


International Classification of Functioning, Disability and Health: development of an assessment set to evaluate functioning based on the Brief ICF Core Set for Hand Conditions – ICF Hand_A

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Abstract

Timely identification of patients' problems after disorder or injury of the hand requires a thorough functional assessment. However, the variety of outcome measures available makes it difficult to choose the appropriate instrument. The brief International Classification of Functioning, Disability and Health (Brief ICF Core Set for Hand Conditions) provides a standard for what aspects need to be measured in hand injuries and disorders without specifying how to make the assessment. We developed the ICF-based Assessment Hand (ICF Hand_A), an assessment set for functioning based on the Brief ICF Core Set for Hand Conditions. First, we performed a literature review and an expert survey to pool outcome measures appropriate to assess functioning in clinical practice. At an interdisciplinary consensus conference experts decided on the outcome measures to be included in the ICF Hand_A. The ICF Hand_A provides a consensus on outcome measures and instruments to systematically assess function in patients with hand injuries and disorders.

Keywords

International Classification of Functioning, Disability and Health, ICF, ICF Core Set, hand disorders, hand injuries, outcome assessment

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Introduction

Hand surgeons and therapists require standardized assessments (MacDermid, 2014) to timely identify patients' impairments, limitations and restrictions, and to guide treatment in a multidisciplinary setting for achieving the best result for the patient. Such assessments also provide standardized information along the continuum of care. We know from clinical practice and the literature that a multitude of assessments exist to evaluate clinical outcomes of patients with hand injuries and disorders (Changulani et al., 2008; Dubert, 2014; MacDermid, 2014; van de Ven-Stevens et al., 2009; Velstra et al., 2011). In numerous studies, highly diverse assessments have been applied (Kus et al., 2011a). However, the lack of consensus regarding the assessments limits comparability of data across studies and hampers in-depth professional exchanges among experts.

The International Classification of Functioning, Disability and Health (ICF) (World Health Organization, 2001) is based on a biopsychosocial view of

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functioning, which is the outcome of the interaction between a health condition and contextual factors (environmental and personal factors). Based on this concept, the classification includes alphanumeric coded ICF categories of the components: Body Functions (b), Body Structures (s), Activities and Participation (d), and Environmental Factors (e). The Brief ICF Core Set for Hand Conditions (ICF CS-HC) (Rudolf et al., 2012) specifies functioning domains and environmental factors relevant in hand injuries and disorders. It provides a well-established and validated list, including 23 ICF categories, and serves as the minimal standard that should be applied to report on functioning and environmental factors of persons with hand injuries or disorders (Kus et al., 2012). The ICF CS-HC defines what to measure (e.g. impairment of a body function) without providing information on how to measure it. This makes the set a helpful reference rather than a standardized assessment instrument for clinical use. A standardized assessment set based on the ICF CS-HC would facilitate the assessment and the comparability of functioning-related information. It could also be used in medical reports and improve communication among health professionals, service providers and cost bearers. This article describes the decision-making process used to develop the ICF-based Assessment Hand (ICF Hand_A). The specific aims were to report on the results of the preliminary studies chosen to provide evidence for a consensus conference and to present the results of this conference.

Methods

We adopted a multistage, evidence-based process to develop the ICF Hand_A. We initially performed systematic literature reviews and a national survey with clinical experts. The results of these studies provided information for the participants of a consensus conference who then decided on the ICF Hand_A. The studies were performed within the Lighthouse Project Hand.

Preliminary study: systematic literature reviews

We carried out systematic literature reviews to identify outcome measures and instruments (hereinafter referred to as 'measures') used to assess the 23 categories of the ICF CS-HC. The literature reviews followed the PRISMA guidelines (Moher et al., 2009) (PRISMA guidelines define an evidence-based minimum set of aspects to be reported in systematic reviews and meta-analyses). We searched for standardized outcome measures, such as patient-reported outcomes (PRO),

clinical assessments (e.g. hand dynamometer) and physical examinations (e.g. goniometry).

