ICD-10 Chapter XXI is used to record health related circumstances that are not a disease. These categories, coded with Z codes, contain a mix of concepts, including reasons for encounter, risk factors and interventions. The current scenario of the revision of ICD presents an opportunity to review the chapter and propose new ways of organising the content. The Topic Advisory Group on functioning (fTAG) has the mandate of suggesting a new structure of the Z codes chapter starting from the alignment of the revised ICD and ICF but also taking into account all the possibilities given by the joint uses of the WHO-FIC.

Methods & Materials

After a preliminary meeting of fTAG co-chairs with WHO a Z codes working group was formed. Background materials and briefing notes were made available and a work plan drafted. Current debate on Z codes and suggestions for change were collected through a search of scientific literature and through the commenting of the WHO ICD-11 beta browser. The ICD-10 chapter XXI (current ICD-11 Chapter 23, Fig.1), exported in spreadsheet format from the revision collaborative platform (Collaborative authoring tool, iCAT, Fig. 2), was taken as starting point for redrafting the chapter. The different blocks of chapter XXI were reviewed in teleconferences, highlighting the relevance of the single classification entities in terms of their relevance as post-coordination categories of ICD-11, as contextual factors of the International Classification of Functioning Disability and Health (ICF), or as categories of the International Classification of Health Interventions (ICHI, now under development).

Results

Of the 801 ICD-10 chapter XXI categories considered in the analysis 158 ICD-10 categories relate to ICF contextual factors. In this regard the development and integration of a personal factors classification is encouraged. A large group of categories (367) could be represented in an interventions classification. Classifications of devices and assistive technology are important extensions to these categories. The possibility offered by ICD-11 to post-coordinate dimensions such as "history of" would make redundant another 105 categories (see examples below in Tab. 1 and 2). For 171 categories alternative possibilities for ordering the concepts remain to be debated. Overall results are shown in Fig. 3.

ICD-10 code and title WHO-FIC classification

<table>
<thead>
<tr>
<th>ICD-10 code and title</th>
<th>WHO-FIC classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z20.5</td>
<td>Contact with and exposure to viral hepatitis</td>
</tr>
<tr>
<td>Z20.6</td>
<td>Contact with and exposure to human immunodeficiency virus [HIV]</td>
</tr>
<tr>
<td>Z20.7</td>
<td>Contact with and exposure to pediculosis, acarasis and other infestations</td>
</tr>
</tbody>
</table>

Tab. 2 – Examples of Z codes as ICD-11 post-coordination dimensions

former ICD-10 chapter XXI categories and WHO-FIC

Conclusions

Revising the structure of ICD-10 chapter XXI in the context of development of ICD-11 offers the possibility of testing the actual integration of the Family of International Classifications in terms to effectively represent, beyond the disease, all dimensions of health. In order to achieve this task the fTAG highly values the involvement, through the collaborating centres, of experts in all WHO reference classifications.

Acknowledgements

Authors are members of the fTAG and in their work took advantage of preparatory materials made available by the Group for this purpose.

References

2. iCAT
   http://icat.stanford.edu/
3. ICD-11 Beta browser
   http://apps.who.int/classifications/icd11/browse/2013/en

Digital, mobile, now!

Scan this to get a digital version
INTRODUCTION
The beta phase of the 11th revision of International Classification of Diseases (ICD-11) started in May 2012. As part of work plan of the World Health Organization (WHO), the lexical terms used in ICD-11 labels or properties of entities should follow a standard and homogeneous approach. For example, the terms “cardiac”, “renal” should always be used in ICD titles, definitions and values instead of the terms “heart”, “kidney”. The objective of the study is to develop and evaluate a hybrid solution to identify term heterogeneity in ICD titles.

METHODS & MATERIALS
Fig. 1 shows the system architecture. We utilized a lexical toolset known as the Sub-Term Mapping Tools (STMT) developed at National Library of Medicine (NLM). Two main features of the tool were used: 1) to find all sub-terms for an entity; 2) to find all permutations of synonymous sub-term substitutions. We developed a Semantic Web-based wrapper service that links WHO ICD-11 content services with local STMT lexical sub-term services. Specifically, the wrapper service takes an ICD entity URI as the input (which retrieves the title of the ICD entity), and then renders the sub-terms of an entity and the synonyms of each sub-term in a Semantic Web Resource Description Framework (RDF) format using the W3C standard Simple Knowledge Organization System (SKOS) signatures (Fig. 2). Using the wrapper service, we harvested the sub-terms and their synonyms in RDF triples for all foundation entities (n= 29,445) and loaded them into an open source RDF triple store known as 4store. We enabled a SPARQL endpoint that provides standard SPARQL query services against the sub-term dataset. We analyzed the dataset using a set of SPARQL queries (Fig. 3).

RESULTS
As a pilot study, we retrieved the sub-term pairs, in which the preferred label of a sub-term appears to be the synonym of the other sub-term, and identified 4,927 distinct sub-term pairs. We manually reviewed a small subset of the sub-term pairs and concluded that they reflect reasonably well the term heterogeneity in ICD titles. For example, for the sub-term “bleeding”, we identified its synonymous sub-terms “haemorrhages”, “haemorrhage”, “haemorrhagic”, “hemorrhage”, “hemorrhagic”, “blood loss”, “ruptured”, “rupture”, “spot”, and “spotted”. We plan to work with WHO to conduct a comprehensive review for the set of sub-term pairs and their frequency distribution in ICD titles (Fig. 4).

CONCLUSION
In summary, we developed a hybrid approach that combines an NLP-based lexical tool with a semantic web-based approach, which would provide an effective and scalable solution for lexical term standardization of ICD-11.
Introduction

The Clinical Dictionary project is a part of iSalut, a transversal and strategic program that aims to transform the healthcare assistance model in Catalonia (Spain), using ICT as the key element to make this change possible. iSalut includes other projects like the Shared Medical Records System in Catalonia (HC3), the Personal Health Channel (CPS) or the model to integrate different assistance levels (WiFIS).

