedical, leaving “no room within this framework for the social, psychological, and behavioral dimensions of illness” [1].

In contrast to the International Classification of Diseases, which is focused on classifying causes of death (i.e. morbidity and mortality), the ICF classifies health. The ICF is aimed at providing, in complement with the ICD, a holistic approach to classify health and functioning, along with morbidity and mortality data, both at individual, and population levels, with the incorporation of the impact the environment plays in health outcomes [5–7]. The biopsychosocial model of disability, represented in the ICF, moves from the traditional, biomedical framework, presenting the disability

as linked to the individual person, towards a model stressing the interaction of a person and their environment [4,8]. The ICF framework combines the interactions between person’s health condition (disease, disorder, disfunction or any other, such as aging or pregnancy), and its impact on person’s body structures and functions, which, in turn, and *vice versa*, impact person’s activity limitations or participation restrictions. Further, they are moderated by contextual – environmental and personal – factors [2,5] .

1.2. New Classification of Functioning

From the diagnostics, or assessments, perspective, the contrast between seeing the disability not as a “*medical condition that rests within the individual*” [4] but as a functional status that “*arises from the interaction of an individual’s functional status with the physical, cultural, and policy environments*” [4] is critical. The former implies that a person who has a disability necessarily has poorer health, whereas the latter believes that people are not disabled as long as they are able to fully participate in the society. The ICF combines the two, with the fundamental term “**functioning**”, putting the factual health status of a person in context of their environment.

Furthermore, and which is the *clue* of this review, the ICF offers not only a concept, a vision of how to understand, describe and analyse health, disability and functioning, but also **a framework and a system to classify functioning** and disability using its components, and to generate comparable and standardized data [5,6,9].

The ICF is grounded in the WHO’s Rehabilitation 2030 strategy, among its ten goals, for “collecting information relevant to rehabilitation to enhance health information systems including system level rehabilitation data and information on functioning utilizing the International Classification of Functioning, Disability and Health (ICF)” [10].

1.3. Value of the Assessment of Functioning

There is a growing global need for rehabilitation, which is focused on functioning [3,10,11]. “*The changing health and demographic trends are contributing to rapid increases globally in numbers of people experiencing declines in functioning*” [12]. Consequently, so is the issue of the assessment of functioning, and assessment methods, tools, as well as their accuracy, trustworthiness, standardization, acceptability, utilisation, and universal use. In 2017, Krug and Cieza argued: “*Rehabilitation comprises a set of interventions designed to reduce disability and to optimize functioning in individuals with health conditions so as to enable them to better interact with their environment*”. They highlight the role of rehabilitation: “*The commitment to strengthen health systems to provide rehabilitation services should make it possible for millions of people not only to live longer, but to live well*” [13]. In his 2019 discursion, Cieza argued “*rehabilitation stakeholders need to bring together the distinct portraits of rehabilitation under the concept of functioning*” [12]. We present in Table 1 key aspects of the term “functioning”, as it is conceptualised, with address to the postulate of the “**functioning revolution**” [9,13–16].

Table 1. Descriptions of the term “functioning” and its role, as addressed in the concept of the ICF [9,13–16].

the term “functioning” and its value
functioning: the sum total of functions and structures of the body and mind, the actions people perform, and the complex and socially-embed life activities they participate in
functioning, as a term of science , requires both a conceptual description or model and (...) operationalization and measurement, a classification of the lived experience of health
the notion of functioning has (...) made it possible to clarify the concept and practice of healthcare , and most particular the concept and practice of rehabilitation
the ICF notion of functioning provides a clearer understanding of the health and social impact of future trends in population aging and increased prevalence of non-communicable diseases
from the public health perspective, the use of functioning as a third health indicator could show more than the frequency of a disease and its death rates, offering information on how the population performs its activities and participation

clinically, the **functioning assessment** can provide information for patient-centered health care and specific clinical interventions according to their functioning profile

1.4. Rationale

The ICF, as a concept, is an element of “*a cultural change and a new conceptualisation of functioning and disability*” which has been happening, with significant boost of research [6]. Success of the ICF as a framework / model in changing how disability is measured – “*ICF has made a difference*”, nonetheless, “*the field needs to mature. Identified gaps suggest ways to improve measurement and statistics to underpin policies, services and outcomes*” [17].

