Harmonizing WHO’s International Classification of Diseases (ICD) and International Classification of Functioning, Disability and Health (ICF): importance and methods to link disease and functioning

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Abstract

Background: To understand the full burden of a health condition, we need the information on the disease and the information on how that disease impacts the functioning of an individual. The ongoing revision of the International Classification of Diseases (ICD) provides an opportunity to integrate functioning information through the International Classification of Functioning, Disability and Health (ICF).

Discussion: Part of the ICD revision process includes adding information from the ICF by way of “functioning properties” to capture the impact of the disease on functioning. The ICD content model was developed to provide the structure of information required for each ICD-11 disease entity and one component of this content model is functioning properties. The activities and participation domains from ICF are to be included as the value set for functioning properties in the ICD revision process.

Summary: The joint use of ICD and ICF could create an integrated health information system that would benefit the implementation of a standard language-based electronic health record to better capture and understand disease and functioning in healthcare.

Keywords: International classification of diseases, ICF, Classification, Functioning, ICD revision, Disability

Background

Describing and understanding the relationship between disease and functioning requires the use of two of the World Health Organization’s classifications systems: the International Classification of Diseases (ICD) [1] and the International Classification of Functioning, Disability and Health (ICF) [2]. The ICD classifies disease entities and other health conditions to gather diagnostic information, while the ICF classifies domains of functioning and disability in terms of body functions and structures or activities and participation at the body, person and societal levels. The ICD and the ICF classification systems are intended by WHO to complement each other so as to capture and provide the full picture of health or health-related state of an individual. Currently, however, there is no standard platform in which the disease and its impact on functioning are concurrently used within an integrated health information system. Efforts to capture the impact of a disease in a structured and systematic way have so far been hampered by the failure to link the ICD and the ICF at a conceptual and operational level.

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ICD revision

The ICD is undergoing its 11th revision (ICD-11) [3] wherein part of the process is to add information from the ICF to the classification of diseases by adding “functioning properties” (i.e. ICF domains or codes) to capture the impact of the disease on functioning. In this integrated system, we want to be able to use universal domains (functioning properties) that depict the functioning of an individual by way of the ICF and also use information related to disease entities (ICD codes).

The process of revising the ICD is coordinated through Topic Advisory Groups (TAGs), each of which is responsible for different content areas. Responsible for the appropriate integration of the functioning properties is the Functioning Topic Advisory Group (fTAG), which consults with each of the TAGs regarding how to deal with functioning properties for their assigned ICD entities.

Functioning properties of the ICD-11 content model

The ICD-11 Content Model (Table 1) provides the structure of information detail required for each ICD-11 code included through the revision process [3,4]. In the ICF, “functioning” is an encompassing term for body functions, body structures, and activities and participation. In the ICD Content Model at this time, functioning properties only include the activities and participation component of the ICF. Activity is defined in the ICF as the “execution of a task or action by an individual”, while participation is defined as “involvement in a life situation” [2]. Activities and participation are important in describing the impact of a disease because they capture the broad and relevant aspects of activity and involvement with society and life in general. Table 2 lists the ICF categories that are included in the value set for functioning properties. Hence, an ICD code would have a corresponding value set of functioning properties.

The task of populating the functioning properties in iCAT

Before ICD-11 is completed, functioning properties will need to be populated for each ICD code. This task of population is being done and coordinated using the web-based International Collaborative Authoring Tool (iCAT) by content experts worldwide in three steps: [1] selection of functioning properties provided in iCAT (Table 2), [2] if an additional ICF domain or category needs to be added based on a published disease-specific ICF Core Set, then it is entered manually into the iCAT, and [3] use evidence from the literature (i.e. mini-review) by identifying the commonly used measures relevant to the disease of interest, and in those measures identify meaningful concepts of functioning with a focus on activities and participation in life situations, and then subsequently link the identified concepts to a specific domain in the ICF [5].