The dictionary is being developed by the Office of Standards and Interoperability (OFSTI) of TicSalut foundation and many professionals of the Catalan Health System participate as domain experts.

The objective of the Clinical Dictionary for iSalut is to normalize the vocabulary of the Catalan Health System using an international standard and minimizing the impact of its adoption. This project aims to allow semantic interoperability between the information systems of the different healthcare providers and to provide a homogeneous base to represent the clinical knowledge in the Electronic Health Record Systems (EHRS).

Clinical Dictionary

- Part of iSalut
- Based on SNOMED CT as ontology
- Worked by domains and priorities
- Each domain as a subset of SNOMED CT
- Contains other vocabularies mapped to SNOMED CT
- Created by healthcare professionals of the Catalan Health System
- Preforms a homogeneous base for representing clinical knowledge in EHRS.
- Allowing semantic interoperability between information systems

Material and Methods

SNOMED CT was the reference terminology selected for HC3 and is also the ontology used to build the Clinical Dictionary for iSalut. The dictionary contains other controlled vocabularies that are currently in use, but these resources are mapped to SNOMED CT to guarantee the semantic interoperability of contents.

The dictionary is conformed by different domains that are worked as subsets of SNOMED CT, following the methodology of creating subsets of SNOMED CT defined by the OFSTI.

The project is managed by a permanent commission that indicates the actuation lines and the priority domains to work on. There is a team of multidisciplinary experts for each area of the dictionary that creates and defines all the necessary components (i.e. concepts, relationships or subsets) of SNOMED CT in the Catalan extension of the standard.

Results

In the first half of this year we have worked the domains related to groups of professionals (occupations), scales of assessment of chronic patients and referral procedures. The second part of 2013 we focus on rare or minority diseases and types of clinical reports. The dictionary also includes the revision of the spirometry test report domain and other subsets of SNOMED CT that had been created of allergies, immunizations and anatomic pathology.

Conclusions

The Clinical Dictionary for iSalut is standardizing, by priorities and domains, the controlled vocabulary used in the information systems of the Catalan Health System. The homogeneous base provided by this project is allowing the unique identification of contents to feed EHRS and Clinical Decision Support Systems (CDSS) in research and innovation projects. The cost of adopting SNOMED CT is significantly reduced through the subsets-driven development and the possibility to map the currently use vocabularies to SNOMED CT.

The components created in the Catalan extension of SNOMED CT are submitted to the Health Ministry of Spain to allow its use in all the Spanish National Health System and to consider its submission to (International Health Terminology Standards Development Organisation) IHTSDO.
Development of a native 13606 clinical repository using a conceptual approach

Authors: Lozano-Rubí R**†, Pastor-Duran X**, Canela-Soler J#

*: Medical Informatics. Hospital Clinic; #: Public Health Dep. Univ. of Barcelona;
†: Computer Science Dep. Autonomous Univ. of Barcelona

Abstract In spite of a high investment in the development of EHRs, a new wave of resistance by healthcare professionals is appearing. Their main complaint deals about difficulties to gather proper data to be informed about patient’s condition and to take a decision. A new scenario will require a hard investment in knowledge representation and semantic interoperability, as well as a deep review about the proper representation of the clinical process. We present OntoCR as an step forward in the right direction based upon ontologies. At this moment is a full prototype, but we are near to implement and evaluate it.

Introduction

Computer science in healthcare has achieved 50 years of history. During this time, one goal has been the consolidation of a model of computer systems architecture to support the main processes at the Healthcare facilities with several subsystems fully integrated in terms of information and business process representation. But in spite to succeed in the full implementation of such model, a new wave of resistance by healthcare professionals is appearing. The majority of institutions have changed only the technology changing from paper, fax and phone calls to a digital registration database. The healthcare professionals complaint about the fragmentation of data sources and the excessive time required to gather relevant data to be informed about patient’s condition and to take a decision. New tools have to be developed, and they will require a hard investment in knowledge representation and semantic interoperability, as well as a deep review about the proper representation of the clinical process, putting the s health problems of the patient at the center of the IS, and allowing their management and relationship with all the clinical activities.

Material and Methods

Departure situation was OntoCRF, a product developed by our team which allows data collection for research using ontologies to model both, the information required by the researcher and the information needed to build a web user interface. The ontologies are saved in a database specifically designed to store OWL ontologies. All the solution is under Liferay an open source web portal, with porlets that can access directly the database and extract the specific ontology, building dynamically the web pages on the fly.

OntoCR is a step forward. The metamodel of OntoCRF was extended to represent both the reference and the archetype models of ISO-EN 13606 and ISO 21090 datatypes. This is not a straightforward task, a transformation process from the information models specified in the standards to knowledge models to be represented with ontologies, is necessary.

OntoCR elements:

- Reference model: ISO-EN 13606-1
- Archetype model: ISO-EN 13606-2
- Data types: ISO 21090
- Available archetypes
- Terminologies: ICD, SNOMED CT

Results

At this moment OntoCR stores data recoverable by any EPR in a standard format: ISO-EN 13606. Both, the reference model and the archetype model are represented into the system. This system communicates with other systems using 13606 extracts directly, without any conversion module, and accepts 13606 archetypes as specification of clinical data structures. The presentation layer is build editing the ontology which defines the graphic control for each data element, its position, and any other characteristic. In our solution, both, the storage and the user interface are obtained automatically.

One of the important elements to achieve semantic interoperability is the use of standard vocabularies. In OntoCR it’s possible to represent different vocabularies integrated with the ISO 21090 CD.CV data type.

Conclusions

OntoCR is a Clinical Repository. At this moment there is a β-version available Using OntoCR it’s possible:

- to use archetypes as building blocks of clinical applications
- to use standard vocabularies to identify clinical data
- to communicate with other systems in a standard way.

