

PERSPECTIVES IN REHABILITATION

## Development of the International Classification of Functioning, Disability and Health Core Sets for Hand Conditions – results of the World Health Organization international Consensus Process

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**Purpose:** A formal decision-making and consensus process was applied to develop the first version of the International Classification on Functioning, Disability and Health (ICF) Core Sets for Hand Conditions. **Method:** To convene an international panel to develop the ICF Core Sets for Hand Conditions (HC), preparatory studies were conducted, which included an expert survey, a systematic literature review, a qualitative study and an empirical data collection process involving persons with hand conditions. A consensus conference was convened in Switzerland in May 2009 that was attended by 23 healthcare professionals, who treat hand conditions, representing 22 countries. **Results:** The preparatory studies identified a set of 743 ICF categories at the second, third or fourth hierarchical level. Altogether, 117 chapter-, second-, or third-level categories were included in the Comprehensive ICF Core Set for HC. The Brief ICF Core Set for HC included a total of 23 chapter- and second-level categories. **Conclusions:** A formal consensus process integrating evidence and expert opinion based on the ICF led to the formal adoption of the ICF Core Sets for Hand Conditions. The next phase of this ICF project is to conduct a formal validation process to establish its applicability in clinical settings.

**Keywords:** Hand conditions, hand injuries, functioning, International classification of functioning, disability and health, ICF core set

### Introduction

The hand is the “tool of the tools” (Aristotle). It is one of the most relevant organs connecting us to our environment. Therefore, hand impairment from diseases or structural

### Implications for Rehabilitation

- The ICF offers a unified language of human functioning, disability and health substantial to describe comprehensively the experience of patients suffering from a determined disease.
- The ICF Core Sets for Hand Conditions provide the basic international standard of what should be measured and reported to describe functioning and disability of patients with hand conditions.
- The ICF Core Sets for Hand Conditions serve as a useful tool to guide clinicians in the assessment of a patient's functioning in clinical studies, clinical encounters, and multi-professional evaluation.

damages will limit and restrict daily activities. Even though disorder and injuries of the hand are frequent, their consequences are often underestimated in clinical practice. Clinicians typically concentrate on impairments of body functions and structures and disregard their impact, for example, relating to psychological aspects or day to day life situations [1,2].

The World Health Organization (WHO) developed the International Classification of Functioning, Disability and Health (ICF) as a means to address the impact of health conditions from a biopsychosocial perspective [3]. It comprises the components Body Functions, Body Structures, Activities and Participation, as well as contextual Environmental and Personal Factors, whereas the Personal Factors have not yet been classified (Figure 1).

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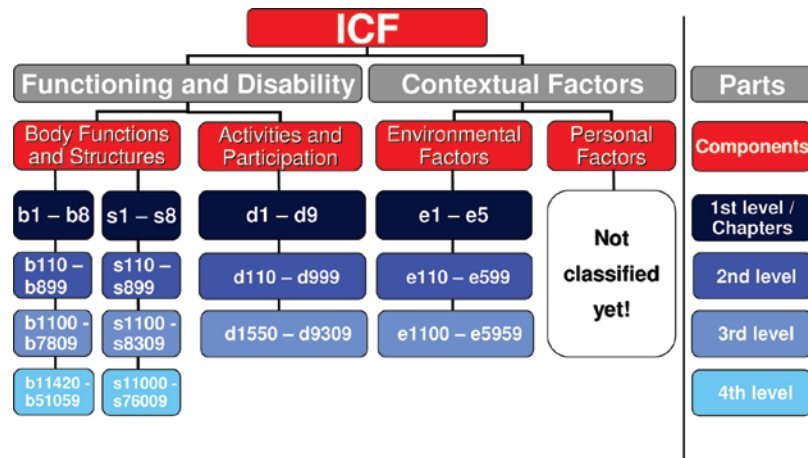


Figure 1. Structure of the International Classification of Functioning, Disability and Health (ICF).

Table I. Hierarchical structure of the ICF with further specification in the higher levels.

ICF code	Title	ICF level
s7	Structures related to movement	(first/chapter-level)
s730	Structure of upper extremity	(second-level)
s7302	Structure of hand	(third-level)
s73020	Bones of hand	(fourth-level)
s73021	Joints of hand and fingers	(fourth-level)
s73022	Muscles of hand	(fourth-level)
s73023	Ligaments and fasciae of hand	(fourth-level)
s73028	Structure of the hand, other specified	(fourth-level)

The components contain the units of the classification – the ICF categories. They are alphanumeric coded, where the letters b, s, d and e refer to the components Body Functions (b), Body Structures (s), Activities and Participation (d) and Environmental Factors (e). The letters are followed by a numeric code starting with the chapter number (one digit), followed by the second level (two digits), and the third and fourth levels (one digit each). The ICF categories are arranged hierarchically. The chapters constitute the first level of precision and categories on higher hierarchical levels (e.g. second-, third- or fourth-level) are more detailed (Table I).

With the ICF, clinicians can now rely on a classification that complements the widely-used ICD-10 [4] to report in clinical practice the problems associated with the health conditions treated. The ICF can be applied as a starting point for planning and monitoring the effectiveness of clinical interventions. The usefulness and the advantages of the ICF have widely been reported [5–8].

The ICF Core Sets for Hand Conditions are practical tools based on the main ICF that aim to describe functioning and disability of patients with hand conditions. In principle, they are agreed-on lists of functioning aspects (taken from the entire classification), important in different types of health disorders related to the hand. The ICF Core Sets for Hand Conditions provide the basic international standard of what should be measured and reported to describe functioning and disability of patients with hand conditions. Thus, they can serve as a useful tool to guide clinicians and researchers in the assessment

of a patient's functioning and health in clinical studies, clinical encounters, and multi-professional evaluation.