Discussion

Obtaining information about disease entities and their impact on functioning is not entirely new in the field of medicine and health. While the consideration of the disease and its impact on functioning has been in place, or at least acknowledged, for a long time, [6] there remain prevailing issues, such as the lack of wide dissemination and implementation extending beyond simple awareness [7,8]. The operationalization of integrated disease-and-functioning models currently varies, is fragmented across healthcare settings, and is perhaps

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**Table 1 The Content Model of the ICD 11 [4]**

| Any category in ICD is represented by: TITLE of ENTITY: Name of disease, disorder, or syndrome |
|---|
| 1. ICD Concept Title |
| 1.1 Fully Specified Name |
| 1.2 Type |
| 1.3 Use and Linearization(s) |
| 2. Classification Properties |
| 2.1 Parents |
| 2.2 Type |
| 2.3 Use and Linearization(s) |
| 3. Textual Definition(s) |
| 3.1 Impact on Activities and Participation |
| 3.2 Contextual Factors |
| 3.3 Body Functions |
| 4. Terms |
| 4.1 Base Index Terms |
| 4.2 Inclusion Terms |
| 4.3 Exclusions |
| 5. Body Structure Description |
| 5.1 Body System(s) |
| 5.2 Body Part(s) [Anatomical Site(s)] |
| 5.3 Histopathology |
| 6. Manifestation Properties |
| 6.1 Signs and Symptoms |
| 6.2 Investigation Findings |
| 7. Causal Properties |
| 7.1 Etiology Type |
| 7.2 Causal Properties- Agents |
| 7.3 Causal Properties- Causal Mechanisms |
| 7.4 Genomic Linkages |
| 7.5 Risk Factors |
| 8. Temporal Properties |
| 8.1 Age of Occurrence & Occurrence Frequency |
| 8.2 Development Course / Stage |
| 9. Severity of Subtypes Properties |
| 10. Functioning Properties |
| 10.1 Impact on Activities and Participation |
| 10.2 Contextual Factors |
| 10.3 Body Functions |
| 11. Specific Condition Properties |
| 11.1 Biological Sex |
| 11.2 Life-Cycle Properties |
| 12. Treatment Properties |
| 13. Diagnostic Criteria |
| 14. External Causes |

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| Domains               | ICF codes          |
|----------------------|--------------------|
| Understanding        | Watching d110      |
|                      | Listening d115     |
|                      | Learning d130-d155 |
|                      | Focusing attention d160 |
|                      | Reading d166       |
|                      | Writing d170       |
|                      | Calculating d172   |
|                      | Solving problems d175 |
|                      | Other specified    |
| Communication        | Communicating with others d310 |
|                      | Speaking d330      |
|                      | Starting a conversation d3500 |
|                      | Sustaining a conversation d3501 |
|                      | Other …            |
| Mobility             | Standing d4104     |
|                      | Bending d4105      |
|                      | Maintaining a body position d415 |
|                      | Transferring oneself d420 |
|                      | Lifting and carrying objects d430 |
|                      | Fine hand use d440 |
|                      | Hand and arm use d445 |
|                      | Walking short distances d4500 |
|                      | Walking long distances d4501 |
|                      | Vigorous activities d455 |
|                      | d4303              |
|                      | Moving around within home d4600 |
|                      | Moving around outside the home and other buildings d4602 |
|                      | Using transportation d470 |
|                      | Driving d475       |
|                      | Other …            |
| Self-Care            | Washing oneself d510 |
|                      | Caring for body parts d520 |
|                      | Urination d5300    |
|                      | Defecation d5301   |
|                      | Dressing d540      |
|                      | Eating d550        |
|                      | Drinking d560      |
|                      | Managing one’s health (needs, assistance or oversight) d570 |
|                      | Other …            |
| Interpersonal Relations | Making friends d7200 |
|                      | Engaging with other people d740 |
|                      | Maintaining family relationships d760 |
|                      | Dealing with strangers d730 |
|                      | Engaging in sexual relationships d7702 |
|                      | Other …            |
| Life Activities      | Household Shopping d620 |
|                      | Cooking/preparing meals d630 |
|                      | Doing housework d640 |
|                      | Looking after/helping others d660 |
|                      | Other …            |
|                      | School Attending school d820 |
|                      | Learning a job (vocational training, apprenticeship) d825 |
|                      | Going to university d830 |
|                      | Other …            |
|                      | Work and economic life Engaging in paid work d850 |
|                      | Seeking employment d8450 |
|                      | Performing job related tasks d8451 |
|                      | Handling money d860 |
|                      | Other …            |
|                      | Life management Undertaking a single task d210 |
|                      | Undertaking multiple tasks d220 |
|                      | Carrying out daily routine d230 |
|                      | Handling stress and psychological demands d240 |
|                      | Other …            |
|                      | Social Participation Taking part in social life d910 |
|                      | Sports d9201       |
|                      | Travel d920        |
|                      | Visiting friends d9205 |
|                      | Human rights (e.g. self-determination, equal opportunities) d940 |
|                      | Political life and citizenship (e.g. voting) d950 |
|                      | Other …            |
|                      | Children and Youth Learning to read d140 |
|                      | Learning to write d145 |
|                      | Learning to calculate d150 |
|                      | Communicating with others d310 |
|                      | d315               |
|                      | d320               |
|                      | d325               |
more commonly observed in healthcare systems with medium to advanced infrastructures and access to resources. We can do a better job at facilitating an integrated disease-and-functioning model across systems from low to high resource countries. Moreover, the ongoing ICD revision would make the assessment and documentation of a comprehensive set of information about a disease entity as broad and as inclusive as possible; at the same time utilizing the standard and common language of the ICF on functioning. This information will consist of biomedical and biopsychosocial aspects of the disease that will provide clinicians and users alike an integrated and unified ICD-ICF platform and which will be helpful in interdisciplinary communication towards a concerted planning of care ultimately benefiting the patients.