OntoCR is intended to support the daily clinical practice managing the Health Problems of patients in our Health Information System (HIS) in Barcelona city. It would have the capability to manage the Health Problems by physicians in real time and in an integrated an innovative way among Family Physicians and Specialists.

With such design based on standards it’s possible to develop new EHRs suited for a better global healthcare in a semantic web network.

rlozano@clinic.ub.es
**Abstract**

The inclusion of SNOMED CT in the preparation of the next version of ICD adds value to the classification use in the 21st century. All ICD entities plan to include definitions providing clear description of meaning of categories. The inclusion of SNOMED Clinical Terms (SNOMED CT) as the foundational layer of the next version of ICD incorporates the “most comprehensive, multilingual clinical healthcare terminology in the world” into the the most widely used international classification. As the development of ICD-11 is progressing it is important to explore, understand and appreciate the value of the inclusion of SNOMED CT in the structure and capabilities of the classification. This poster illuminates the value of SNOMED CT to provide additional utility to the classification and to support its role in global healthcare activities and eHealth planning. Around the world, “in practice the ICD has become the international standard diagnostic classification for all general epidemiological and many health management purposes.” As the recognized global standard for mortality and morbidity statistics and its significant use for allocation of health expenditures, the revision with new and innovative improvements are welcomed. The addition of using the attributes and power of SNOMED CT is one of the significant changes, especially for countries that have adopted SNOMED CT as the terminological standard for electronic records. Examples of the ways the terminology brings to this century’s classification are featured here.


---

**INTRODUCTION**

The use of SNOMED CT added to the development of the International Statistical Classification of Diseases and Related Health Problems provides additional value to its utility. SNOMED CT’s structure and design is more suitable than other terminologies or classifications for clinical documentation in the electronic health record. This addition is an important tool around the world to support research to enable improvement in global health.

It is important to resist the temptation to compare SNOMED CT to ICD at the surface level in order to judge which is “better” than the other. This would be like comparing an automobile to a boat – the two are used for different purposes, but each benefits from being used “together”.

---

**SEMANTIC INTEROPERABILITY**

Interoperability is a very popular word used to describe how systems communicate with each other so that meaning is clearly understood those dependent on and using the data or information. Both ICD and SNOMED CT facilitate communication for health business. SNOMED CT’s structure and use of synonyms enables clinicians to use different words to express and record clinical concepts. 21st century medicine requires unambiguous and shared meaning between the sender and receiver whether the system is electronic or maintained on paper. For electronic systems semantic interoperability is a requirement to enable safe and reliable communication for health care providers. Today’s information systems require the latest version of both of these standards to ensure code sets reflect current clinical knowledge.

Different words for the same meaning support communication between care providers:

- **Concept Status: current**
  - Descriptions:
    - Pneumocystis zoster (disorder)
    - Shingles
    - Herpes zoster infection
    - Zoster

- **Concept Status: current**
  - Descriptions:
    - Zoster
    - Interstitial pneumonia
    - Pleural pneumonia

---

**VALUE ADDED FEATURES OF SNOMED CT**

- Provides more clinical coverage by adding additional clinical representation for additional healthcare activity and documentation requirements
- Allows for encoding at any level of granularity as appropriate for the clinical situation or process
- Offers multiple hierarchies important to more flexible data entry and retrieval
- Includes attributes to support data retrieval
- Provides well defined rules to extend coverage by combining existing concepts (post coordination)
- Facilitates direct generation of ICD codes from clinical data enabling “capture once, use multiple times” to save effort and reduce costs of manual data extraction for secondary use

---

**RECENT PAPER**

Sharing Ontology Between ICD11 and SNOMED CT: Seamless Re-Use and Semantic Interoperability

In August, 2013 a paper was featured in the MEDINFO 2013 meeting in Copenhagen, Denmark describing e-health systems use of terminologies and classifications for data representation, efficient retrieval and analysis.

The work continues through the WHO and IHTSDO Joint Advisory Group (JAG). ICD-11 and SNOMED CT harmonization efforts are ongoing to strengthen both systems for the benefit of health care around the globe.


Access to the paper is available from http://ebooks.iospress.nl/publication/34015
The International Statistical Classification of Diseases and Related Health Problems (ICD) has been updated annually based on the recommendations mainly from the WHO-FIC Collaborating Centres to the Updating and Revision Committee (URC) of WHO.

There is no systematic process for gathering recommendations from various researchers and scientific societies in Japan for making recommendations to the updating and revision of ICD.

A new scheme for gathering recommendations from various medical societies in Japan (hereinafter the new scheme) has been recently established, which is organized and managed by the WHO-FIC Collaborating Centre in Japan.

Establishment of a New Scheme for Making Recommendations to the Updating and Revision of ICD in Japan
Toshio Ogawa¹, Emiko Oikawa², Nobuyoshi Tani², Tomoaki Imamura¹
1 Nara Medical University School of Medicine
2 The Ministry of Health, Labour and Welfare of Japan

Abstract
A new scheme for making recommendations to the updating and revision of ICD has been recently established in Japan, which is organized and managed by the WHO-FIC Collaborating Centre. All medical societies in Japan could contribute to the ICD updating and revision under the new scheme. It would allow us to have more comprehensive and scientific recommendations to the WHO.

Background
The International Statistical Classification of Diseases and Related Health Problems (ICD) has been updated annually based on the recommendations mainly from the WHO-FIC Collaborating Centres to the Updating and Revision Committee (URC) of WHO.

There is no systematic process for gathering recommendations from various researchers and scientific societies in Japan for making recommendations to the updating and revision of ICD.

A new scheme for gathering recommendations from various medical societies in Japan (hereinafter the new scheme) has been recently established, which is organized and managed by the WHO-FIC Collaborating Centre in Japan.

Method
The new scheme was analysed based on the interviews with the WHO-FIC Collaborating Centre in Japan and a number of medical societies. The influence of the new scheme on the ICD updating and revision process was discussed in comparisons with the former scheme.