In contrast to the other ICF Core Sets already developed [9], the starting point of this Core Set development process was the body part “hand”. All different hand conditions were thereby taken into account, for example, diseases affecting the hand such as Parkinson's disease, as well as diseases or injuries located at the hand such as carpal tunnel syndrome, fractures or amputations. Two different ICF Core Sets for Hand Conditions have been developed: the Comprehensive and the Brief ICF Core Set. The specific aim of this paper is to describe the development process and report the ICF categories included in the ICF Core Sets for Hand Conditions.

## Methods

The development process of ICF Core Sets follows a standardized methodology, which has already been applied in several ICF Core Set development projects [10–12]. The development of ICF Core Sets for Hand Conditions was divided into a preparatory phase in which information was gathered from different studies and an international consensus conference in which the previously retrieved information was evaluated. During the conference, 23 health care professionals, representing 22 countries served as the international panel to develop the International Classification of Functioning, Disability and Health (ICF) Core Sets for Hand Conditions. The panellists followed a formal decision-making and consensus process.

## Preparatory studies

The preparatory studies were performed to pre-select a pool of candidate ICF categories, relevant to persons with any kind of hand condition from four different perspectives: (1) to identify from the patients' perspective the important aspects of functioning, as well as environmental and personal factors, we used a qualitative methodology. We performed ten focus groups including 59 patients with hand conditions. The focus group sessions were digitally recorded and transcribed verbatim. Patients' statements were translated into the ICF following a standardized linking procedure, based

on established linking rules [13,14]. The sample size of the focus groups was determined by saturation [15]. Saturation refers to the point at which an investigator has obtained sufficient information from the field [16]. (2) The health professional perspective was explored with an Internet-based expert survey including 162 health professionals from 55 countries worldwide with at least five years of expertise in the field of hand conditions. The experts were asked to document the most relevant and typical areas to be considered in individuals with hand conditions. Expert recruitment comprised two steps: First, we identified and the contacted international organizations in the field of hand conditions and asked their representatives to name experts. A pool consisting of all experts who fulfilled the selection criteria was created. Second, we drew a separate random sample for each health profession and each WHO region out of this expert pool. Totally, 36 expert pools existed (6 different WHO regions  $\times$  6 different health professions). Experts were contacted via email and asked if they would agree to participate in our survey. If an expert refuses her/his participation, another expert was drawn by chance out of the respective expert pool. We used the framework of the ICF to analyse and group the statements given by the experts. (3) The research perspective was covered by a systematic literature review on outcomes used in 204 studies including patients with hand conditions, which have been published between 2003 and 2008. We conducted the review in three steps: step 1, selection of studies, step 2, outcome measures extraction, and step 3, linking of the concepts contained in the outcome measures to the corresponding categories of the ICF. (4) The clinical perspective was addressed by an empirical, cross-sectional multicentre study, performed in trauma hospitals and rehabilitation facilities in Germany. The study intended to describe functioning and health of individuals with hand conditions and to identify the most common problems using the classification system of the ICF. Altogether, 210 patients participated in this cross-sectional multicentre study.

The ICF categories most frequently mentioned in all four preparatory studies made up the starting point of the decision-making and consensus process.

### Recruitment of conference participants

The recruitment strategy for conference participants had to balance the needs for international expertise without compromising a feasible decision-making process. Potential conference participants were selected from a pool of candidates willing to participate in the expert survey. Additionally, health professionals who expressed their interest in the project in advance, as well as people who were suggested by the project steering committee constituted the pool of potential participants. Three hundred eighty nine people (114 physicians, 106 physical therapists, 134 occupational therapists, 17 nurses, 7 psychologists and 11 social workers from 68 countries) made up this pool. Participants were selected randomly subject to consideration of the profession, the six WHO world regions, and the country of origin to assure a balanced representation of all important health professions and all world regions (see Table II).

Table II. Healthcare professionals participating at the ICF consensus conference.

Name	Health profession	Country represented
Davit Abrahamyan	Physician	Armenia
Kevin C. Chung	Physician	United States
Tora Dahl	Occupational therapist	Denmark
Mohamed Elazhary	Physiotherapist	Jordan
Patricia Fronck	Social Worker	Australia
Margareta Gustafsson	Nurse	Sweden
Johanes Hardjono	Physiotherapist	Indonesia
James January	Psychologist	Zimbabwe
Marie Johnston	Psychologist	Scotland/UK
Hamid Kamarzarin	Psychologist	Iran
Ali Kitis	Physiotherapist	Turkey
Monique LeBlanc	Occupational therapist	Qatar
Joy MacDermid	Physiotherapist	Canada
Kay Maddison	Nurse	Australia
Christine Meier	Occupational therapist	Switzerland
Fabian Puepet	Physician	Nigeria
Upinderpal Singh	Physician	India
Michael Solomons	Physician	South Africa
Catherine Sykes	Physiotherapist	United Kingdom
Jin Bo Tang	Physician	China
Piya Trevittaya	Occupational therapist	Thailand
Lucelle van de Ven-Stevens	Occupational therapist	The Netherlands
Shwu-fen Wang	Physiotherapist	Taiwan

### Consensus procedure

The 23 participants were divided into 3 groups with uneven numbers of participants who were engaged in small working group discussions. Each group consisted of different health professionals from different countries who worked actively together for 3 days. The operating language during the conference was English.

At the beginning of the conference, participants were trained in (1) the structure, principles, and nomenclature of the ICF in general, (2) the results from the preparatory studies, and (3) the principles and rules of the consensus process applied during the conference. They were further provided with information regarding the pre-selected ICF categories.

### Comprehensive and Brief ICF Core Set for Hand Conditions

The Comprehensive ICF Core Set for Hand Conditions provides a list of functioning aspects (i.e. ICF categories) relevant to describe functioning and disability of individuals with hand conditions in a comprehensive, multidisciplinary assessment. The Brief ICF Core Set for Hand Conditions provides a list of functioning aspects (i.e. ICF categories) that serves as the minimal international standard that should be addressed to report about functioning and disability of individuals with hand conditions along the continuum of care (ranging from the acute hospital to rehabilitation facilities and community) and across sectors (health, education, labour and social affairs), independently of the hand condition or the status of disease.