The value the ICF added to the cultural developments of the understanding, and acceptance, of disability, and of people with disabilities, is critical. Nonetheless, the technical side of this issue, i.e. the measurement, the diagnosing of functioning, is another problem matter. Through over twenty years of the ICF various approaches, models, instruments and tools have been developed, for the use in multiple applications and contexts, with varying scales and of their proposed and factual applications. Some tools have recently been introduced [18], and some approaches have been discontinued [19]. In this paper, we are attempting to provide a picture of the *status quo*, as well as of progressing proposals and developments. As early as in 2008, ICF-based tools such as Core Sets and ICF Qualifiers were already developed with the aim to support clinical practice and to “*allow the description of a functioning state, the illustration of the patient’s experience of functioning and the relation between rehabilitation goals and appropriate intervention targets, an overview over required resources to improve specific aspects of human functioning and finally, the changes in functioning states following rehabilitative interventions*” [20] among other advantages, such as efficient communication within rehabilitation team, using the *common language* of the ICF [20]. Nonetheless, as of 2025, further measurement tools were produced and proposed, while numerous other, developed outside the ICF movement, are widely used and accepted [21–26]. This is the key aspect of our analysis – such a wide choice, and numerous proposals and recommendations, may, one hand, produce confusion.

Thus, the aim of this paper is to provide a picture of the achievements of the WHO ICF way of measuring functioning, but also to highlight the current state-of-the-art of this unfinished journey. We focus of the difficulties, doubts and uncertainties clinicians may face when trying to settle of how, and with the use of which measurement tools, functioning of their patients should, or could, be measured in accordance with the principles of the WHO approach.

2. Methods

We based our report on the Scale for the Assessment of Narrative Review Articles, SANRA, guidance for narrative review articles [27], as well as corresponding guidance related to narrative reviews as secondary study types and sources of evidence [28,29], as well as a critical review approach that we previously applied [30–32].

Literature searches were initially conducted through PubMed, starting from the newest publications, with the keywords “ICF” and “International Classification of Functioning Disability and Health”, with study type limits “review” and “systematic review”. Based on included reports, in-depth further searching was conducted, using the “cited by” and “citing articles” options (forward and backward searches). Reference lists of relevant publications were further inspected for eligible publications. We also analysed relevant websites, such as the WHO ICF and rehabilitation websites, and the ICF Research Branch website. The methods, including literature search strategy were conceptualised by MP, but the searches were conducted independently by MP and KP. Then a discussion and final decisions were made in concert.

3. Results

As we mentioned, ICF is both a concept, and an assessment framework. The whole classification is very comprehensive and – in consequence – elaborative, demanding and challenging for users, so that more technical, classification-based assessment tools and measures have been developed.

3.1. *The ICF Children and Youth Version, ICF-CY*

In the first years of the development of the use and dissemination of the ICF, WHO produced a whole version of the classification, the ICF Children and Youth version, ICF-CY. Following as early as 2003 initiative [33], in 2007, the ICF-CY was published, providing “an important milestone in the further development of the ICF” [34]. Since that time, a number of usages and research, as well as educational, initiatives were undertaken [35–38], with the development of ICF-CY-based core sets. Only twelve core sets for children were produced [37], with the main reason to be the “*lack of ICF knowledge requiring intense training and translating results from standardized measures into the ICF qualifiers in a consistent way*” [37]. Finally, the ICF-CY has been merged back to the ICF [19,39].

3.2. *ICF Core Sets*

The ICF provides over 1,400 categories for body functions and structures, activities and participation, and environmental factors (with personal factors which are not categorised). Core sets are a way of providing an ICF-based, and clinically doable assessment of functioning.