Aim
The aim of this research is to analyse the new scheme and to discuss the influences of the new scheme on the ICD updating and revision process.

Results
The new scheme was established by the WHO-FIC Collaborating Centre in Japan in collaboration with the Japanese Association of Medical Sciences (JAMS), which is an umbrella organization, consists of 118 specialist medical societies (Figure 1).

JAMS refers the recommendations to the updating and revision of ICD to the specialist medical societies on request from the WHO-FIC Collaborating Centre in Japan.

Discussion
This new scheme would allow us to have more comprehensive and scientific recommendations to the WHO Updating and Revision Committee, compared with the old scheme which allowed only a limited number of researchers to make recommendations to the ICD revision. It would be also important to conduct ICD revision in a systematic manners and to clarify the division of the roles between the WHO-FIC Collaborating Centre and medical societies.

The new scheme could contribute to the further improvement of the ICD in accordance with the clinical needs. It could be a model for every countries involving the ICD revision.
Identification and coding of the main condition using ICD: suggested workflows

Lucilla Frattura, Francesco Gongolo, Flavia Munari
Central Health Directorate, Classification Area, Friuli Venezia Giulia Region, IT WHO-FIC CC, Udine - Italy

Abstract
This poster presents an Italian proposal for the systematization of current knowledge in identification and coding of a condition introducing as well a revised workflow for the identification of the main condition.

Introduction
Starting from a review of the documents produced at international level (1) and taking into account the work done by the Italian WHO-FIC Collaborative Centre (CC) within an inter-regional cooperation in the field of children and youth neuropsychiatry (2), we propose a new perspective on the coding rules to assign the main condition.

Methods & Materials
The main condition workflow produced by the Morbidity Reference Group (MbRG) in 2010 was taken as the starting point to develop three separate trees to identify the conditions, code them, and sort out the condition, recognized at the end of the episode of care, primarily responsible for the patient’s need for treatment or investigation (reason vs condition generating the greater use of resources). We adopted the perspective of clinicians who, while coding, are keen to keep their diagnosis-oriented approach. We verified the logic of our proposal by testing it against the coding guidelines adopted in Australia, Canada, Germany, and US.

Results
The materials we examined showed that the definitions adopted in the above-mentioned Countries for hospital discharges, are different, although they all are specifications of the WHO definition, which has also been largely modified and updated during the course of the years.

Figure 1: Decision tree 1 - identification of the main condition

Figure 2: Decision tree 2 - coding of the condition

Figure 3: Decision tree 3 - identification of the main condition

Conclusions
We propose a systematization of the WHO indications to code the main condition. The assignment rules for the main condition should remain valid not only in hospital settings and therefore it is highly desirable the engagement of other parties in testing our solution also in primary care.

Acknowledgements
Thanks to L. Moskal (North American WHO-FIC-CC), Dr. G. Henriksson and Dr. O. Steineum (Nordic WHO-FIC CC) for the help in recollection of background materials.

References
2. Frattura L, Gongolo F, Munari F. ICD-10 implementation in the health information system of the Piedmont Region (Italy) to overcome WHO multidimensional classification of mental disorders of children, WHO-FIC Nework annual meeting, Beijing 2013
Introduction

Since its adoption in 1948, ICD has been progressively made suitable, through successive revisions, for grouping morbidity data. Worldwide, adaptations of ICD have also been adopted to respond to national requirements in terms of morbidity coding (clinical modifications). ICD-11 is now being developed, to be used in electronic health records and information systems. Member States have to use the most current ICD revision for mortality and morbidity statistics but one of the development goals of ICD-11 is to contain, in its foundation layer, all the different adaptations of ICD. A tool to compare different adaptations and different revisions of ICD would make immediately available existing resources (eg. extensions and translations) for the design of an ICD adaptation that takes into account classification possibilities already explored by other national modifications and at the same time incorporates the novelties of ICD-11.

Methods & Materials

An informatic tool was designed to help experts in identifying ICD-10 candidate extensions from other available sources, including ICD11 beta morbidity linearization, national modifications of ICD-10, and possibly other resources such as ICD-9CM translations and the Orphanet inventory. Starting from ICD10 entities, candidate extensions are prompted from the available modifications, sorted, and when possible, merged according to lexical rules. A web-based interface is available for the user, that shows an ICD10 tree browser and on its side the set of candidate extensions, identified as above mentioned. For each ICD10 entity, the user views appropriate candidates for modification, and in a second step, can select subsets of extensions assigning them a code. Imaging to develop a new clinical modification or to maintain an existing one, the set of selected extensions can eventually be submitted via Web Services, in form of an update proposal, to a classification management platform and be adopted in the respective classification. To foster ICD11 compatibility, ICD11 entities always appear as first choices among extensions. Considering the possibility to use the tool for the Italian scenario, the English extensions of ICD-10, were linked to the Italian translation of ICD9-CM, currently used for morbidity coding.

Acknowledgements

The tool has been provisionally fed with the free online available electronic versions of ICD-10-CM, ICD-10-AM, ICD-9-CM, ICD-10plus (Nordic Countries), ICD-11beta.

Abstract

This poster introduces a tool, developed at the Italian WHO-FIC CC, to compare the possible extensions of ICD-10 with rubrics coming both from clinical modifications and from ICD-11 beta browser, thus potentially simplifying the transition from any ICD-10 based system to ICD-11.

Results

A first prototype (Figures 1 and 2) was developed that implements the above mentioned features, starting from ICD11beta (accessed through the new URI API), ICD10-CM, ICD10-AM, ICD10+ (Nordic Countries).

Conclusions

The tool enables the development and maintenance of clinical modifications of ICD-10 and facilitates their representation as linearizations of ICD-11. Such representation simplifies the transition from any ICD-10 based system to ICD-11.