### Iterative decision-making process

The ICF Core Set categories were identified in an iterative decision-making process with discussions and voting in working

groups and plenary sessions. Each working group consisted of 7 or 9 voting participants, including a working group leader (KC, ML, and MJ). Additionally, in each group, there was a nonvoting working group assistant to document group results. In the plenary sessions, working group leaders presented their group decisions and arguments. However, all participants were allowed to speak up during the plenary sessions. The plenary sessions were moderated by an independent health professional (AC) with an expertise in the ICF, but without any personal experience in treating hand conditions. The moderator did not have the right to vote.

The decision-making process consisted of two major activities: (1) selection of ICF categories for the Comprehensive ICF Core Set on the second-level, including the selection of categories that require further specification on higher hierarchical levels of the ICF (i.e. third- and fourth-level); and (2) selection of categories from the Comprehensive ICF Core Set that should be included in the Brief ICF Core Set for Hand Conditions.

The voting process for the first major activity, the selection of ICF categories on the second-level, comprised in its first phase three voting rounds (vote A, B, C). A category was considered as included in the first two voting rounds (vote A and vote B – working-group sessions) if in all three working groups  $\geq 75\%$  of the experts voted “yes” for a respective category. A category was considered as excluded in the first two rounds if in all working groups  $< 40\%$  of the experts voted “yes” for a respective category. In vote C (plenary session) a majority decision was applied on the categories that remained ambiguous after the first two voting rounds. The next phase of the voting process comprised three additional voting rounds (vote D, E, F). In vote D (plenary session), the experts decided by majority, whether or not the included second-level ICF categories required further specification on the third-level of the ICF. In the subsequent round (vote E – working-group session) a corresponding third-level category was considered as included if in all three working groups  $\geq 75\%$  of the experts voted “yes”, and was excluded if

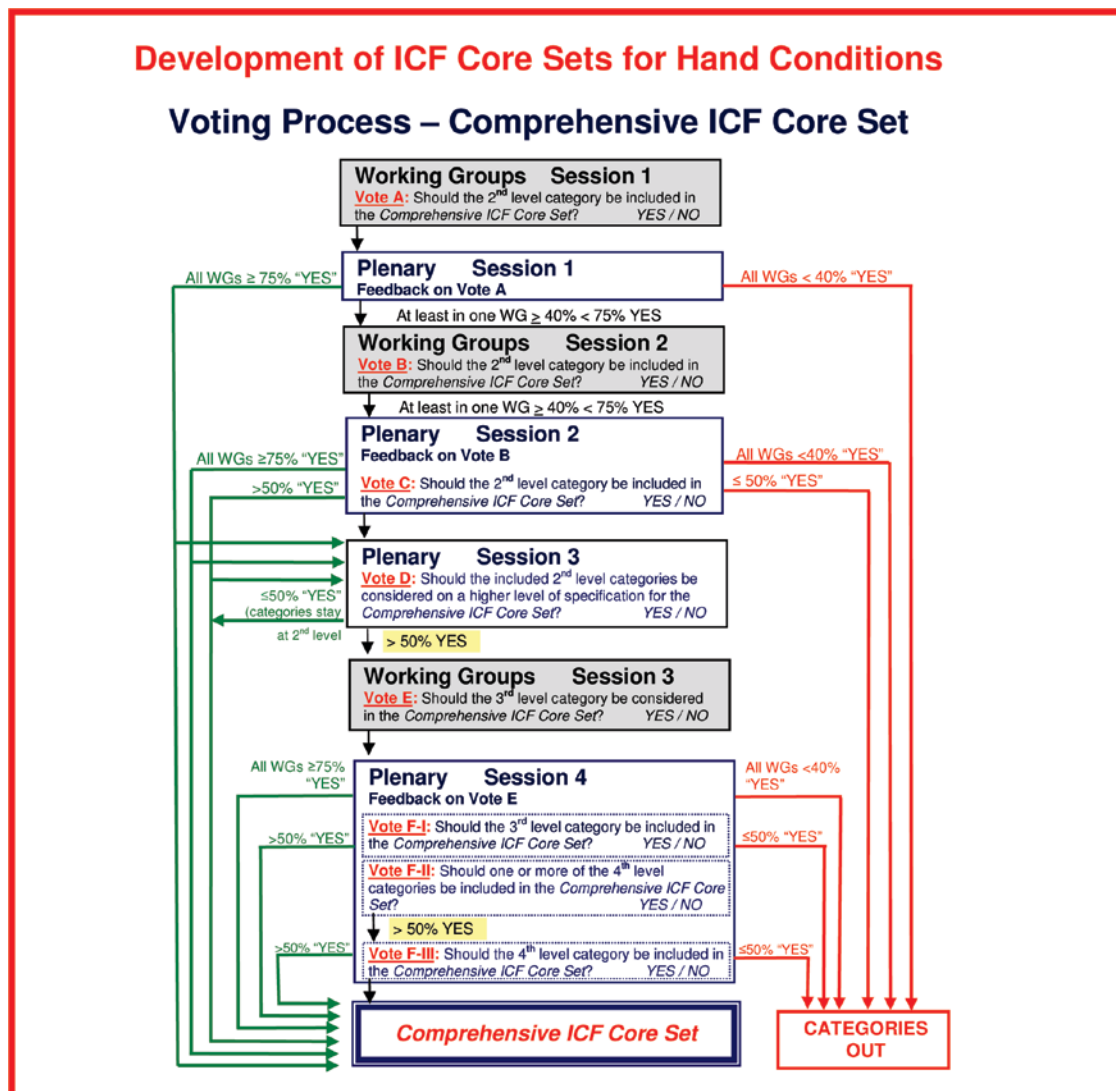


Figure 2. Voting process leading to the Comprehensive ICF Core set for Hand Conditions.