There are shortlists of ICF categories that are tailored for specific purposes (such as Core Sets for autism spectrum disorders, musculoskeletal, neurological, mental health, as well as cardiovascular and respiratory Core Sets), and there are also generic core [40–43]. There are thirty four **condition-specific core sets** (apart from mentioned above ICF-CY based ones [37]), and two **generic core sets**: a comprehensive, Generic-30, or Rehabilitation, core set, and a shorter (also called “Minimal”) seven item generic set.

The Generic-30, Rehabilitation core set was developed as an initiative of producing as minimal set of ICF categories, that would represent the ICF framework, but could be efficiently applied in clinical practice [40,41,44–52]. It comprises thirty ICF categories, specifically regarding body structures and functions, and activities and participation, which are assessed using a 5-point ordinal scale (instead of linking assessment tools to the ICF codes). The Generic 6-set, or the Minimal Set, is a further compromise, i.e. comprises seven out of thirty categories included in the Rehabilitation 30-set, and it was intended as a tool that can be used for a very brief description of functioning, but generally applicable across health conditions and contexts [49]. The Minimal and Rehabilitation sets are sometimes described as Brief and Comprehensive sets [44,49], the Rehabilitation set is sometimes called Rehabilitation (Generic) 30-set [44,47], and the Generic (Minimal) Set is sometimes called Generic-6 set [48]. The Minimal Set was first piloted using the generic ICF qualifier (a five point ordinal. Likert 0-10 scale [45] and then using a 10-point ordinal scale (from 0 – “no problem” to 10 – “complete problem”) [49].

Initiatives were undertaken to introduce the Rehabilitation core set in countries such as China [48,49], Japan [50], Italy [46], Poland (with a modification to support the value of environmental factors measurement) [53] and Croatia [52]. An international effort is being made for the preparation of the ICF generic set simple descriptions in different languages [47].

3.3. *Measures of Functioning and Disability Corresponding to ICF*

WHO, and other institutions and initiatives, have developed several instruments for assessment of functioning and disability, which are based on, or at least inspired by, the ICF.

3.3.1. WHO Disability Assessment Scale 2.0, WHODAS 2.0

The World Health Organization Disability Assessment Schedule 2.0, WHODAS 2.0 (WHODAS II [54]), is a generic tool to assess functioning and disability in accordance with the ICF functioning

model [55,56]. It is an alternative to assess functioning in a less time-consuming way, with the duration of the application being one of the main ICF critiques [23,56,57]. In Table 2 we summarise the advantages of WHODAS 2.0 [55,58].

Table 2. Advantages of WHODAS 2.0, according to WHO, based on WHO [55] and Castro et al [58].

advantages	remarks
direct correspondence with the ICF framework and classification	ICF Core sets are a choice of ICF codes; WHODAS 2,0 is not – it is a questionnaire, which items correspond to the ICF domains
cross-cultural comparability	developed and tested a an universal measure, to be used in various populations, allowing wide data analyses
psychometric properties	extensively validated measure, with high validity and reliability
applicability	five to twenty minutes to administer short (12 item) or long (36 item) version of the instrument; crucial advantage comparing to the ICF
accessibility	a free tool available in over 30 languages

WHODAS 2.0 is available in a long, 36-item, and a short, 12-item, versions, which can be interviewer-, self- or proxy-administered, and also in an be interviewer-administered version consisting of 24 plus 12 items [59]. A 5-point rating scale is applied on all versions. The tool is designed to rate how much difficulty someone has with various activities. The total score for each version is calculated by adding up the item scores. The score can be converted to a 0-100 scale [55,59]. The full (36-item, WHODAS-36), version addresses six domains, and the 12-item version (WHODAS-12) is a subset of the WHODAS-36, with two questions from each domain, and it explains 81% of the variance in the WHODAS-36 [54,60,61].

3.3.2. Model Disability Survey, MDS

The Model Disability Survey, MDS, developed by the Disability Unit of the WHO with collaboration from the World Bank, is an extensive data collection instrument “*providing comprehensive and systematic documentation on all aspects of functioning within a population*” [62]. It comprises 294 questions, with accompanying household survey of 21 questions, which requires at least 2 hours to complete [62,63]. The MDS is a general population survey which usage is to provide detailed and nuanced information on the lives of people with disability, and is based on the ICF [63].