We conducted a search for every ICF category of the ICF CS-HC (e.g. 'b265 Touch function'). We searched MEDLINE, CINAHL, PsycINFO, PEDro and OTseeker for studies focusing on individuals with hand injuries or disorders that reported the use of measures (see search strategy for 'b265 Touch function' as electronic supplementary material). Randomized controlled trials, clinical controlled trials, cross-sectional and longitudinal studies, validation studies, epidemiological trials, qualitative studies and psychometric studies published between 2007 and 2012 in English or German were included. Exclusion criteria were: (1) sole inclusion of individuals with injuries and/or disorders of shoulder, elbow or upper arm; (2) ICF category of interest was not addressed in the measures used; (3) measures were not reported; (4) no abstract available. For practical reasons, whenever a search retrieved more than 1000 records after duplicate checks, we performed random sampling to obtain a 30% sample. Two researchers (SK, MC) checked the abstracts from all studies and extracted data on diagnosis, measures used for data collection and type of measures (e.g. PRO, clinical measure, etc.). Whenever there were uncertainties within the abstract regarding which specific measure the authors had used to evaluate an outcome (e.g. 'sensitivity'), we analysed the full text. Frequency analyses were performed on the measures that were identified in the retrieved studies.

Preliminary study: expert survey

We performed a national expert survey to identify measures used in clinical routine to assess the categories included in the ICF CS-HC. The survey was carried out as a stand-alone research study, and measures identified in the systematic review were not presented to the participants.

We recruited hand specialists from German-speaking countries by contacting hand clinics and centres, professional associations and authors of hand-specific publications identified by internet search (e.g. PubMed). Experts had to meet the following inclusion criteria: professional background as physician, occupational therapist, physiotherapist, hand therapist, nurse, psychologist or social worker with at least 5 years of experience in treatment, rehabilitation or care of individuals with hand injuries or disorders. Identified experts received an email with information, the invitation to participate in the survey and the request to nominate other hand specialists (snowball system) (Biernacki and Waldorf, 1981).

| Semmes-Weinstein monofilament test (SWMT) | | Semmes-Weinstein Monofilament Test (SWMT) – German Version | |
|---|---|---|--|
| Reference: Semmes J, Weinstein S, Ghent L, Teuber H. Somatosensory Changes After Penetrating Brain Wounds in Man. Cambridge: Harvard University | | German version: In: Handrehabilitation für Ergotherapeuten und Physiotherapeuten. Band 1. Springer Verlag, 2009 | |
| Properties of the assessment instrument: | | Clinical measurement | |
| ICF-category: | Sensory functions related to temperature and other stimuli (b270) | Source : | Literature search (n= 48); expert survey (17,3 %) |
| Aim: | Assessment of sensibility | Target | unspecific |
| Content | | Number of items: | 1 test |
| Sensitivity to pressure (b2702) | | Time to fill in: | no information |
| Further content | | Scope of application: | Diagnostic |
| no further content | | Data collection: | Health professional |
| Scoring: | ----- | Psychometrics | Interrater reliability: excellent (.92); Practicability (nationale expert survey 0-6): Median=2 |
| Interpretation: | The lighter a monofilament is that a patient can feel, the better is perceived sensibility. | Cut-offs: | Norm values available |
| Costs: | Approximately 100€ | | |
| Comment: | ----- | | |
| McGill Pain Questionnaire (MPQ) | | McGill Pain Questionnaire (MPQ) – German Version | |
| Reference: Melzack, R. The McGill Pain Questionnaire: Major properties and scoring methods. Pain 1975; 1; 277-299. | | German version: Short form, not validated translation by Amir Tal-Akabi and Peter Oesch | |
| Properties of the assessment instrument: | | Patient-reported outcome measure (PRO) | |
| ICF-category: | Sensation of pain (b280) | Source : | Literature search (n= 7); expert survey (2,6 %) |
| Aim: | Assessment of pain | Target | unspecific |
| Content | | Number of items: | 20 / 15 (short version) |
| Sensation of pain (b280), Pain in head and neck (b28010), Pain in stomach or abdomen (b28012) | | Time to fill in: | 10-20' / 2-5' (short version) |
| Further content | | Scope of application: | Follow-up of medical examination, treatment evaluation, outcome parameter of clinical studies |
| no further content | | Data collection: | Patient reported |
| Scoring: | Calculation of a total score. Calculation of subscores, such as the Pain Rating Intensity Score possible. | Psychometrics | Test-retest reliability: good to excellent (0,83); Practicability (nationale expert survey 0-6): Median=2 |
| Interpretation: | differs according to scores; in general: a lower score indicates a higher quality of life (QoL). | Cut-offs: | no information |
| Costs: | no costs | | |
| Comment: | Information retrieved from ProQoIid | | |