Table III. List of 138 candidate second-level categories presented to the experts at the ICF consensus conference along with their prevalences according to the respective preparatory studies.

ICF category	Title	Empir. study	Expert survey	Syst. review	Qual. study
		N=210	N=162	N=204	N=10
		%	%	%	N
<b>Body functions (N=35)</b>					
b114	Orientation functions	-	1	6	-
b126	Temperament and personality functions	-	31	15	2
b130	Energy and drive functions	36	23	10	3
b134	Sleep functions	45	6	7	2
b140	Attention functions	14	2	7	1
b144	Memory functions	7	-	6	-
b147	Psychomotor functions	-	1	3	1
b152	Emotional functions	24	12	14	10
b167	Mental functions of language	-	-	6	-
b180	Experience of self and time functions	-	5	3	-
b260	Proprioceptive function	-	6	5	-
b265	Touch function	41	15	26	7
b270	Sensory functions related to temperature and other stimuli	46	10	30	3
b280	Sensation of pain	80	72	58	10
b415	Blood vessel functions	-	5	1	1
b435	Immunological system functions	12	9	12	7
b525	Defecation functions	-	1	6	-
b530	Weight maintenance functions	-	1	1	2
b550	Thermoregulatory functions	11	1	-	-
b620	Urination functions	-	1	6	-
b710	Mobility of joint functions	91	66	70	10
b715	Stability of joint functions	30	4	29	-
b720	Mobility of bone functions	26	2	5	-
b730	Muscle power functions	77	56	66	8
b735	Muscle tone functions	-	19	17	3
b740	Muscle endurance functions	-	4	-	2
b750	Motor reflex functions	16	2	6	-
b760	Control of voluntary movement functions	30	25	18	2
b765	Involuntary movement functions	15	1	7	-
b780	Sensations related to muscles and movement functions	43	1	3	3
b810	Protective functions of the skin	-	2	5	3
b820	Repair functions of the skin	25	6	4	5
b830	Other functions of the skin	30	1	3	1
b840	Sensation related to the skin	29	2	13	6
b860	Functions of nails	-	1	1	1
<b>Body structures (N=12)</b>					
s110	Structure of brain	-	16	5	-
s120	Spinal cord and related structures	38	56	16	4
s130	Structure of meninges	-	6	-	-
s410	Structure of cardiovascular system	15	17	5	1
s420	Structure of immune system	-	4	-	-
s710	Structure of head and neck region	-	7	-	1
s720	Structure of shoulder region	-	26	16	7
s730	Structure of upper extremity	90	92	58	10
s760	Structure of trunk	-	5	-	2
s770	Additional musculoskeletal structures related to movement	-	6	1	-
s810	Structure of areas of skin	55	38	9	2
s830	Structure of nails	-	12	1	1
<b>Activities and participation (N=42)</b>					
d166	Reading	9	-	2	-
d170	Writing	39	31	23	5

(Continued)

Table III. (Continued)

ICF category	Title	Empir. study	Expert survey	Syst. review	Qual. study
		N=210	N=162	N=204	N=10
		%	%	%	N
d230	Carrying out daily routine	57	4	13	1
d240	Handling stress and other psychological demands	–	1	1	4
d360	Using communication devices and techniques	43	17	6	6
d410	Changing basic body position	24	1	20	1
d415	Maintaining a body position	13	1	13	1
d420	Transferring oneself	–	2	12	–
d430	Lifting and carrying objects	82	43	32	9
d440	Fine hand use	71	49	49	10
d445	Hand and arm use	79	27	44	7
d450	Walking	6	2	20	1
d455	Moving around	20	2	17	1
d460	Moving around in different locations	–	–	11	–
d465	Moving around using equipment	–	1	8	–
d470	Using transportation	20	2	11	6
d475	Driving	53	36	11	10
d510	Washing oneself	48	49	31	8
d520	Caring for body parts	59	42	11	5
d530	Toileting	27	33	13	4
d540	Dressing	55	52	33	8
d550	Eating	52	45	33	7
d560	Drinking	29	7	19	–
d570	Looking after one's health	–	15	7	4
d620	Acquisition of goods and services	–	2	7	–
d630	Preparing meals	60	22	16	7
d640	Doing housework	66	22	25	9
d650	Caring for household objects	62	6	17	4
d660	Assisting others	–	12	1	5
d710	Basic interpersonal interactions	–	2	1	3
d740	Formal relationships	–	1	–	4
d750	Informal social relationships	11	–	13	3
d760	Family relationships	8	7	16	9
d770	Intimate relationships	16	17	12	10
d820	School education	6	7	2	–
d830	Higher education	5	9	1	–
d845	Acquiring, keeping and terminating a job	–	4	5	8
d850	Remunerative employment	64	56	20	7
d855	Non-remunerative employment	23	50	12	2
d870	Economic self-sufficiency	–	2	1	1
d920	Recreation and leisure	65	54	24	10
d930	Religion and spirituality	–	1	1	1
<b>Environmental factors (N=49)</b>					
e110	Products or substances for personal consumption	53	22	20	6
e115	Products and technology for personal use in daily living	41	31	38	10
e120	Products and technology for personal indoor and outdoor mobility and transportation	36	17	7	5
e125	Products and technology for communication	52	3	–	2
e130	Products and technology for education	–	1	–	1
e135	Products and technology for employment	–	33	1	6
e140	Products and technology for culture, recreation and sport	–	2	–	1
e145	Products and technology for the practice of religion and spirituality	–	–	–	1
e150	Design, construction and building products and technology of buildings for public use	27	10	–	2
e155	Design, construction and building products and technology of buildings for private use	22	14	1	1

Table III. (Continued)