In 2017, WHO released a shortened version, the Brief Model Disability Survey, Brief-MDS, which has 18 questions [64]. The Brief MDS includes only fundamental MDS modules necessary to describe disability, addressing environmental factors, functioning, as well as capacity and health conditions.

3.3.3. Clinical Functioning Information Tool, ClinFIT:

In 2018, a Task Force from the International Society of Physical and Rehabilitation Medicine, ISPRM, developed the Clinical Functioning Information Tool, ClinFIT – a “*universal functioning information tool, based on the WHO’s ICF*”, with the purpose to evaluate and monitor changes in functioning over time, in patients with various health conditions [18].

ClinFIT is based on the ICF Rehabilitation Core Set categories, addressing body structures and functions, and activities and participation, but not environmental factors, with no address to personal factors, (which are not categorised in the ICF) [65]. There are two versions of the tool, short and long, with a 10-point and a 5-point rating scale [18,65]. Additionally, a COVID-19 version was developed [66].

Different versions of the instrument were tested in rehabilitation settings in Australia [67] and Italy [68], and the COVID-19 version was applied in a Romanian study [69].

3.3.4. Other tools with Adherence to ICF Concept / Conceptually Based on the ICF

Diverse initiatives have developed instruments that are grounded in the ICF concept [4,24,26,70–77]. In Table 3 we summarise specific proposals, with short descriptions.

Table 3. Functioning assessment tools which are conceptually based on the ICF.

functioning assessment tool	Characteristics
Instrument for the Classification and Assessment of Support Needs, I-CAN	a tool for assessing and reporting on the support needs of people with disabilities using a process that involves the person, their family, friends and staff; developed by the Centre for Disability Studies, Australia; comprises twelve domains - the ICF's Activity and Participation domains supplemented by three domains based on health and wellbeing [78,79]
Rehabilitation Problem-Solving Form, RPS-Form	instrument designed to address the patients' perspectives and enhance their participation in the decision-making process; as based on the ICF, it could provide a common language for the description of human functioning and therefore facilitates multidisciplinary work and decision-making [80]
ManMed Set	ICF-based assessment schedule for manual medicine with a focus on LBP, based on ICF Generic-30 Set, Comprehensive ICF Core Set for LBP and a Delphi study of experts for LBP; co-developed by WHO experts [81]
Guide d'évaluation multidimensionnelle, GEVA	an assessment tool used schools across France, by national law; used to provide multidimensional evaluation of the needs of people with disabilities, with the goal is to help ensure equal treatment and benefits for people with disabilities; some GEVA domains cover ICF domains [82]
"your ideas about participation and environment", YIPE	self-report instrument developed for understanding the interrelationship between participation and environment in which participation takes place, that can be used at various points in a therapy process [83]
ICF Measure of Participation and ACTivities screener, IMPACT-S	generic, self-report measure of activities and participation to describe functioning and disability independent of health condition; includes a screening part, IMPACT-S for measuring activity limitations and participation restrictions [21]
Work Rehabilitation Questionnaire, WORQ	questionnaire to evaluate functioning in vocational rehabilitation; consisting of 36 questions related to functioning, based on 44 ICF categories; can be used for improving interdisciplinary understanding of the patient's situation, as well as planning of the employment or return-to-work process [84]
Assessment of SpondyloArthritis international Society (ASAS) Health Index, ASAS-HI	self-report questionnaire to assess health in patients with all forms of spondyloarthritis; designed to measure functioning and health

	across seventeen aspects of health and nine environmental factors [85,86]
Utrecht Scale for Evaluation of Rehabilitation-Participation, USER-Participation	generic participation instrument that measures both objective and subjective participation in adults living in the community, feasible for use in rehabilitation practice [87]
ICanFunction mHealth Solution, mICF	global project, led at University of Groningen; the mICF is proposed as “a solution facilitating person-centered action on a complex set of factors and determinants that are conceptualized in the bio-psycho-social-spiritual model of health that defines the functioning of people in their contexts”, with the aim “to serve as a technical catalyst for instructional (educational) and institutional (service) reforms in the health, social, and education sectors by empowering persons (e.g., those with disabilities and chronic health conditions) to play a pivotal role in achieving health equity” [88]

LBP – low back pain.