The ICD-11 is due to be launched in 2015, and steps toward that goal are being pursued. Certainly there are challenges on our way, but there are also opportunities that are presented for users in the clinical and research communities to actively contribute in this huge endeavor by WHO and its collaborators worldwide. The unified ICD-ICF in the ICD-11 will allow for consistent terminologies to be used and to be harmonized across ICD and ICF and will provide holistic information about a disease entity and its impact on the functioning of an individual. Efforts are also currently being taken to facilitate the identification of the overlaps for ICD-11 disease entities and their titles with their conceptual equivalent in the ICF towards harmonization of ICD and ICF.

**Conclusion**

The joint use of the ICD and ICF towards an integrated health information model would, in our opinion, benefit medicine and health systems and would support the push for the implementation of a standard language-based electronic health record system towards better health services planning and reimbursement.

**Abbreviations**

FTAG: Functioning Topic Advisory Group; ICAT: International Collaborative Authoring Tool; ICD: International Classification of Diseases; ICF: International Classification of Functioning, Disability and Health; TAG: Topic Advisory Group; WHO: World Health Organization.

**Competing interests**

The authors declare that they have no competing interests.

**Authors’ contributions**

All authors provided concept/idea, consultation, and writing, and reviewed the manuscript before submission. All authors read and approved the final manuscript.

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**References**

1. World Health Organization: International Classification of Diseases (ICD-10). Available from: [http://www.who.int/classifications/icd/en/](http://www.who.int/classifications/icd/en/).
2. World Health Organization: International Classification of Functioning, Disability and Health, Geneva, Switzerland: World Health Organization; 2001.
3. World Health Organization: The International Classification of Diseases 11th Revision. 2012. Available from: [http://www.who.int/classifications/icd/revision/en/index.html](http://www.who.int/classifications/icd/revision/en/index.html).
4. Tu S, Bodenreider O, Cell C, Chute C, Heard S, Jakob R, et al: A content model for the ICD-11 revision: a technical report. Stanford, CA: Stanford Center for Biomedical Informatics Research; 2011. [http://bmir.stanford.edu/file_asset/index.php/1752/BMIR-2010-1405.pdf](http://bmir.stanford.edu/file_asset/index.php/1752/BMIR-2010-1405.pdf).
5. Cleza A, Geyh S, Chatteji S, Kostanjsek N, Ustun B, Stucki G: ICF linking rules: an update based on lessons learned. J Rehabil Med 2005, 37(4):212–218.
6. Engel GL: The need for a new medical model: a challenge for biomedicine. Science 1977, 196(4286):129–136.
7. Alvarez AS, Pagani M, Meucci P: The clinical application of the biopsychosocial model in mental health: a research critique. Am J Phys Med Rehabil 2012, 91(13 Suppl 1):S173–S180.

8. Alvarez AS: The application of the International Classification of Functioning, Disability, and Health in psychiatry: possible reasons for the lack of implementation. Am J Phys Med Rehabil 2012, 91(13 Suppl 1):S69–S73.

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