ICF category	Title	Empir. study	Expert survey	Syst. review	Qual. study
		N=210	N=162	N=204	N=10
		%	%	%	N
e165	Assets	41	38	3	2
e215	Population	-	1	-	1
e225	Climate	49	4	-	5
e240	Light	18	1	-	-
e245	Time-related changes	-	-	-	1
e250	Sound	12	-	-	-
e310	Immediate family	82	68	1	10
e315	Extended family	-	66	1	1
e320	Friends	78	14	1	7
e325	Acquaintances, peers, colleagues, neighbours and community members	64	31	1	8
e330	People in positions of authority	48	30	1	1
e335	People in subordinate positions	-	25	-	1
e340	Personal care providers and personal assistants	16	6	-	3
e345	Strangers	-	-	-	3
e350	Domesticated animals	-	-	-	1
e355	Health professionals	84	30	1	7
e360	Other professionals	27	5	-	-
e410	Individual attitudes of immediate family members	68	4	-	3
e420	Individual attitudes of friends	65	1	-	3
e425	Individual attitudes of acquaintances, peers, colleagues, neighbours and community members	-	3	-	8
e430	Individual attitudes of people in positions of authority	-	2	-	3
e440	Individual attitudes of personal care providers and personal assistants	16	2	-	-
e445	Individual attitudes of strangers	-	-	-	1
e450	Individual attitudes of health professionals	67	2	-	4
e455	Individual attitudes of health-related professionals	20	-	-	5
e460	Societal attitudes	29	21	-	1
e465	Social norms, practices and ideologies	19	1	-	-
e525	Housing services, systems and policies	21	1	-	-
e530	Utilities services, systems and policies		1	-	1
e535	Communication services, systems and policies	31	1	-	1
e540	Transportation services, systems and policies	36	15	-	1
e545	Civil protection services, systems and policies	-	-	-	1
e550	Legal services, systems and policies	24	3	1	-
e555	Associations and organizational services, systems and policies	-	10	-	-
e570	Social security services, systems and policies	47	43	1	6
e575	General social support services, systems and policies	27	22	-	1
e580	Health services, systems and policies	71	80	70	10
e585	Education and training services, systems and policies	28	4	-	1
e590	Labour and employment services, systems and policies	43	36	1	2

in all working groups <40% of the experts voted “yes” for the respective third-level category. In vote F (plenary session), a majority decision was applied on the third-level categories that remained ambiguous in vote E. The voting process on the Comprehensive ICF Core Set categories was completed by two further voting rounds (F-II and F-III – plenary session), in which the experts first determined by majority, whether or not the included third-level ICF categories required further specification on the fourth-level of the ICF and, second, if the corresponding fourth-level categories should be included

in the Comprehensive ICF Core Set. Figure 2 illustrates the voting process for the Comprehensive ICF Core Set for Hand Conditions.

The second major activity, the selection of categories from the Comprehensive ICF Core Set that should be included in the Brief ICF Core Set for Hand Conditions was performed by means of a three-step ranking exercise. In two ranking sessions the experts independently ranked their top 10 ICF categories for every ICF component (i.e. Body Functions, Body Structures etc.). Between the two ranking sessions the pros

and contras regarding the various categories were discussed in plenary. The final ranking of categories in the different components was determined based on the experts' previous ranking decisions. In the last session, every expert decided on the maximum number of categories to be included per component in the Brief ICF Core Set and by this, the cut-off for the ranking was determined in every single component. Throughout the conference, the data resulting from the voting and ranking processes were continuously recorded.

## Results

### Preparatory studies

In the empirical study, 88 second-level categories were identified. The qualitative study, the expert survey and the systematic review revealed 106, 125 and 98 second-level categories, respectively. The list of ICF categories finally presented at the conference to the participants consists of 138 different candidate ICF categories on the second level of the classification system along with 605 corresponding ICF categories on a higher level of precision (i.e. third- or fourth-level). Table III lists the 138 candidate second-level categories along with their prevalences according to the respective preparatory studies.

### Comprehensive ICF Core Set

In the first activity in the decision-making process, the selection of ICF categories for the Comprehensive ICF Core Set on the second-level, the participants included 97 categories from the 138 candidate categories on second level. Further, it was decided to include from the candidate categories the whole chapter d7 Interpersonal interactions and relationships, as well as the complete blocks referring to "Education" (d810–d839) and "Work and employment" (d840–d859). In addition, the participants decided that for seven ICF categories a further specification was required to comprehensively describe functioning in patients with hand conditions: b180 Experience of self and time functions, b270 Sensory functions related to temperature and other stimuli, b710 Mobility of joint functions, b730 Muscle power functions, s730 Structure of upper extremity, d440 Fine hand use and d445 Hand and arm use. Table IV shows the ICF categories finally included in the Comprehensive ICF Core Set for Hand Conditions.

The total number of ICF categories that were finally included in the Comprehensive ICF Core Set is 117, with one category on chapter-level (d7), two blocks referring to "Education" (d810–d839) and "Work and employment" (d840–d859), 90 categories on second-level and 24 categories on third-level. The 24 third-level categories are a further specification of seven above mentioned second-level ICF categories. Table V presents an example of a second-level ICF category and its corresponding third-level categories, which were included in the Comprehensive ICF Core Set.

The 117 categories of the Comprehensive ICF Core Set are made up of 27 categories from the component Body Functions (18 second-level and nine third-level), 10 from the component Body Structures (seven second-level and three third-level), 38 from the component Activities and Participation

Table IV. ICF categories included in the Comprehensive ICF Core Set for Hand Conditions ( $N=117$ ).