References

(2) C. Çelik, R. Jacob, T.B. Üstün Translation Platform for ICD 11, Brasilia WHO-FIC Network annual meeting (2012)
A joint effort to harmonize SNOMED CT with ICD 11 and other WHO Classifications has been established by a Collaboration Agreement between WHO and IHTSDO[1] with a Joint Advisory Group, and has agreed on principles for a Common Ontology for ICD 11 and SNOMED CT.

There is a multi-purpose disease classification extending ICD’s traditional uses for statistical reporting and remuneration.

ICD 11 has a novel two-level architecture:
- Foundation Component (FC) - a polyhierarchical collection of all relevant classes
- Purpose-specific linearizations (mortality, morbidity, primary care) with exhaustive and mutually exclusive monohierarchies

We are exploring the feasibility of a Common Ontology for SNOMED CT and the Foundation Component[2]

### RESULTS

- The best interpretations of both SNOMED CT and ICD-Foundation Component classes is as Clinical Situations[3][4] e.g.: "Anemia" denotes the class of situations (life periods) of patients having anemia.
- Most of current taxonomic links in both systems are compatible with Situation interpretation
- Exclusion statements are pervasive throughout ICD 10. In ICD 11 they will be limited to linearizations
- Foundation Component entities not in Common Ontology:
  - Chapter headings typically using plurals ("Diseases of...")
  - Fine-grained parts of ICD, more specific than SNOMED CT
  - Non-ontological content (signs, symptoms, diagnostic criteria)
  - Residuals (not in Foundation Component, only in linearizations)

### METHODS

- Ontological Commitment: Which kind of things are classified / represented by
  - SNOMED CT disorders
  - ICD foundational component
  - ICD linearizations
- Analysis of hierarchical relations:
  - which ones correspond to subclass relations, which ones have a different meaning
- Analysis of exclusions and residuals in ICD
- Construction of a general framework
  - Scope of common ontology (CO)
  - Scope of foundation component (FC)
  - Characterization of non-CO nodes in FC
  - Identification of linearization-specific nodes
- Testbed: draft of ICD11 chapter on cardiovascular diseases

### OUTLOOK

- Consolidation of the ICD revision architecture and integration into ICD editing and QA processes
- Experimental release of the ICD cardiovascular chapter supported by common ontology
- Extension to other WHO classifications

### REFERENCES

4. Schuch, S; Rector, A; Rodrigues, JM; Spackman, K Competing Interpretations of Disorder Codes in SNOMED CT and ICD. AMIA Annu Symp Proc. 2012; 2012:819-827

### INTRODUCTION

SNOMED CT is a standardized health terminology for health records. SNOMED CT formulated concept definitions in a description logic. ICD11 is a multi-purpose disease classification extending ICD’s traditional uses for statistical reporting and remuneration.

- Foundation Component (FC) - a polyhierarchical collection of all relevant classes
- Purpose-specific linearizations (mortality, morbidity, primary care) with exhaustive and mutually exclusive monohierarchies

We are exploring the feasibility of a Common Ontology for SNOMED CT and the Foundation Component[2]
Leveraging ICD Data to Improve Global Health

Sue Bowman
American Health Information Management Association

Abstract
New and improved classification systems are better able to meet changing health information demands, allowing improved capture of information about the increasingly complex delivery of healthcare. This poster explores some of the exciting new ways in which the advent of new classifications leads to expanded use of coded data to improve the care of individuals and populations and the effectiveness and efficiency of healthcare delivery.

Introduction
An increasingly global, complex, and electronic healthcare environment and an accelerating body of knowledge regarding diseases and medical advances have led to ever-expanding demands for richer health information. Accurate and detailed information about clinical conditions and the services rendered are essential to ongoing management of care as well as refinement of healthcare delivery systems.

Adoption of electronic health record (EHR) systems and interoperable health information networks require sophisticated classifications for summarizing and reporting data. The demand for better, more detailed healthcare data is also driven by emerging or expanding data-dependent initiatives such as value-based purchasing, accountable care, quality measurement and patient safety programs, and changing healthcare reimbursement models.

Close alignment between classifications and terminologies will allow rich healthcare data to be extracted at the level of aggregation or granular detail needed for the intended purpose.

Modern code sets will permit a level of precision that hasn’t been possible in the past, enabling more meaningful data and analytics and greater health intelligence.

Public Health
As a result of both more detailed ICD data and the widespread adoption of EHRs, ready access to collective data worldwide would allow for early exchange of public health information to identify disease outbreaks and bioterrorism events, allowing action to be taken more swiftly.

Research
Better understanding of diseases and injuries will lead to improved prevention or mitigation strategies. Clinically robust algorithms to treat chronic diseases and track outcomes of care can be designed. Greater detail offers the ability to discover previously hidden relationships or uncover phenomena such as incipient epidemics early.

Quality of Care
Data can be used in more meaningful ways to better understand complications, monitor patient safety, track care outcomes, and design clinically robust algorithms. Best practices across the healthcare industry can be identified, resulting in the sharing of more effective and cost-conscious treatments targeted to the patient’s disease state or clinical condition. Individuals’ health status can be monitored over time as well as the effectiveness of health interventions.

Better ICD data will permit improved identification of patients for disease management programs and more effective tailoring of these programs to meet individual patient needs, thus improving patient outcomes, patient satisfaction, and lowering healthcare costs.

Effectively practicing population health management will require the ability to innovatively assess and stratify patient demographic and ICD data into categories, such as patients who are well, at risk, or have chronic conditions.

Consumer Engagement
Coded data can be used to provide consumers with the ability to compare quality and cost across healthcare providers. With better data, consumers will be able to forecast healthcare needs. Both payers and providers will be able to more effectively monitor service and resource utilization and patient outcomes.

Reimbursement
Modern classifications provide more detail for determining payment policies and reimbursement rates under existing reimbursement programs as well as for new reimbursement systems based on quality measurements and outcomes, value-based purchasing, and such as accountable care organizations and bundled payments.