Figure 1. Consensus conference: example of materials handed out to the conference participants.

Materials: The survey questionnaire consisted of two parts. Part I contained basic information such as age, sex, professional background and years of experience as a hand specialist. Part II asked for measures the expert commonly uses in clinical routine to assess the ICF categories included in the ICF CS-HC.

Specialists agreeing to participate received an email with information about the survey, the questionnaire and instructions on how to fill it in. The time allotted to complete the questionnaire was 3 weeks. Reminders were sent immediately before and after the deadline. Parts I and II of the questionnaire were analysed descriptively. Frequency analyses were performed on the measures listed by the participants.

Consensus conference

A 2-day consensus conference (hereinafter referred to as 'conference') involving an interdisciplinary panel

was held to create the ICF Hand_A. Participants belonged to previously established working groups of the Lighthouse Project Hand representing clinical experts (i.e. physicians, physiotherapists, occupational therapists and psychologists working at specialized departments/clinics for hand surgery in one out of ten large hospitals in Germany) and representatives of the German Social Accident Insurance. We applied a multistep consensus procedure to reach agreement among the experts on measures to be included in the ICF Hand_A. The results retrieved from the preliminary studies served as a basis for the selection. In order to be presented at the conference, measures had to be available in German language and standardization had to be described in the identified study itself or elsewhere in corresponding references. Information on psychometric properties of the measures was gained from original reference or secondary publications and was handed out to the participants in order to inform the decision-making process (see Figure 1). During