ICF category	Title
<b>Body functions (<math>N=27</math>)</b>	
b134	Sleep functions
b152	Emotional functions
b1801	Body image
b260	Proprioceptive function
b265	Touch function
b2700	Sensitivity to temperature
b2701	Sensitivity to vibration
b2702	Sensitivity to pressure
b2703	Sensitivity to a noxious stimulus
b280	Sensation of pain
b415	Blood vessel functions
b7100	Mobility of a single joint
b7101	Mobility of several joints
b715	Stability of joint functions
b720	Mobility of bone functions
b7300	Power of isolated muscles and muscle groups
b7301	Power of muscles of one limb
b735	Muscle tone functions
b740	Muscle endurance functions
b760	Control of voluntary movement functions
b765	Involuntary movement functions
b780	Sensations related to muscles and movement functions
b810	Protective functions of the skin
b820	Repair functions of the skin
b830	Other functions of the skin
b840	Sensation related to the skin
b860	Functions of nails
<b>Body structures (<math>N=10</math>)</b>	
s120	Spinal cord and related structures
s410	Structure of cardiovascular system
s710	Structure of head and neck region
s720	Structure of shoulder region
s7300	Structure of upper arm
s7301	Structure of forearm
s7302	Structure of hand
s770	Additional musculoskeletal structures related to movement
s810	Structure of areas of skin
s830	Structure of nails
<b>Activities and participation (<math>N=38</math>)</b>	
d170	Writing
d230	Carrying out daily routine
d360	Using communication devices and techniques
d410	Changing basic body position
d420	Transferring oneself
d430	Lifting and carrying objects
d4400	Picking up
d4401	Grasping
d4402	Manipulating
d4403	Releasing
d4408	Fine hand use, other specified
d4450	Pulling
d4451	Pushing
d4452	Reaching



Table IV. (Continued)

ICF category	Title
<b>Body functions (N=27)</b>	
d4453	Turning or twisting the hands or arms
d4454	Throwing
d4455	Catching
d4458	Hand and arm use, other specified
d455	Moving around
d465	Moving around using equipment
d470	Using transportation
d475	Driving
d510	Washing oneself
d520	Caring for body parts
d530	Toileting
d540	Dressing
d550	Eating
d560	Drinking
d570	Looking after one's health
d620	Acquisition of goods and services
d630	Preparing meals
d640	Doing housework
d650	Caring for household objects
d660	Assisting others
d7	Interpersonal interactions and relationships
d810–d839	Education
d840–d859	Work and employment
d920	Recreation and leisure
<b>Environmental factors (N=42)</b>	
e110	Products or substances for personal consumption
e115	Products and technology for personal use in daily living
e120	Products and technology for personal indoor and outdoor mobility and transportation
e125	Products and technology for communication
e130	Products and technology for education
e135	Products and technology for employment
e140	Products and technology for culture, recreation and sport
e150	Design, construction and building products and technology of buildings for public use
e155	Design, construction and building products and technology of buildings for private use
e165	Assets
e225	Climate
e310	Immediate family
e315	Extended family
e320	Friends
e325	Acquaintances, peers, colleagues, neighbours and community members
e330	People in positions of authority
e335	People in subordinate positions
e340	Personal care providers and personal assistants
e345	Strangers
e355	Health professionals
e360	Other professionals
e410	Individual attitudes of immediate family members
e420	Individual attitudes of friends

Table IV. (Continued)

ICF category	Title
<b>Body functions (N=27)</b>	
e425	Individual attitudes of acquaintances, peers, colleagues, neighbours and community members
e430	Individual attitudes of people in positions of authority
e440	Individual attitudes of personal care providers and personal assistants
e445	Individual attitudes of strangers
e450	Individual attitudes of health professionals
e455	Individual attitudes of other professionals
e460	Societal attitudes
e465	Social norms, practices and ideologies
e525	Housing services, systems and policies
e530	Utilities services, systems and policies
e535	Communication services, systems and policies
e540	Transportation services, systems and policies
e550	Legal services, systems and policies
e555	Associations and organizational services, systems and policies
e570	Social security services, systems and policies
e575	General social support services, systems and policies
e580	Health services, systems and policies
e585	Education and training services, systems and policies
e590	Labour and employment services, systems and policies

Table V. Example of a second-level ICF category (b270) with its corresponding third-level categories (printed in bold), which were included in the Comprehensive ICF Core Set.

ICF code	Title	ICF level
b270	Sensory functions related to temperature and other stimuli	(second-level)
b2700	Sensitivity to temperature	<b>(third-level)</b>
b2701	Sensitivity to vibration	<b>(third-level)</b>
b2702	Sensitivity to pressure	<b>(third-level)</b>
b2703	Sensitivity to a noxious stimulus	<b>(third-level)</b>

(one chapter-level, two blocks, 23 second-level and 12 third-level) and 42 second-level categories from the component Environmental Factors (see Table IV).

### Brief ICF Core Set

The Brief ICF Core Set includes a total of 23 chapter- and second-level categories that represent 25% of all chapter- and second-level categories that were selected for the Comprehensive ICF Core Set. Nine categories were chosen from the component Body Functions, three from Body Structures, eight from Activities and Participation, and three from Environmental Factors. Table VI shows the ICF categories that were selected for the Brief ICF Core Set for Hand Conditions.

### Discussion

The formal consensus process that integrated evidence from the four preparatory studies and expert appraisal at

Table VI. ICF categories included in the Brief ICF Core Set for Hand Conditions ( $N=23$ ).

ICF category	Title
<b>Body functions</b>	
b152	Emotional functions
b265	Touch function
b270	Sensory functions related to temperature and other stimuli
b280	Sensation of pain
b710	Mobility of joint functions
b715	Stability of joint functions
b730	Muscle power functions
b760	Control of voluntary movement functions
b810	Protective functions of the skin
<b>Body structures</b>	
s120	Spinal cord and related structures
s720	Structure of shoulder region
s730	Structure of upper extremity
<b>Activities and participation</b>	
d230	Carrying out daily routine
d430	Lifting and carrying objects
d440	Fine hand use
d445	Hand and arm use
d5	Self-care
d6	Domestic life
d7	Interpersonal interactions and relationships
d840–d859	Work and employment
<b>Environmental factors</b>	
e1	Products and technology
e3	Support and relationships
e5	Services, systems and policies