In Table 4 we list research synthesis studies and narrative reviews which analysed functioning assessment tools (as well as quality of life and disability) linked to the ICF framework. Linking assessment tools to the ICF – the ICF linking rules is a method of applying ICF in the assessment of functioning [23,89].

Table 4. Research synthesis studies and narrative reviews analysing functioning assessment tools / measures of disability in connection to the ICF framework.

authors, year [ref]	characteristics
Noonan et al., 2009 [75]	review of participation assessment instruments based on the ICF
Gignac et al., 2011 [90]	characteristics of various measures of disability, with a focus on arthritis, including: Arthritis Impact Measurement Scales 2, AIMS2, Arthritis Impact Measurement Scales 2-Short Form, AIMS2-SF, OECD Long-Term Disability, LTD, questionnaire, EQ-5D (EuroQoL), WHODAS 2.0, Late-Life Function and Disability Instrument, LLFDI, and its abbreviated version, LLFDI-Abbreviated
Azzopardi et al., 2016 [91]	systematic review on linking frailty instruments / functioning assessment tools (outcome measures, diagnostic instruments) to the ICF framework
Liebzeit et al., 2018 [92]	ADL / IADL assessment tools, including Katz, Barthel, Lawton – and their modified versions, and ADL Summary Scale
Prodinger et al., 2019 [73]	comparison of the ICF qualifier ratings to assess functioning with existing health status instruments
González-Seguel et al., 2019 [77]	scoping review / systematic map of sixty physical functioning measurement instruments used with adult intensive care, linked to the ICF domains

Morreira et al., 2022 [93]	systematic review of instruments to assess components of disability in community dwelling adults
Jamshidi et al., 2022 [94]	systematic review assessing of content of patient-reported outcome measures, addressing functioning in breast cancer survivors

OECD - Organisation for Economic Co-operation and Development; ADL – activities of daily living; IADL – instrumental activities of daily living.

3.4. Conventional Instruments and Other than the ICF Contemporary Models and Measures in Disability

There has been a discussion regarding terminology and definitions, but also fundamental differences regarding biomedical and psychosocial or biopsychosocial, and holistic, approaches, regarding defining functioning and quality of life [2,16], and disability [4,95]. Assessment of functioning was introduced with the ICF concept [24,96,97], but also with other instruments and approaches, that have been introduced parallely to the ICF [25,98]. Tools and instruments of evaluation of functioning, disability, quality of life and daily living activities / functional independence are in use regardless the introduction of the ICF, and studies compare their use and properties [21,22,82]. In Table 3 we present initiatives connected to the ICF concept, and in Table 6 we present major earlier, and presently used, approaches.

Table 5. Exemplar “conventional” (i.e. not ICF-based) functioning related assessment tools and evidence synthesis studies presenting various health status assessment tools / measures of disability linked to the ICF framework.

Instrument	Characteristics
Katz Activities of Daily Living Index, Katz ADL and its modified versions	the Katz Activities of Daily Living (ADL) scale, first presented in 1963 [96], is a widely used instrument that assesses six primary and psychosocial functions – i.e. person’s independence in common ADLs: bathing, dressing, going to toilet, transferring, feeding, and continence; the purpose of the Katz ADL, is to monitor the prognosis and treatment of older adults and people with chronic health conditions; there also are modified versions of the instrument [99,100]
Barthel Index	an ordinal scale which measures a person’s ability to complete ADLs, published in 1965 [24]; there are main modifications of the index (Collin and Shah modifications), and further adaptations (short versions and a self-rating version) [92]
Functional Independence Measure, FIM	FIM, published in 1987 [70], is an 18-item measure of functional independence, comprising motor, cognitive, and total scores; it is based on the Barthel Index; FIM is one of the most frequently used outcome measures in people with stroke and traumatic brain injury, but also spinal cord injury, acute medical admissions, general injuries, and other clinical populations [97]
Washington Group Questions, including: Short Set, WG-SS enhanced Short Set Extended Set, WG-ES UNICEF/WG Child Functioning Module, CFM	the Washington Group on Disability Statistics (WG) is established under the United Nations Statistical Commission [98]; the WG Questions are targeted questions on individual functioning; among a range of WG tools,

the Short Set (WG-SS) comprises six questions, focusing on difficulties in: seeing, hearing, mobility, communication, cognition and self-care, the enhanced Short Set has additional six questions, and the Extended Set, WG-ES encompasses thirty-five questions [25,98]