Administrative Efficiencies
Increased administrative efficiencies and lowered costs will result from increased use of automated tools to facilitate the code process, fewer rejected and improper reimbursement claims, fewer coding errors, increased productivity, and less reliance on manual review of medical records for audits, research, and other purposes.

Organizational Performance
Better data will support providers’ and payers’ efforts to improve performance, create efficiencies, and contain costs. Considerable cost savings can be realized through more accurate trend and cost analysis. Payers will better be able to forecast healthcare needs. Both payers and providers will be able to more effectively monitor service and resource utilization and patient outcomes.

Conclusion
While the introduction of new classifications is costly and disruptive to mortality and morbidity statistics, it is essential to meet the expanding demands for health information.

A classification system designed for the 21st century would maximize investments in EHR systems because it would facilitate data retrieval at the desired level of detail and lead to the expanded use of technologies to improve data quality and efficiency of data collection, such as computer-assisted coding and natural language processing.

The information a healthcare organization collects needs to be managed as a business asset to ensure it is trustworthy and actionable, because in the future, accurate and timely information will be the greatest asset to drive successful healthcare organizations.
Hospital-based medical records are abstracted to create International Classification of Disease (ICD) coded discharge health data in many countries. We describe how the “main condition” in ICD data is currently defined across countries, the impact of these definitions on research and analysis, and propose recommendations for international harmonization.

Table 1. Main condition definition in ICD coded health data.

<table>
<thead>
<tr>
<th>Country</th>
<th>Resource Use</th>
<th>Reason for Admission</th>
<th>Coding System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Belgium</td>
<td>X</td>
<td></td>
<td>ICD-9</td>
</tr>
<tr>
<td>Brazil</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Canada</td>
<td>X</td>
<td>[Province of Quebec]</td>
<td>ICD-10</td>
</tr>
<tr>
<td>China</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Denmark</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Finland</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>France</td>
<td>X (2009)</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Germany</td>
<td>X (2001)</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Iceland</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Ireland</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Italy</td>
<td>X</td>
<td></td>
<td>ICD-9-CM</td>
</tr>
<tr>
<td>Japan</td>
<td>X (2001)</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Latvia</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Netherlands</td>
<td>X</td>
<td></td>
<td>ICD-9-CM/ICD-10</td>
</tr>
<tr>
<td>New Zealand</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Nicaragua</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Norway</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Portugal</td>
<td>X</td>
<td></td>
<td>ICD-9</td>
</tr>
<tr>
<td>Singapore</td>
<td>X</td>
<td></td>
<td>ICD-9</td>
</tr>
<tr>
<td>South Africa</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>South Korea</td>
<td>X (2012)</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Spain</td>
<td>X</td>
<td></td>
<td>ICD-9</td>
</tr>
<tr>
<td>Sweden</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Switzerland</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>Thailand</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td></td>
<td>ICD-10</td>
</tr>
<tr>
<td>United States</td>
<td>X</td>
<td></td>
<td>ICD-9-CM</td>
</tr>
<tr>
<td>Venezuela</td>
<td>X</td>
<td></td>
<td>ICD-10</td>
</tr>
</tbody>
</table>

Note: Brackets indicate date changed.

Diagnosis timing indicator.
A diagnosis timing indicator, also known as “present on admission (POA),” improves the ability of ICD coded hospital discharge data to support outcomes research and the development of quality and safety indicators. The importance of POA reporting is that enhancing risk-adjustment with POA-corrected covariates may have a substantial impact on estimates of hospital performance, especially for conditions and procedures that often involve acutely ill patients. An advantage of POA reporting is its ability to exclude relevant events with a higher likelihood of being present on admission and focus on complications only that occurred during hospitalization.

Conclusion
We propose a method of harmonizing the international definition to enable researchers and international organizations using ICD-coded health data to aggregate or compare hospital care and outcomes across countries in a consistent manner.
The wide use of ICD data has been facilitated by their:

- readiness to be analyzed,
- wide geographic coverage and
- relatively complete ability to capture episodes of patient contact with the health system.

The use of ICD data for any purpose is based on the assumption that ICD data provides valid information on diagnoses and clinical services. However, errors could occur in the process of creating ICD data, due to incomplete information in ICD-11 and coders’ misinterpretation of ICD diagnoses.

ICD-11 Advancements

- ICD-11 has more codes than previous versions and elaborates diagnoses and symptoms more in-depth.
- ICD-11 codes are linearized—providing the ability to extract ICD-11 codes for a specific task.
- Concise and structured definitions and guidelines are available for ICD-11 codes.
- ICD-11 is a single standard coding system that will replace various country specific ICD-10 versions.

Systematically testing the ICD-11 before its use will identify improvement paths, reduce errors and increase its consistency. The ICD-11 should be easy to use (feasibility), generate same results in the hands of all users (reliability) and add value (utility). It will fit multiple purposes and be comparable with ICD-10.

OBJECTIVES

- Reliability of ICD-11 coding among coders.
- Comparability between ICD-10 and ICD-11 in defining morbidities.
- Data quality improvement generated from ICD-11 compared with data coded with ICD-10.
- Impacts of coding rules on condition identification and grouping.

METHODS

ICD-10 Data

We will identify inpatients discharged between January 1, 2013 and June 30, 2013 in the teaching hospitals in Calgary, Alberta, Canada. The identified discharge records will be stratified by hospital site. Medical discharge records will be purposively selected from hospitals. The selected records will have conditions, symptoms or injuries that reflect changes in ICD coding guidelines. These data have already been coded using ICD-10-CA.

ICD-11 Data

To create the new ICD-11 database, coders who have ICD-10-CM coding experience at these hospitals will re-code the charts following the ICD-11 coding guidelines. The coders will be blinded to the original ICD-10-CA codes assigned in each hospital.

Chart Review Data

Corresponding patient charts for the selected discharge records will be located using a combination of the patient chart number and admission identification number that are unique to admissions at each hospital.

Two clinically trained chart reviewers will undergo training in the data extraction process. Once the two reviewers reach substantial agreement, they will extract data independently. The reviewers will examine the entire chart to define conditions.