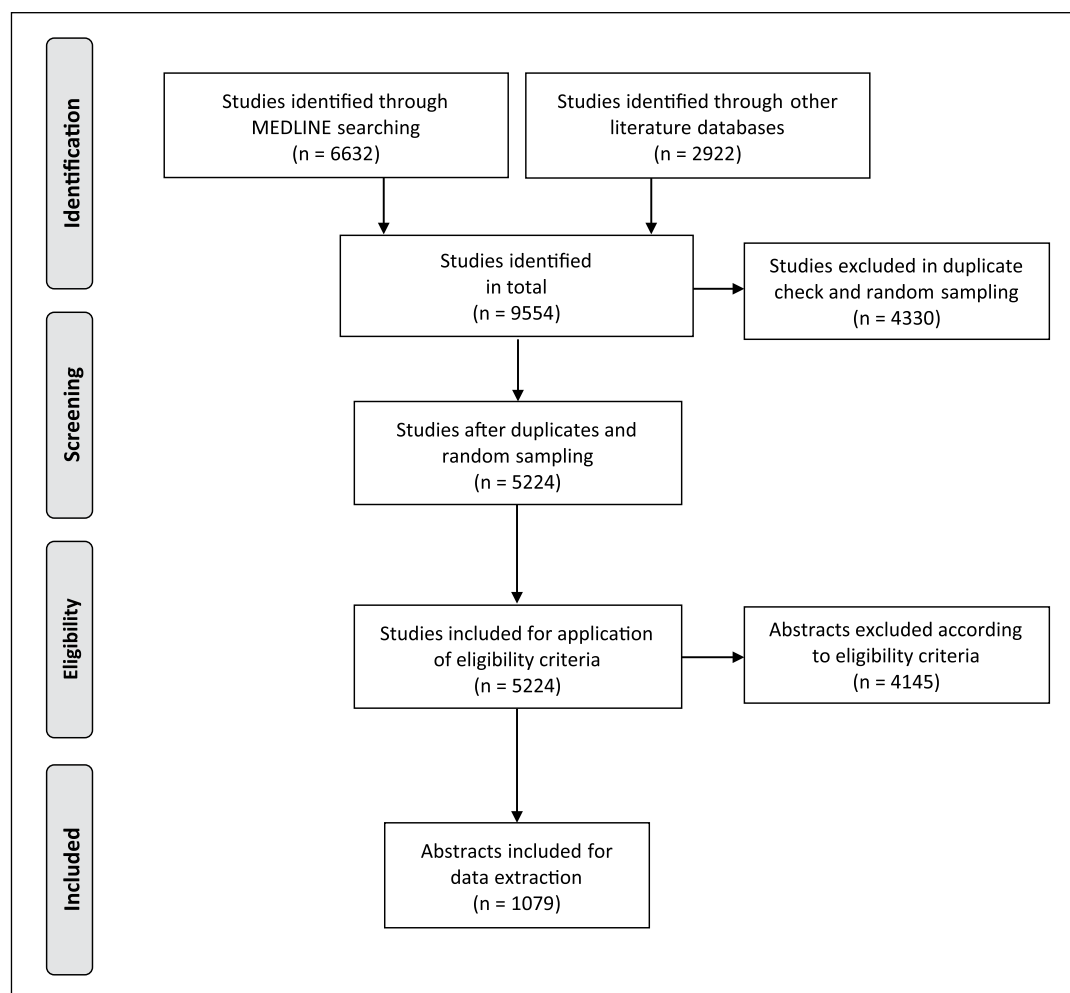


Figure 2. Systematic literature review: study selection process of the systematic review.

the consensus procedure, experts discussed and voted in profession-specific working groups, presented their decisions to the panel and performed final voting in plenary sessions to agree on the measures to be included in the ICF Hand_A.

Results

Preliminary studies

From 23 literature reviews, we identified 9554 studies. From these, 5224 abstracts were screened for eligibility and 1079 studies fulfilled the inclusion criteria. A flow chart of the selection process is shown in Figure 2. In total, 246 measures were extracted from the studies. We selected 153 measures (shown in the online appendix S4) to be presented at the conference based on the previously described criteria. Measures that existed only in English or for which standards of usage were missing were excluded.

From 923 physicians and therapists contacted, 161 (17%) participated in the survey (Table 1). They named 121 measures, of which 99 had already been identified from the literature reviews. Consequently, we added 22 measures for the presentation at the conference (marked with an asterisk in Appendix S4).

The measures retrieved from the preliminary studies most frequently addressed the ICF categories 'd440 Fine hand use', 'b280 Sensations of pain' and 'd445 Hand and arm use' (Table 2). The disabilities of arm, shoulder and hand (DASH) Questionnaire (Hudak et al., 1996) and the Michigan Hand Outcomes Questionnaire (MHQ) (Chung et al., 1998) covered most of the aspects of the ICF CS-HC.

Consensus conference – creation of the ICF Hand_A

A panel consisting of 42 professionals from different disciplines attended the 2-day conference in Hamburg in November 2012. Information on participants'

Table 1. Expert survey and consensus conference: description of participants of the national expert survey ($N=161$) and of the 2-day consensus conference ($N=42$).

| <i>Expert survey (N=161)</i> | | |
|---|--------------------------------------|------------------------|
| Sex | Male | 58% ($n=93$) |
| | Female | 42% ($n=68$) |
| Age (in years) | | $M=41.4$ ($SD=9.77$) |
| Profession | Physicians | 42% ($n=68$) |
| | Therapists (PT, OT, hand therapists) | 54% ($n=87$) |
| | Others | 4% ($n=6$) |
| Experience in the treatment of hand conditions (in years) | | $M=11.5$ ($SD=8.35$) |
| <i>Consensus conference (N=42)</i> | | |
| Sex | Male | 48% ($n=20$) |
| | Female | 52% ($n=22$) |
| Profession | Physicians | 33% ($n=14$) |
| | Therapists (PT, OT, hand therapists) | 36% ($n=15$) |
| | Psychologists | 2% ($n=1$) |
| | Insurance representatives | 19% ($n=12$) |

PT: physical therapist; OT: occupational therapist.