IADL – instrumental activities of daily living; OECD – Organization for Economic Cooperation and Development.

3.5. Whole Picture of Functioning – ICF with Other WHO Classifications

With the updating work on the International Classification of Diseases, ICD, and with the initiative of establishing the International Classifications of Health Interventions, ICHI, efforts were made towards integrating the ICF with those, to provide a *“whole picture of functioning”* [101–104] within the WHO’s family of classifications. Original assumptions were to fully integrate ICD (the eleventh version, ICD-11) and the ICF [102–104] but current *status quo* is quite different. Similarly, the connections between ICF and ICHI seem not fully achieved. We communicate those issues below.

3.5.1. ICF and ICD-11

ICD is about disease, and ICF about health (or – of how we die and how we live [105]). An integration of both classifications was postulated at the stage of the revising of the ICD to the ICD-11, with the idea to understand the full burden of a health condition, to gather information on how disease (mortality and morbidity data from the ICD) impacts the functioning of an individual (the insights from the ICF) [103,104], as well as to *“better capture and understand disease and functioning in healthcare”* [102].

But this has not fully happened [103] – ICF assessment is additional, not obligatory, within the ICD-11: assessment of functioning is added to the ICD-11 in the *“Supplementary Section for functioning assessment”* (Section V) [106]. The section is complemented by two ICF-based instruments developed by WHO: WHODAS 2.0, 36-item version, and MDS, as well as a generic set of functioning categories derived from the ICF Annex 9 [101,107,108].

Individual overlapping categories are present in the ICD-11, but have different descriptions than in the ICF. Della Mea et al. [109] compared the ICF *“body structures”* and the ICD-11 *“anatomic detail”* chapters, and assumed that, in general, ICF is less detailed than ICD-11, and favours lumping of structures, and in very few cases, the two classifications follow different anatomic models. In 2022, WHO authors recommended to use the ICF, as *“the international standard for framing, describing, recording and measuring functioning and disability”* alongside ICD-11 [39].

3.5.2. ICF and ICHI

The issue of harmonising the ICF with the new WHO classification, the ICHI, to capture information on health interventions, relevant to people with disabilities, has also been raised [39,110,111]. The ICHI offers extension codes shared with ICD and ICF to *“allow users to describe additional detail about the intervention in addition to the relevant ICHI code”* [112]. The approach has been studied in sexual health promotion [113].

3.5.3. The WHO Package of Interventions for Rehabilitation

A major resource, and proposal, is the WHO 2023 initiative of evidence-based guidelines for rehabilitation, addressing the most needed areas, from musculoskeletal disorders, through neurodevelopmental disorders, to mental health problems – The Package of Interventions for Rehabilitation [114]. The package (set of documents seven documents, plus an introductory one, with methods appendices) is structured in a way based on health conditions rather than on the ICF

framework [115,116], which enabled the package to correspond with all there WHO classifications – ICD-11, ICF and ICHI [117].

4. Discussion

Our overall aim in for this review was to analyse and discuss approaches, and instruments, which are available for assessing functioning, in the context of the ICF concept and classification. We also wanted to present the difficulties and doubts clinicians / practitioners may face making decisions on which instrument (and approach) to use or follow – uncertainty that we ourselves have been experiencing.

