The International Classification of Functioning, Disability and Health (ICF) in health outcome evaluation - review and outlook of the use of the ICF in clinical practice

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Abstract

Outcome research seeks to understand the end results of health services. There are a number of challenges with regard to a more unified approach within outcome research. The International Classification of Functioning, Disability and Health (ICF) as a common reference framework for functioning may contribute to improve outcome research.

With the ICF is now possible to explicitly specify which domains to address when measuring functioning. ICF categories are needed when specifying "what to measure" while "items" and "clinical tests" are needed when specifying "how to measure".

The ICF and the WHO model of functioning, disability and health are also useful bases to structure the process of multi-professional patient care. The results of the clinical examination, the long-term, program and cycle goals and intervention targets in the ICF Sheet help to address the complexity of the different possible interactions among the factors that influence and comprise the level of functioning and disability of the individual patients. This enables the care and treatment of the patients to be tailored according to their specific needs in a very intuitively way.
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ICF in health outcome evaluation

Outcomes research seeks to understand the end results of health services. The patient and consumer perspective plays thereby an essential role [1, 2]. Researchers use a wide variety of outcome measures including technical, clinical and patient-oriented measures.

Technical measures comprise e.g. laboratory, imaging and electro-physiologic examinations. Clinical measures include e.g. tests of physical and cognitive impairment and tests to assess activities like walking. Patient-oriented measures include e.g. patient and proxy self-reports on health status, quality of life, and health preferences.

Many different international initiatives have recently been introduced to create recommendations on which outcomes to address and which outcome measures to use in studies with patients with determined health conditions, such as, in alphabetical order, ankylosing spondylitis [3], chronic pain [4], depression [5] low back pain [6, 7, 8], obesity [9], osteoarthritis [10], osteoporosis [11], rheumatoid arthritis [12, 13, 14], and stroke [15]. These recommendations have strongly contributed to standardization in outcomes research.

However, there are still a number of challenges with regard to a more unified approach within outcome research.

First, the concepts health status, functional status, well-being, quality of life and health-related quality of life are often applied interchangeably in discourse and in outcome research [2], which makes it difficult to understand, interpret, and compare study results. With the International Classification of Functioning, Disability and Health (ICF) [16] and the increasing literature supporting the validity and the usefulness of the biopsychosocial, etiologically-neutral, and universal model of functioning and disability, a common conceptual understanding of patient-oriented outcome measures is now emerging. Based on the ICF, the concept of functioning will be seen as distinct from quality of life and health preferences in the
future. While functioning refers to limitations and restrictions related to a health problem, quality of life refers to how someone feels about these limitations and restrictions. Health preferences refer to the personal value given to these limitations and restrictions.

Second, a vast number of often competing, condition-specific and generic instruments have been developed over the last decades [17], and new versions of old instruments are continuously appearing. Thus, it has become very difficult for investigators and clinical researchers to select the most appropriate outcome measures for their studies and for readers to interpret and compare the results of different studies.

Third, many recommendations do not consistently distinguish outcomes from outcome measures. This distinction has only been applied by a few initiatives, e.g. OMERACT [Outcome Measures in Rheumatoid Arthritis Clinical Trials] initiative, which emphasized two steps in outcome research, namely, to first define “what to measure” and only then “how to measure”. In line with this approach, ICF Core Sets have been developed [18]. ICF Core Sets aim to define the ICF domains or categories out of the whole classification, which can serve as minimal standards for the reporting of functioning and health, i.e., they define “what to measure” for functioning. This seems to be the appropriate approach because, while recommendations regarding “what to measure” will persist, any recommendation regarding a specific instrument is likely to soon be outdated.

Fourth, there is often no or only a vague association between interventions and outcome measures, which limits the efficiency of the investigations. Outcome measures at least have to specifically address the aims with which interventions are applied. The application of the ICF as a connecting framework between interventions and outcome measures can be extremely useful when comparing different investigations with respect to the interventions administered and the results obtained. In a recent review of studies containing explanatory models of functioning in patients with rheumatoid arthritis, Cieza & Stucki (2005; 19) showed that even if the outcomes addressed and the outcome measures used in the different investigations were
very diverse, the ICF and its model of functioning, disability and health for the depiction of the independent and dependent variables helped to address the diversity of the studies and the complexity of the different possible interactions among variables.