Table 2. Frequency analysis of outcome measures retrieved from the systematic reviews and from the expert survey.

| Aspects of the Brief ICF Core Set for HC | | Number of outcome measures addressing the single aspects | | |
|--|--|--|--------------------|---------------|
| | | Total | Systematic reviews | Expert survey |
| b152 | Emotional functions | 25 | 20 | 11 |
| b265 | Touch functions | 37 | 37 | 7 |
| b270 | Sensory functions related to temperature and other stimuli | 42 | 41 | 11 |
| b280 | Sensation of pain | 47 | 45 | 12 |
| b710 | Mobility of joint functions | 35 | 35 | 8 |
| b715 | Stability of joint functions | 7 | 7 | 4 |
| b730 | Muscle power functions | 39 | 36 | 12 |
| b760 | Control of voluntary movement functions | 11 | 11 | 3 |
| b810 | Protective functions of the skin | 11 | 10 | 2 |
| s120 | Spinal cord and related structures | 12 | 10 | 6 |
| s720 | Structure of shoulder region | 1 | 1 | 1 |
| s730 | Structure of upper extremity | 17 | 17 | 2 |
| d230 | Carrying out daily routine | 7 | 5 | 5 |
| d430 | Lifting and carrying objects | 25 | 22 | 8 |
| d440 | Fine hand use | 50 | 48 | 12 |
| d445 | Hand and arm use | 43 | 40 | 12 |
| d5 | Self-care | 40 | 38 | 8 |
| d6 | Domestic life | 25 | 23 | 7 |
| d7 | Interpersonal interactions and relationships | 18 | 18 | 3 |
| d840–d859 | Work and employment | 36 | 33 | 9 |
| e1 | Products and technology | 10 | 9 | 1 |
| e3 | Support and relationships | 12 | 11 | 1 |
| e5 | Services, systems and policies | 5 | 4 | 1 |

professional backgrounds is presented in Table 1. The participants decided on the ICF Hand_A and agreed on a two-stage procedure involving a screening and a

supplementary test of functioning, if indicated. They also decided to take into account the patient perspective by adding the DASH. In the screening, a physician

guides the entire assessment of functioning by evaluating the patient's problems regarding aspects of the ICF CS-HC using the measures of the ICF Hand_A (Table 3; column: *Screening*).

For *Body structures*, established diagnostic imaging techniques, such as radiography, are used, if necessary, to document localization and nature of the impairments (i.e. nerves, muscles and tendons of the forearm and hand). For *Body functions*, PROs and various clinical measures are used to assess impairments. For example, emotional functions are rated by using standardized screening questions (e.g. Generalised Anxiety Disorder-2 (Kroenke et al., 2007)). Sensory function is rated by using two-point discrimination (Lundborg and Rosen, 2004). For *Activities and participation*, standardized questions, performance tasks and single items from the DASH are used to screen for limitation and restrictions. For example, problems in self-care are assessed by means of three DASH items, namely: 'Wash or blow dry your hair', 'Wash your back' and 'Put on a pullover sweater'. For *Environmental factors*, patients' further needs, such as drugs or assistive devices, were evaluated. In the electronic supplementary material, a detailed overview of the content of the ICF Hand_A screening is provided.

If a supplementary examination is indicated according to the results of the screening, the ICF Hand_A provides 11 outcome measures for optional supplementary testing by capturing nine aspects of the ICF CS-HC (Table 3; column: *Supplementary testing*). The supplementary test is initiated by the physician who guided the screening. Depending on the organizational structure of the individual clinic, health professionals are involved in the supplementary testing.