4.1. State-of-the-Art

Kostanjsek, from the WHO group of the ICF developers, stated in 2011 that “as a classification the ICF is meant to be a **“living document”** and therefore has to be kept up-to-date and developed further” [34]. Earlier, Rauch, Cieza and Stucki concluded that “to take advantage of the ICF in rehabilitation management there is a need to develop appropriate ICF Tools for clinical practice” [20]. In this paper we underlined that such instruments have been developed or are being developed, but nonetheless, these developments are under way, and, from users’ perspective, it does not seem clear, which particular instruments of the measurement of functioning, and how, should be used in practice.

A good example of such uncertainty is the choice among the generic Core sets, and the CLINFit instrument. It is unclear as to whether the Rehabilitation core set is the final clinical product for the ICF-based assessment of functioning – as its use and versions are not finalised. Furthermore, there are doubts as to the range of ICF sets which constitute the set, with only level two (body structures and functions, and activities and participation), and no environmental codes. Interestingly, a recent study from Poland proposes a modified version of the core set, with a number of environmental domains, replacing domains of body functions [53]. There are also proposals of modified core sets for ADHD and autism spectrum disorders [42,118]. Methodological issues address uncertainties as to individual and team rating with the use of the instrument [119]. Availability of WHO-produced tools such as WHODAS 2.0 and MDS, specific ICF-based instruments, such as ManMed, and, importantly, approaches from outside the ICF domain, including contemporary and so called “conventional” measures, such as the Barthel Index, in our view can imply further disorientation (especially, given the fact that clinicians may not be very familiar with the nuances of the different approaches and models, and may not be sufficiently prepared to the proper use of the ICF in clinical practice [120,121]).

In a July 2024 evidence brief paper [122], the Physical and Rehabilitation Medicine Section and Board of the European Union of Medical Specialists, including the authors and developers of the ICF concept, stated that functioning-based standards and tools using the ICF as a reference framework are being developed, and called for further developments, in line with implementation efforts. That comprehensive paper provides ideas for future directions of the issuing / promoting / recommending groups / bodies, rather than a guidance for individual users, not specifically familiar with the complicated ideas of the movement of rehabilitation strategies, and not necessarily very much enthusiastic about the ICF, in terms of their understanding of it, and the sophisticated and various palette of tools, methods, and attempts .

We signal in this review that other measures and approaches, such as The Washington Group Questions, GEVA, and “conventional” tools, such as Katz Index, among other [90], are recommended as valid measures of varying functioning level consistent with the ICF [25]. The modified Barthel index [22,24] and FIM [71,76], are also standard disability and functioning measurement tools.

Also, the fragmented connections among ICF, ICD-11 and ICHI classifications, other than their initially postulated entire harmonisation [102], in our view, can further blur the image.

4.2. New Perspectives

Since the ICF was introduced, spectacular developments of telehealth, machine learning and artificial intelligence approached, and have been influencing health and care, and, specifically for the topic, rehabilitation, field [123–125]. Here, to provide further insights in the discussion, we signal those developments that are taking place and influence the evolution of the assessment of functioning, and that were not initially incorporated in the ICF operationalization.

Vasudeva et al. [126] proposed improvements to the use of ICF-based assessment of disability with the incorporation of telemedicine and AI, with a concept of ‘functional disability’ in terms of legal procedures, such as disability certification, pointing out, that the biopsychosocial model of disability, connected with the ICF, is still not fully in use. Newman-Griffis et al [127] discussed in 2021 opportunities of applying natural language processing to link free text documentation of functioning and disability to the ICF. Habenicht et al [128] suggested (2023) a mechanism of machine learning-based linking of patient reported outcome measures to the activity and participation categories of the ICF.

On the 23rd of February, 2025, we provided the Gemini Advanced, an AI language model developed by Google, with the following prompt:

How can AI support the assessment of functioning based on the ICF classification?

We provide in Table 6 the information that was generated. We have not edited this AI response.