**The ICF as fundamental basis for the definition of “what should be measured”**

Lacking a globally agreed conceptual model for human functioning and lacking an exhaustive classification of human functioning, there has been no explicit specification of which domains to address when measuring functioning. With the ICF, which encompasses 1454 so-called ICF categories, this is now possible. The ICF categories are an exhaustive list of globally acceptable descriptions of "what" can be relevant to people with a health condition experiencing decrements in functioning.

ICF categories should not be confused with "items" used e.g. in patient-reported outcome measures or health related quality of life measures. There is a wide range of items which are potentially suitable for the measurement of a specific ICF category or a set of ICF categories. While there is a finite number of ICF categories relevant to people with a specific health condition, there is at least in principle an infinite number of items potentially useful to measure these categories.

Similarly, the ICF categories should not be confused with clinical tests. ICF categories are needed when specifying "what to measure" while "clinical tests" including imaging, laboratory tests or capacity tests are needed when specifying "how to measure".

ICF categories are, therefore, needed when specifying "what to measure" while "items" and "tests" are needed when specifying "how to measure".

**ICF Linkage: mapping the world of measures to ICF categories**

The ICF and more specifically the ICF Core Sets can serve as reference or interface when appraising and comparing candidate instruments to address the level of functioning of patients with a
determine health condition. The mapping of existing instruments to the ICF using established linking rules [20] provides a new way to study their content validity. After having linked candidate condition specific and generic measures to the ICF, it is possible to examine whether and to what extent an instrument covers the ICF Core Set categories or to examine their overlap [21, 22, 23, 24, 25]. Along this line, the ICF Core Sets can be used as reference for the development of new instruments to assess functioning for research.

This approach will open new opportunities, also in the design, analyses and reporting of studies. The ICF Core Sets serve as reference for researchers to make sure that all relevant aspects of functioning are considered in the planning of studies. Depending on the setting of the study (experimental or observational) the study outcomes/endpoints will be selected based on the disease specific ICF Core Sets.

In addition to intervention targets, the inclusion of exploratory targets from the ICF Core Sets would help us to enrich our understanding of the mechanisms that lead to an improvement based on an intervention. The target and exploratory categories should be measured by psychometrically sound and responsive health-status measures or clinical tests. In addition to these selected categories, all other categories of the ICF Core Set should be described at the start of the study to allow comparison of populations with respect to their functioning profile. This can easily be done by the qualifier scale.

Several parties in healthcare could benefit of this standardisation among which not only researchers and healthcare practitioners, but also the editors of medical papers, readers as well as reviewers of manuscripts.

**The use of the ICF in clinical practice**

In clinical practice, the ICF and/or the ICF Core Sets can be applied to list the impairments, limitations in activities, restrictions in participation and the influential environmental factors of a determined patient using the qualifier scale. This actually provides a functioning profile for each patient. The first profile of a determined patient prior to treatment can serve as reference for follow-up.

However, a process that goes beyond the establishment of functioning profiles is needed in clinical
practice. Moreover, the treatment of patients with chronic conditions also requires a coordinated longitudinal care involving physical medicine, nursing, physical therapy, occupational therapy, social work, podiatry, vocational counselling and clinical psychology [26]. Therefore, a problem-solving approach that can structure the management of patients with chronic health conditions among the different health professionals involved is needed.

The ICF is a universal language of functioning and disability. It can be applied regardless of the culture, the health condition, and, most importantly, the health profession. Thus, a problem solving approach based on the integrative, bio-psycho-social model of functioning, disability and health and that can be used incorporating the ICF would be an important development for the care of patients with chronic conditions. Such approach is presented below using the example of a patient with RA.