Discussion

We report on the multistage, evidence-based, decision-making process used to develop the ICF Hand_A. This assessment is based on the ICF CS-HC, and consists of internationally established measures enabling a standardized assessment of functioning. In the systematic literature reviews we found a great number and heterogeneity of measures (Changulani et al., 2008; Goldhahn et al., 2008; Marks et al., 2013; Velstra et al., 2011) making a comparison of information and results difficult. Applying the ICF as a framework to select, classify or develop outcome measures has already been suggested (Birch et al., 2011; Bryant and Fernandes, 2011; Metcalf et al., 2007; Rosales, 2015). The aspects included in the ICF Hand_A refer to the ICF and therefore reflect the comprehensive view of health and functioning. The ICF Hand_A provides for the first time a set of instruments

to assess these domains (Marks et al., 2013). However, in particular cases, other aspects of functioning not included in the ICF CS-HC could be relevant, especially for activities and participation (e.g. caring for others, sports).

The experts at the conference agreed on a two-stage procedure – screening and the supplementary testing – to improve the clinical feasibility of the ICF Hand_A in light of time and staff limitations in clinical practice. Depending on the current situation of a patient (e.g. time point in continuum of care), not all aspects of the ICF Hand_A need to be assessed at every visit. Furthermore, assessment of a functioning aspect that is obviously not impaired is dispensable with documentation of its status as 'no impairment' is sufficient. By applying the screening, clinicians could provide a comprehensive overview of all domains of function and identify aspects that require further testing.

All measures (e.g. DASH, two-point discrimination) selected are internationally established and validated instruments. Some performance tasks (e.g. Push/pull an object) or single questions (e.g. 'Do you have problems in planning, managing and completing your daily requirements?'), however, require validation in the future. Even though developed as a national effort, the ICF Hand_A could be used internationally after translation validation.

Implementing it in clinical practice would yield valuable and standardized information on patients' functioning irrespective of the type of injury or treatment. Standardized data on functioning could be generated for clinical research and along the continuum of care. A prospective data pool would facilitate comparability of outcomes after surgical interventions and rehabilitation. This would allow for complex data analyses, such as predictive modelling and predicting outcomes, such as return to work. This is an indispensable requirement to provide evidence on interventions or treatment efficacy. Nevertheless, to fully benefit from the advantages of using the ICF Hand_A, a user-friendly electronic data documentation tool is required, as handling data in a paper-pencil record form will be far too time-consuming.

Some methodological aspects are relevant. We did not involve patients in the decision on which measures should be included in the ICF Hand_A. Nevertheless, the patient perspective was considered in the development process of the ICF CS-HC, on which the ICF Hand_A is based. We assumed that which measures are the most appropriate to be used in clinical practice required professional expertise. Representatives of the accident insurance companies, however, were invited to attend the conference to consider important aspects, such as return to work

Table 3. ICF Hand_A assessment set based on the Brief ICF Core Set for Hand Conditions.