the consensus conference led to the definition and formal adoption of a first version of the ICF Core Sets for Hand Conditions: (1) a Brief ICF Core Set as a minimal standard to describe functioning and (2) a Comprehensive ICF Core Set covering all aspects of functioning potentially relevant to individuals with hand conditions. Concerning the future use of the Core Sets, it is envisioned that the Brief ICF Core Set for Hand Condition can serve as the basic instrument to be applied in any setting for any patient, independently of the hand condition or the status of disease. The Comprehensive ICF Core Set for Hand Condition, however, should serve as a reference pool of functioning aspects to go back to, in order to describe functioning and disability of a specific patient with a specific condition in a specific situation. In a clinical setting, it should be seen in addition to established tools such as validated patient questionnaires (e.g. the DASH questionnaire) [17], clinical assessments, and standardized performance tests. Since the Comprehensive Core Set provides a reference pool of important functioning aspects (i.e. ICF categories), it offers a useful framework to guide comprehensive, multidisciplinary treatment (1) regarding what to measure and to report among patients with hand conditions, and (2) to structure the information retrieved from questionnaires, clinical assessments, and tests frequently used in clinical practice according to the bio-psychosocial umbrella of the ICF. This would

help to facilitate the interpretation and aggregation of data for health information.

In this publication, the focus lies on the detailed presentation of the results of the consensus conference and the categories discussed in the following sections refer to the Comprehensive ICF Core Set for Hand Conditions.

### Comprehensive ICF core set

The 117 categories of the Comprehensive ICF Core Set reflect the numerous functional issues that are encountered in people with hand conditions. With respect to the four main components of the ICF, the following issues were raised.

#### Component Body Functions

From 35 candidate second-level ICF categories 22 were finally included and 13 were excluded. About one-third (12 out of 35 candidate categories) of the Body Functions categories were included in the first vote with a high agreement among the participants. These categories cover body functions frequently impaired in people hand conditions, such as “Touch function” [18,19], “Sensory functions related to temperature and other stimuli” [20,21], “Sensation of pain” [22,23], “Mobility of joint functions” [24,25], “Stability of joint functions” [26], “Muscle power functions” [27], “Repair functions of the skin” [28] and “Functions of nails” [29].

Ten candidate categories remained ambiguous during two voting sessions and five of them were finally excluded: The decision on b126 Temperament and personality functions was controversial and was discussed during two plenary sessions, because it was unclear whether it is related to personal factors or to the actual body function. Participants brought forward the argument that b126 covers the ability to be cooperative within the rehabilitation process, or that upper extremity injury might cause anxiety and thereby affects temperament and personality functions. After the definition was read out, the category was excluded, because in the final decision more than 50% of the participants felt it could be omitted.

The category b130 Energy and drive functions was excluded, though the importance of patients’ motivation [30,31] was discussed in the plenary with arguments such as patients often feel tired, have no power or refuse to participate in therapy.

With regard to the exclusion of b550 Thermoregulatory functions, it was not clear for the participants whether skin temperature differences between affected and unaffected limb, that can be seen for example in Complex regional pain syndrome [32] refer to this ICF category.

The inclusion of the category b750 Motor reflex functions remained ambiguous during two working group votes and was eventually excluded, although some participants mentioned it being impaired in conditions involving the hand, for example, in Parkinson’s disease [33].

The ICF category b435 Immunological system functions remained ambiguous during two plenary sessions. With regard to the exclusion of b435, it was unclear to the participants whether this category relates to the function or also relates to the system. After reading the inclusion criteria, it was further mentioned that b435 might be an important aspect in patients with rheumatoid arthritis [34,35]. At the end, this category was excluded.

### **Component Body Structures**

In total, from 12 candidate second-level categories among Body Structures, eight were finally included and four were excluded. In this selection process, five out of 12 categories were included in the first voting round with a high agreement. Categories were selected from chapter 7 that includes anatomical structures (bones, joints, muscles, ligaments and fascia) related to movements such as s720 Structure of shoulder region and s730 Structure of upper extremity, typically found to be impaired in persons with hand conditions. The category s730 Structure of upper extremity was in a further step of the decision-making process replaced by its corresponding third-level categories. Further, the categories s810 Structure of areas of skin and with s830 Structure of nails with its strong association to hand conditions were included [36–38]. The category s130 Structure of meninges was excluded in the first voting, resulting in six ambiguous categories among Body Structures that deserved further discussion.

After feedback in two plenary sessions, the participants further decided to include s120 Spinal cord and related structures, as it also covers peripheral nerves, as well as s410 Structure of cardiovascular system including arteries, veins, and capillaries. Structural impairments in all these anatomical parts of the upper extremity are quite common in hand conditions [39,40]. The category s710 Structure of head and neck region was included in the Core Set, whereas validation of the ICF Core Sets for Hand Conditions will show if this category is of relevance and has to remain in the future version of the Core Set.

The categories s110 Structure of brain, s420 Structure of immune system and s760 Structure of trunk were finally excluded even though there was much discussion on whether to focus on the body region of interest or to include cause or mechanism of the disease that might lead to the functional problems in the hand.

### **Component Activities and Participation**

A broad range of categories from the ICF component Activities and Participation (21 from 42 candidate categories) was selected by the participants in the first decision round, reflecting the diversity of problems associated with hand conditions. In total, the participants agreed in excluding only eight of 42 categories referring to Activities and Participation.