The Rehab-Cycle

The Rehab-Cycle can be defined as a structured approach to rehabilitation management with four key elements: assessment of the problems, assignment of intervention targets to health professionals and to intervention principles, the intervention using specific intervention techniques and, finally, the evaluation of goal achievement (Figure 2) [27].

Assessment

Three different steps must first be differentiated within the assessment:

1. identification of the problems and needs of the patient,
2. determination of the long-term, intervention program and cycle goals and
3. identification of intervention targets related to the cycle goals.

Identification of the problems and needs of the patient

In this step, the physician together with other involved health professionals of the team and even specialists will assess the patient’s problems.

The integrative bio-psycho-social model of functioning, disability and health can be used to guide this process. In this case, the so-called ICF Sheet can be used (Figure 2) [28].

The integrative bio-psycho-social model with its different components (body functions and structures, activity, participation and contextual factors) is clearly visible in the ICF Sheet. In addition, the ICF Sheet, which is divided in two parts. The upper part corresponds to the patient’s perspective and the
lower part, to the health-professional or rehabilitation-team perspective.

The patient-perspective part provides a practical way to document the patients’ problems from their subjective perspectives. Since this part is entirely dedicated to the patients’ perspective, the patients’ own words and expressions are documented. From the patient history and information provided by proxies, personal factors and contextual factors relevant to her/his current problems can also be recorded with a + or a – sign, indicating whether they represent a barrier or a facilitator for a determined patient.

The health-professional part documents the findings from the medical history, the clinical examination and technical investigations, such as laboratory, imaging and electro-physiologic examinations. Documentation of the ICD-10 [29]-Diagnosis is also important when using the ICF Sheet.

The information collected from the medical history, the clinical examination and technical investigations can be documented non-systematically or systematically with the appropriate ICF Core Set. A systematic approach alone or in combination with a non-systematic approach is best to assure that all potentially relevant problems identified in the ICF Core Set development have been considered, for example, by inexperienced or new team members.

In the systematic approach and using the example of Mrs. Baker, one would systematically go through all the ICF categories of the comprehensive ICF Core Set for RA after having collected the information from her medical history, the clinical examination and technical investigations. The ICF categories that are impaired, limited or restricted and the environmental factors relevant to her would then be marked. The ICF categories that are relevant to the patient’s current situation are then transferred to the health-professional part of the ICF Sheet.

**Determination of the long-term, intervention program and cycle goals**

After identifying patient problems, the next step in the assessment is the definition of the long-term, intervention-program and cycle goals. This step should be performed by the whole team and usually under the leadership of a physician. The physician’s responsibility is not only to coordinate the team in defining the named goals, but also to ensure the patients’ medical and physical safety, including the amount of stress the patient can comfortably endure.

While long-term goals and program goals are typically defined on the level of participation, cycle goals are typically selected from the activity or, in the case of the acute hospital setting, from the body function component. As a cycle goal, one should identify that area which best represents or indicates the next goal to be achieved within the following days or weeks. Since one typically has many goals, it is
advisable to select only one or very few cycle goals which reflect the intervention. Since patient resources are limited, it is not advisable to pursue more than two or three goals at the same time.

The cycle goals are typically marked in the patient-perspective part of the ICF Sheet. This reflects that the patient’s perspective and goals are taken into account during the whole process.

In the example of Mrs. Baker, the long-term goal is her independence in self-care and housework. Since she is a very young patient who had to give up her job and does not want to remain unemployed the rest of her life, the long-term goal is vocational retraining to initiate a new job perspective. The cycle goals set by the team at the beginning of therapy are reduction of the pain in her hands and fingers and difficulties in self-care.

**Identification of potential intervention targets related to the cycle goal**

Once the cycle goals has been established, the team will identify which intervention targets are related to the cycle goal and, once improved, should also lead also to an improvement in the cycle goal.

When selecting the intervention targets, the team will select those which are most relevant to the cycle goal and which also must be modifiable.