| Aspects of the Brief ICF Core Set for HC | | (1) Screening | (2) Supplementary testing |
|--|--|---|---|
| <i>Body structures</i> | | | |
| s120 | Spinal cord and related structures (e.g. nerves) | Localization and nature of impairments in body structures is documented based on diagnostic imaging techniques, if required. | |
| s730 | Bones of forearm and hand | | |
| s730 | Joints of forearm and hand | | |
| s730 | Muscles and tendons of forearm and hand | | |
| <i>Body functions</i> | | | |
| b152 | Emotional functions | Depression (PHQ-2) ¹ , anxiety (GAD-2) ² and standardized question to screen for post-traumatic stress disorder | PHQ-9 ^{3,4} , GAD-7 ⁵ , IES-R ^{6,7} |
| b265 | Touch functions | Ten Test ⁸ | Moberg Test – Object identification ⁹ |
| b270 | Sensory functions related to temperature and other stimuli | Two-point discrimination ¹⁰ Pin prick test ¹¹ Cold-warm discrimination Numeric rating scale ¹⁴ | SWMT ¹² or WEST ¹³ |
| b280 | Sensation of pain | Goniometry ¹⁵ | |
| b710 | Mobility of joint functions | Fingernail-table distance ¹⁶ Fingertip-to-palm distance ¹⁶ Manual provocation testing (e.g. Piano-Key-Test ¹²) (Non-standardized grip test) ^a | Hand dynamometer ¹⁷ Pinch gauge ¹⁷ Purdue Pegboard Test ¹⁸ |
| b715 | Stability of joint functions | | |
| b730 | Muscle power functions | | |
| b760 | Control of voluntary movement functions | One standardized performance task (grasping/lifting and releasing a pen) | |
| b810 | Protective functions of the skin | Visual inspection Visual inspection | Volumetry ¹⁹ or circumferential measure ¹⁵ |
| <i>Activities and participation</i> | | | |
| d230 | Carrying out daily routine | One standardized question to screen for problems | |
| d430 | Lifting and carrying objects | One standardized performance task (lifting/carrying an object from one place to another) DASH ²¹ items 2, 3 ^c Grasp, lift and release a paperclip | Functional capacity evaluation ²⁰ Moberg Test – Picking up test ⁹ |
| d440 | Fine hand use | Four standardized performance tasks (Pushing/pulling, reaching, throwing/catching, turning/twisting) DASH ²¹ items 13, 14, 15 DASH ²¹ items 4, 7, 8, 9 | Functional capacity evaluation ²⁰ |
| d445 | Hand and arm use | | |
| d5 | Self-care | | |
| d6 | Domestic life | | |

(Continued)

Table 3. (Continued)

| Aspects of the Brief ICF Core Set for HC | (1) Screening | (2) Supplementary testing |
|---|---|--|
| d7 Interpersonal interactions and relationships | One standardized question to screen for problems | |
| d840–d859 Work and employment | DASH ²¹ items (work module) | Functional capacity evaluation ²⁰ |
| <i>Environmental factors</i> | | |
| e1 Products and technology | Screening for patient's needs for medication, medical devices, assistance tools for driving/housing, and workplace adaptation | |
| e3 Support and relationships | Screening for the patient's supportive or burdening family and living situation | |
| e5 Services, systems and policies | Screening for patient's needs regarding future health services | |

PHQ: patient health questionnaire; GAD: generalized anxiety disorder; IES-R: Impact of Event Scale – revised version; SWMT: Semmes-Weinstein monofilament test; WEST: Weinstein enhanced sensory test; DASH: disability of the arm, shoulder and hand questionnaire.

^aThe conference decision to use a non-standardized grip test for the screening was reconsidered and with hindsight modified because of lacking standardization. For the future use, the ICF Hand_A includes the hand dynamometer and the pinch gauge assessment in the screening.

^bSwelling is not covered either in the Brief ICF Core Set for HC nor in the entire ICF-classification, however, it was included because of its clinical relevance.²²

^cThe conference decision to use the DASH items 2, 3 for the screening of fine hand use was reconsidered and, with hindsight, a simple and quick performance task (picking up a norm paperclip) was added because of lacking comparability of the DASH items 2, 3 and the Moberg Picking up test (supplement testing). For the future use, the ICF Hand_A includes in addition to the DASH items 2, 3 also the picking up performance task.

1. Kroenke K et al., 2003.
2. Kroenke K et al., 2007.
3. Kroenke K et al., 2001.
4. Kroenke K and Spitzer RL, 2002.
5. Spitzer RL et al. 2006.
6. Weiss DS and Marmar CR, 1997.
7. Maercker A and Schützwohl M, 1998.
8. Strauch B et al., 1997.
9. Ng CL et al., 1999.
10. Lundborg G and Rosen B, 2004.
11. Grüne S, 2007.
12. Moriya T et al., 2009.
13. Weinstein S, 1993.
14. Basler HD, 2011.
15. Hüter-Becker A and Dölken M, 2011.
16. Waldner-Nilsson B, 2009.
17. Mathiowetz V et al., 1984.
18. Tiffin J and Asher EJ, 1948.
19. Boffi Ribeiro RC et al., 2010.
20. Isernhagen S et al., 1992.
21. Hudak PL et al., 1996.
22. Kus S et al., 2011b.