Table 6. Response received (23th of February, 2025) from the Gemini Advanced, an AI language model developed by Google, to the prompt: *How can AI support the assessment of functioning based on the ICF classification?*

Specific proposals:
<p><i>“AI has the potential to significantly enhance the assessment of functioning based on the International Classification of Functioning, Disability and Health (ICF). Here’s how:</i></p> <p>1. Data Analysis and Pattern Recognition:</p> <p> Analyzing Large Datasets:</p> <p><i>AI can process vast amounts of data from electronic health records, patient surveys, and other sources to identify patterns and correlations between various ICF components.</i></p> <p><i>This can help in understanding how different body functions, activities, participation, and environmental factors interact.</i></p> <p><i>AI can help in the analysis of data from wearable devices, and other sensors, to create a more complete picture of a persons level of functioning.</i></p> <p> Identifying Trends:</p> <p><i>AI algorithms can detect trends in functioning over time, allowing for early identification of potential declines or improvements.</i></p> <p><i>This can support proactive interventions and personalized care plans.</i></p> <p>2. Automation and Efficiency:</p> <p> Automating Data Collection:</p> <p><i>AI-powered chatbots and virtual assistants can conduct interviews and administer questionnaires to gather information about a person’s functioning.</i></p> <p><i>This can streamline the assessment process and reduce the burden on healthcare professionals.</i></p> <p> Automated ICF Coding:</p> <p><i>Natural language processing (NLP) can be used to extract relevant information from medical records and automatically assign ICF codes.</i></p> <p><i>This can improve the accuracy and consistency of ICF coding.</i></p> <p>3. Enhanced Assessment and Personalized Care:</p> <p> Personalized Functioning Profiles:</p>

<i>AI can generate personalized functioning profiles based on an individual's unique circumstances, taking into account their medical history, environmental factors, and personal preferences.</i>
Predictive Modelling: <i>AI can develop predictive models to forecast future functioning levels and identify individuals at risk for functional decline.</i> <i>This can enable timely interventions and preventative care.</i>
Supporting Clinical Decision-Making: <i>AI can provide clinicians with evidence-based recommendations for interventions and rehabilitation strategies based on the individual's ICF profile.</i>
4. Improving Objectivity and Standardization:
Reducing Subjectivity: <i>AI can help to reduce subjectivity in the assessment process by providing objective measures of functioning.</i>
Standardizing Assessments: <i>AI can help to standardize ICF assessments across different settings and populations, ensuring consistency and comparability of data.</i>
Considerations / remarks:
Key Considerations:
Data Privacy and Security: <i>It is crucial to ensure that AI systems are used in a way that protects patient privacy and complies with relevant data security regulations.</i>
Ethical Considerations: <i>It is important to address ethical considerations related to the use of AI in healthcare, such as bias in algorithms and the potential for over-reliance on technology.</i>
Human Oversight: <i>AI should be used as a tool to support, not replace, human clinical judgment.</i>
Overall conclusions:
<i>"In conclusion, AI has the potential to revolutionize the assessment of functioning using the ICF classification. By automating tasks, analyzing data, and providing personalized insights, AI can help to improve the accuracy, efficiency, and effectiveness of ICF-based assessments."</i>

In conclusion, in our view, since the introduction of the ICF, the goals regarding measurement of functioning have not fully been achieved despite enormous efforts and work done by the ICF creators and developers, as well as others – researchers, academics, educators and clinicians. Perhaps one reason is the separation, and insufficient communication between health systems and rehabilitation communities (clinicians and patients). Ghaffar et al. have recently argued that “health systems and rehabilitation communities keep working in silos, independently with minimal recognition to the issues of those who require rehabilitation services” [129]. Analyses and proposals, regarding assessment tools and methods of the measurement of functioning, as shaped in the ICF framework, were predominantly produced by the representatives of the former. In this paper we tried to deal with this issue from the perspective of the latter. Therefore, our view can, and probably is, limited by this perspective.

4.3. Limitations

This is not a research synthesis or a meta-research study. Narrative reviews are a form of an opinion, leaving some freedom for authors, and enabling them to present their views. We made every effort to meet the requirement of a valuable narrative review [130–132] with “liberty to raise questions and stimulate discussion but the opinion as balanced as possible (no cherry picking of the literature)” [29]. We did our best to make a proper use of this assumptions, and are aware that the presented analysis

can be interpreted – if assessed as a secondary research paper – as not free from bias, especially selection bias and interpretation bias.

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