The major part of the component Activities and Participation consists of categories that allude to chapter d4 Mobility. The participants were 100% in agreement with the inclusion of all candidate categories among d4 referring to the block “Carrying, moving and handling objects”, for example, d430 Lifting and carrying objects, d440 Fine hand use and d445 Hand and arm use. Moreover the inclusion of all third level categories (except for the unspecified categories) of d440 Fine hand use and d445 Hand and arm use highlights the need for in-depth description of hand use problems by health professionals [18]. Candidate categories among d4 referring to the block Changing and maintaining body position, for example, d410 Changing basic body position, d415 Maintaining a body position and d420 Transferring oneself, however, remained ambiguous in two plenary sessions. The categories d410 and d420 were finally included and d415 Maintaining a body

position was excluded because for maintaining a body position, the hand was considered not to be necessarily important, although some participants mentioned it being impaired in conditions involving the hand such as tetraplegia. From the candidate categories among d4 referring to the block Walking and moving, for example, d450 Walking, d455 Moving around, d460 Moving around in different locations and d465 Moving around using equipment, only d465 Moving around using equipment was included with a high agreement. Arguments for this category were the implied use of specific devices designed to facilitate moving, such as a wheelchair or a walker being important for patients, for example, after a stroke or with Multiple Sclerosis [41,42]. After reading the description and inclusion criteria for d455 Moving around, the panel eventually included this category in the second plenary round with respect to the limitations patients with hand conditions might experience in crawling and climbing.

Furthermore, all candidate categories referring to the chapter d5 Self-care and d6 Domestic life were included, emphasizing the importance of activities of daily living (ADL) aspects for patients with hand conditions, which can be supported by an immense body of research on this topic [24,43–46].

It stands out that the participants decided to include d7 Interpersonal interactions and relationships on chapter level in the Core Set. This decision reflects that conditions of the hand might lead to interference in all sorts of relationships or probably influence all kinds of social interactions with people [46,47]. In this context, aspects such as physical contact or nonverbal communication within interactions might play an essential role in patients with hand conditions.

Regarding the chapter d8 Major life areas, the participants decided to comprise two complete blocks. By including the block “Education” (d810–d839), which covers categories such as preschool education, school education or higher education, and the block “Work and employment” (d840–d859), which covers categories such as “Acquiring, keeping and terminating a job” or “Remunerative employment” etc., the participants gave credit to these important aspects of the patient’s life experience. This inclusion was supported by the results of a large number of studies on returning to work after hand conditions [48–51].

### **Component Environmental Factors**

Environmental Factors cover the physical, social and attitudinal environment in which people live and conduct their lives and can have a supportive or hindering influence on a person’s health and health-related states [3]. During the voting process the experts included 42 from 49 candidate categories referring to the Environmental Factors component, thus, only seven categories were excluded.

Consistent with studies reporting the importance of products and technology for patients with hand conditions such as e115 Products and technology for personal use in daily living [52,53], all candidate categories of chapter 1 Products and Technology, except products and technology for the practice of religion and spirituality, were included in the Comprehensive ICF Core Set.

The inclusion of most of the categories from the chapter 3 Support and relationships and chapter 4 Attitudes stress the important

interdependency of social functioning with the environment and underline this major aspect of the patients' perspective and well-being. Previous studies on hand conditions demonstrated that attitudes and support of health professionals, family members and friends or colleagues are crucial for patients for getting along with the consequences of the disease [30,54–56].

Systems, services and policies available for people with hand conditions within their country were regarded as relevant by the participants. Thus, most of the ICF categories of the component Environmental Factors included in the Comprehensive ICF Core Set pertain to this chapter 5.

### Limitations

The aim of the ICF Consensus conference on the ICF Core Sets for Hand Conditions was to derive the Brief and the Comprehensive ICF Core Set for Hand Conditions from a subset of candidate ICF categories selected on basis of the preparatory phase research. As in any decision-making and consensus process involving experts, the process has limitations and the results of the voting may have been influenced by several aspects. This is a summary of some of them:

The knowledge of and familiarity with the ICF codes, definitions and terminology. The experts often stated that the definitions of particular ICF categories were not obvious, too generally formulated or even overlapping. For example, "Cold-intolerance" was seen as being part of "Sensitivity to temperature" by some participants and as part of "Thermoregulatory functions" by others.

The Core Set for Hand Conditions includes "conditions of the hand" and also "health conditions involving the hand function". Thus, categories were included that may only be valid for a certain type of hand condition. Further, it was a challenge to focus on the body part "hand" and not to include ICF categories that were referring to the aetiology of the hand condition.

The process has been varied by including six ICF categories not, as usual, on the second-level, but on another hierarchical level of the classification system (e.g., two categories were included on block level: "d810–d839 Education" and "d840–d859 Work and employment"). However, these decisions arose in the particular situation and were tailored to the need of providing short and practical tools. Further, a consensus process is a dynamic process, thus, a certain degree of flexibility is essential to continuously improve and refine the processes.

The lack of sufficient specific information in the ICF categories at the third- and fourth-level of the classification. Because the ICF categories at the third- and fourth-level – especially in the components Body Functions and Structures – are not specific enough to reflect the problems of persons with hand conditions, the level of specification selected by the experts was the second-level, to keep the ICF Core Set as brief as possible. However, this level of specification may not be useful in clinical practice to precisely describe patients functioning after experiencing a certain condition or injury of the hand.

Last but not least, the ICF Core Sets represent a reference pool of functioning aspects relevant to describe functioning and disability of patients with hand conditions. Criteria for inclusion were to include as many categories as necessary to comprehensively describe functioning in patients with hand conditions, but

as few as possible to be practical. It was therefore, a challenge to decide on the ICF categories to be included in the Core Sets.

This study establishes a formal consensus process by integrating evidence and expert opinion based on the ICF framework and classification that led to the definition of the ICF Core Sets for Hand Conditions. For future use of the Core Sets, the Brief ICF Core Set for Hand Condition is regarded to be the basic instrument to be applied in any setting for any patient, independently of the hand condition or the status of disease. The Comprehensive ICF Core Set for Hand Condition, however, provides a reference pool of potentially relevant functioning aspects to go back to, in order to describe functioning and disability of a specific patient with a specific condition in a specific situation.

All the challenges during the decision-making and consensus process emphasize the need for testing the first version of ICF Core Sets, as well as the need to link this first proposal to assessment instruments and clinical assessment guidelines that are already in use. Both, the Comprehensive and the Brief ICF Core Set are preliminary and have to be validated in the coming years with the ultimate goal of finally defining a universal, valid, and accepted tool for clinical practice, clinical studies, and health reporting.

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