ANALYSIS

We will describe samples and analyze the data using a Kappa score for agreement among coders, and sensitivity, specificity, negative predictive value and positive predictive value for data validity. McNemar’s test will be used to compare the sensitivity of ICD-11 data and ICD-10 data relative to chart review data for detecting conditions. The specificity of the ICD-11 and ICD-10 data relative to chart data will then be compared to cases without the condition.

Experience of the utility of ICD-11 will be described in text. Strategies of improving ICD-11 coding and coding guidelines will be proposed.
OBJECTIVES

The Quality and Patient Safety TAG is charged with reviewing ICD-10, ICD-10CM and progressive drafts of ICD-11 to inform the development of the ICD-11, focusing on identifying practical modifications for ICD 11 drafts that would enable better measurement of quality and safety.

Ultimately, an enhanced classification system will permit expanded use of coded health data for large-scale quality and safety surveillance in health care systems internationally.

TASKS

- Horizontally crossing all ICD-11 chapters to advise on optimizing the entire classification’s content, structure and coding rules for enhanced application in both existing versions.
- Developing an inventory of existing quality of care and patient safety indicators and potentially novel quality and safety indicators.
- Assessing potential uses of ICD-11 for health services, quality and patient-centered outcomes research.
- Reviewing and critiquing the ICD-11 alpha draft from the perspective of the quality and safety use case.
- Providing input to the ICD-10CM refinement, implementation and maintenance in the US, and ultimately designing field trials for the beta version of ICD-11.

MEETING ATTENDEES

Australia: James Harrison, Vijaya Sundararajan

US: Marilyn Allen, Chris Chute, Ginger Cox, Donna Pickett, Harold Pincus, Patrick Romano, Brigitta Spaeth-Rublee,

Canada: Susan Brien, Alan Forster, William Ghali, Yana Gurevich

Switzerland: Bernard Burnand, Lori Moskal, Hude Quan, Danielle Southern

France: Cyrille Colin

Germany: Saskia Droesler

WHO: Nenad Kostanjsek, Bedirhan Ustun.

OBJECTIVES

To assess, from a healthcare leader’s perspective, the utility of patient safety information encoded using the following classification systems: AHRQ Common Format, WHO-ICD 10-CA, and WHO-ICD11 (Beta)

To evaluate the inter-rater reliability of raters classifying patient safety events

To determine the face validity of event classification

To assess the coding practice for classifying patient safety events

The proposed study will achieve its objectives by reviewing detailed descriptions of patient safety events detected from the prospective surveillance of hospitalized internal medicine patients in 5 hospitals in Ontario and Quebec, Canada. We monitored 1346 patients from admission to the service until disposition. Trained observers (who were either MDs or RNs) performed the following tasks daily: staff interviews, medical record reviews, and clinical rounds observations, to detect occurrences suggestive of adverse events or potential adverse events. Once an occurrence was identified, the clinical reviewer described it fully so that it could undergo multidisciplinary review. During weekly review sessions, events were categorized into adverse events, potential adverse events, and non-events. We, thus, identified 546 occurrences that represented adverse events or potential adverse events. Each of these occurrences is described in detail, including the patient’s background medical conditions, the factors leading to the occurrence, response to the occurrence by the healthcare team, and how the patient’s condition was affected.

ACKNOWLEDGEMENT

Q&S TAG was funded by AHRQ and Canadian Institute of Health Canadian Patient Safety Institute (CPSI).

ACTIVITIES

We have held meetings in both New York, NY and Washington, D.C., US

- Reviewed the status of discussions around coding rules (main condition, diagnosis timing, coding field).
- Reviewed chapter 19&20 content and associated clustering mechanisms and presented these concepts in emails to WHO.
- Prepared to undertake a granular review of the content in chapters 1-20 and will devise a committee work plan to do this.

Progressing Manuscripts

The editorial team of the International Journal for Quality in Health Care is welcoming a series submission (i.e. intermittent submission of papers as they are completed).

- Main Condition
- Number of diagnoses fields
- Timing of diagnosis
- Overview TAG
- New PSI project
- 19&20/concepts

Progressing Field Trials

The QS-TAG has devised a matrix model for considering potential ICD-11 field trials. The matrix categorizes cross-tabulates topic areas (e.g., validity of coded concepts, completeness of capture of critical patient safety and quality concepts, reliability and feasibility of various coding rules, opinions of stakeholders on various issues) against the methodologies that would be used for the field trials (i.e., code-recode studies using real medical records, coding studies assessing completeness of capture of key safety/quality concepts, surveys of stakeholders, heuristic evaluations of ICD-11 on various user interfaces, etc).

Survey

With the overriding goal for the TAG (and thus the WHO) to collect info on user needs from ICD-11 in advance of the next TAG meeting (in September) to inform ICD-11 refinements. We have developed a survey for the field trial.


Mapping of existing patient safety indicator

We have begun a mapping exercise, whereby we have attempted to map the Calgary PSI list, the International ICD-10 AHRQ PSI list as well as Patient Safety concepts in ICD-11-Beta.

Code-recode testing
The upcoming ICD-11 field trials present an ideal opportunity to ask participants several standardized questions, as part of the Basic Questions, about whether their countries have fully implemented ICD-10 and its updates for both mortality and morbidity classification, and whether the barriers to implementation. Lessons learned from this information and other WHO-FIC Network studies and activities can be applied to ICD-11 implementation and updating.

**Implementation of ICD-10**

- Information in the current ICD-10 implementation database is incomplete and outdated. The Dutch Centre, working with WHO and the Education and Implementation Committee (EIC), is piloting a new web-based application that will be discussed in Beijing at the 2013 meetings.
- Approximately 100 countries responded to a survey fielded by the Education Committee in 2004; the results reported on implementation of ICD-10, barriers to implementation, mortality and morbidity coding and coder education and support.
- The Pan American Health Organization and the Asia Pacific Network have gathered implementation information since 2005 and reported at meetings.
- Several countries have presented papers on implementation experiences and challenges.
- EIC has developed an Implementation Checklist.