(e.g. workplace adaptations) and environmental factors (e.g. assistance tool for housing) to ensure appropriate guidance in the rehabilitation process.

In the systematic literature reviews we found that study outcomes mostly covered more than a single domain (e.g. grip strength, pain, muscle power). Thus, there was considerable overlap of studies retrieved. Likewise, the same measure could be identified more than once in various searches, as many of them, particularly PROs, include several aspects of functioning. It also became apparent that hand-specific measures addressing activities and participation primarily focus on fine hand use and exclude self-care and daily activities of domestic life. Due to this weakness and to further reflect the patient perspective, the conference participants decided to include items from the DASH to assess self-care, domestic life, work and employment, and fine hand use.

The expert survey largely confirmed the results of the literature review. Nevertheless, since 22 measures could additionally be identified, we consider the survey as indispensable.

Although applying two preliminary studies, we were only able to identify a few measures addressing environmental factors. A previous study of 260 patients emphasized the importance of environmental factors in a patient's life after having experienced an injury or disorder of the hand (Kus et al., 2012). As appropriate measures on environmental factors were lacking, the conference participants decided to add questions to the ICF Hand_A that address current and future needs for medication, medical devices, assistance tools (e.g. for driving), workplace adaptation and needs for future healthcare services in addition to questions about the patient's supportive or burdening family and living situation.

In contrast to the ICF CS-HC, the assessment of 'swelling of the hand' is part of the ICF Hand_A. Swelling in arms and hands is generally not covered in the entire ICF classification (Kus et al., 2011a; van de Ven-Stevens et al., 2015). However, the conference included this aspect because of its importance in clinical practice. The physician rates 'swelling' in the screening based on visual inspection. If an extra examination is indicated, volumetry (Boffi Ribeiro et al., 2010) or circumferential measurements (Hüter-Becker and Dölken, 2011) is applied in the supplementary testing.

Some limitations are apparent. We may have omitted measures in the systematic literature review since we sometimes screened a 30% random sample of abstracts and we only searched for studies published in English or German. In addition, we might have missed recently developed measures as we performed the search on studies published between

2007 and 2012. We did not select a representative sample of clinical experts to attend the conference. However, all clinical experts were working at hand trauma centres certified by the Federation of the European Societies for Surgery of the Hand. We could have retrieved slightly varying measures from the expert survey if we included a representative sample of experts. The development of the ICF Hand_A and the decision on its content were predominantly a national effort. Involving an international perspective (e.g. in the expert survey) could have led to different results. However, the measures included in the ICF Hand_A are internationally established and have been frequently reported upon within the international scientific literature. The ICF Hand_A does not reflect the environment's positive or negative impact on a patient's situation, as originally described in the ICF. Instead, patients' future needs (e.g. for medical devices) are considered, which appeared to be more appropriate for developing an optimized and individually adapted rehabilitation strategy. For the screening of five activities and participation aspects, for example hand and arm use or interpersonal interactions and relationships, specific performance tasks and standardized questions were added to the ICF Hand_A. These tasks and questions refer to the content and definitions in the ICF, but require explicit validation for the future use of the ICF Hand_A.

Conclusion

The ICF Hand_A has been developed within an evidence-based, decision-making process. It provides a consensus on which internationally established measures to use in order to systematically assess functioning in patients with hand injuries and disorders. Standardized data on patients' functioning could be generated in clinical practice and research by applying the ICF Hand_A. Comparability of data across clinical studies would be facilitated along with professional exchange among experts in different hospitals and fields of specialization.

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