This step resembles the modelling of a dependent variable in a multivariate analysis. The dependent variable is the cycle goal and the independent variables are the selected intervention targets. The process also implies the hypothesis regarding the concrete aspects of functioning and disability of the single patient that are related to the dependent variable or cycle goal. This process enables an in-depth understanding of the determinants of functioning and its interactions with personal and environmental factors. The process of identifying intervention targets in relation to cycle goal can also be called modelling and be seen as the art of rehabilitation medicine.

In the case of Mrs. Baker, the most relevant intervention targets selected by the team in relation to the cycle goals ‘pain in hand and fingers’ and ‘difficulties in getting dressed and problems in brushing teeth and combing hair’ are marked with a circle in Figure 2. All relevant intervention targets are in the lower part of the ICF Sheet, which shows that they represent the target areas of the interventions by the different team members.

Most of the intervention targets for the cycle goal ‘pain in hands and fingers’ come from the component body functions and structures. Medication belonging to the component environmental factors is also a relevant intervention target related to pain. The intervention targets for the second cycle goal
referring to self-care come from the components body functions and structures, environmental factors and activity.

There is a connecting line between both cycle goals indicating a strong relationship between them. The improvement in pain will have a positive effect on self-care activities.

**Assignment**

Once the cycle goals and intervention targets have been identified, the team will match intervention categories to health professionals and/or intervention principles.

More than one or even all team members may be assigned to many intervention targets.

The assignment also includes the intervention principle, such as manual therapy, thermotherapy or hydrotherapy, which should be the basis for the intervention by the assigned team members. Assignment of team members to intervention principles makes each aware of each others’ intervention principles, ensuring efficiency by avoiding redundant interventions, which may burden the patient. This process also ensures that all relevant intervention principles are applied to achieve a certain goal.

**Intervention**

Once it has been established which health professional/team member will apply which intervention principle to the intervention targets, each team member will:

- define her/his intervention technique,
- identify a measure to follow the progress made with respect to the intervention target and
- define a goal (measured value) to be achieved after a certain period of time after having ascertained the current state.

Isometric muscle strengthening is one example of an intervention technique within the intervention principle manual therapy.

To follow the progress made with respect to the intervention target, the ICF qualifier scale can also be used for a specific intervention target or a group of intervention targets. Especially if a systematic approach using the ICF and/or the ICF Core Sets has been applied to structure and document the assessment, the use of the qualifier scale is recommended. However, the team may prefer more precise measures that take into account the patients age, general health status and comorbidities or the service-provider situation, like acute hospital or early post-acute facility versus post-acute facility.
Evaluation

After predefined time intervals, the team evaluates the progress in the cycle goals and intervention targets.

For the evaluation, the measures selected in the intervention phase to follow the progress made with respect to the intervention targets are used, always taking into consideration the level of achievement originally proposed. This evaluation is the basis for deciding whether to add intervention targets or to change the intervention principle.

At some point of time, either once the cycle goal(s) have been achieved or after a predefined interval, the team will perform a reassessment including the cycle goals and all intervention targets, as well as a more comprehensive assessment of other areas.

The areas contained in the appropriate Brief ICF Core Set should be addressed in this assessment. The team may then propose either a new cycle with a new cycle goal and relevant intervention targets or may propose another program goal.

Conclusion

The endorsement of the ICF by the World Health Assembly in May 2001 marks an important milestone in health-services provision and research. The ICF and the model of functioning, disability and health upon which it is based are now being implemented by clinicians and health professionals, researchers, health authorities, health-care providers and insurers.

In the field of health outcome evaluation, it is time to rethink and to redefine “what should be measured” when addressing functioning and disability of patients with health conditions. The ICF can help researchers when planning studies focusing on the study of functioning and disability, when selecting instruments and comparing data across studies.

The WHO model of functioning, disability and health also provides a useful framework to structure the process of multi-professional patient care. The results of the clinical examination, the long-term, program and cycle goals and intervention targets in the ICF Sheet help to address the complexity of the different possible interactions among the factors that influence and comprise the level of functioning and disability of the individual patients. This enables the care and treatment of the patients to be tailored according to their specific needs in a very intuitively way.
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