Implementation of Updates

- Questions about awareness and implementation of updates are included in the current ICD-10 Implementation Database, but the information is incomplete and outdated. Additional questions will be included in the new Database.
- The Update and Revision Committee (URC) prepared papers in 2004 and 2006 that addressed accomplishments and challenges of the ICD-10 updating process and identified clinical updating projects that had been beyond the capacity of the Committee.
- The Regional Networks have documented uneven adoption of ICD-10 updates and have identified challenges, such as lack of awareness and lack of resources (financial, translation, nosology).
- Even countries that participate actively in the WHO-FIC Network updating process have not always been able to implement the updates in a timely manner (e.g., the U.S. in its automated mortality coding system).
- There is considerable variation in how frequently countries update their national versions of ICD-10.

The upcoming ICD-11 field trials present an ideal opportunity to ask participants several standardized questions, as part of the Basic Questions, about implementation of ICD-10, awareness of the ICD-10 updating process and whether their countries have implemented the updates in their national versions of ICD-10 used for mortality and morbidity classification. One of the two main purposes of the proposed field trials is to ensure comparability between ICD-10 and ICD-11. Yet all of the basic questions currently proposed are about ICD-11. It is critical that several questions are included on current use of ICD-10 and its updates because ICD-10 is considered a bridge to ICD-11. This can supplement similar questions that have been included in the new WHO-FIC Implementation Database and raise awareness about the updating process. Field trials often include persons and countries not typically involved in the WHO-FIC Network and offer a “captive audience” for collecting parsimonious information. They may also provide an opportunity for focus groups. By identifying barriers to implementation, it may be possible to develop mitigation strategies that will improve the adoption of ICD-11 and the uptake of ICD-11 updates and promote more consistent data on a global basis.

Questions could address demand for updates, limitations of the updating process, demand for national modifications, achievements of the updating process, barriers to full implementation of the updating process and impact of updates and timing on clinical, statistical and other data.

It also would be informative to evaluate whether the clinical areas that could not be addressed in the ICD-10 updating process have been successfully addressed in ICD-11, because this was one of the major rationales for embarking on ICD-11. These areas have been documented by URC and by the Morbidity Reference Group in several papers.

Copies of papers cited are available from the first author. Systematic synthesis of information in these and related papers is recommended.
Tool Support for Collaborative Terminology Authoring:
The Stanford WHO Collaborating Centre

Mark Musen MD PhD, Tania Tudorache PhD, Csongor Nyulas MS, Samson Tu MS

Abstract
The Stanford WHO Collaborating Centre provides modeling support and a common software infrastructure for developing and maintaining WHO classifications. Our foundational software includes iCAT, a Web-based tool that enables subject-matter experts to browse, review, edit, and comment on draft versions of WHO classifications. The iCAT platform additionally allows terminology authors to access standard terminologies hosted in the BioPortal repository of the United States National Center for Biomedical Ontology. Through BioPortal, developers who use iCAT can link their evolving content to terms in reference sources such as SNOMED CT. Additional work enables WHO to review the overall process of terminology development through visual presentations that show areas of evolving classifications that are undergoing rapid change, or that may need additional attention. Future work involves support for modeling and implementing post-coordination in ICD-11 and ICTM, as well as the design and development of methods for enhanced community engagement for commenting on the ICD-11 Beta draft.
Crowdsourcing ICD-11 Sanctioning Rules

Samson Tu MS, Vincent Lou, Csongor Nyulas MS, Tania Tudorache PhD, Robert J. G. Chalmers MB FRCP, Mark A. Musen MD PhD

Abstract: ICD-11 is a post-coordinated classification system, where end users can combine disease codes with qualifiers to form detailed descriptions of diseases. To prevent nonsensical combinations of terms, we need to find sanctioning rules that only allow those sensible combinations to be formed by end users. In this pilot study, we use crowdsourcing methods to find sanctioning rules between diseases and anatomic locations.

ICD-11 Post-Coordination

Pre-coordination
- Enumerate all codes that may represent complex concepts
- Large classification

Post-coordination
- Combine codes to describe a complex concept
- Smaller classification
- Have to specify sanctioning rules to permit sensible combinations

Sanctioning rules:

(Palmoplantar keratodermas, Hand) (Palmoplantar keratodermas, Foot)

Method

Identify the locations where a disease occurs

- Lower Extremity
- Hand
- Foot
- Lower Leg
- Hip
- Extremity
- Head and Neck
- Neck
- Upper Extremity
- Throat

... repeat above steps until the sanctioning rules are found, then repeat for child diseases

Evaluation Metric

Gold Standard:
(Palmoplantar keratodermas, Hand)
(Palmoplantar keratodermas, Foot)

Suppose Turkers indicate:
(Palmoplantar keratodermas, Hand) (Palmoplantar keratodermas, Lower Leg)

Then:

<table>
<thead>
<tr>
<th>True Positive</th>
<th>False Positive</th>
<th>True Negative</th>
<th>False Negative</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1</td>
<td>7</td>
<td>4</td>
<td>0.43</td>
<td>0.88</td>
</tr>
</tbody>
</table>

Cost Analysis:
- We asked 641 questions; we received 6410 responses; we paid 3296 bonuses
- We paid Turkers 4 cents per response and 2 cents per bonus. Amazon Mechanical Turk charged 0.5 cent for each transaction.
- Cost to acquire sanctioning rules per disease = \((6410*0.045 + 3296*0.025)/209 = \$1.77\) USD
- Average time per response: 55 seconds
- Total time for getting all responses: 82h
- Total number of Turkers: 135
The 7 steps to co-create global knowledge in healthcare on Twitter.

The ICD example


Location: Barcelona

Abstract

The microblogging service Twitter and its conversational interaction features combined with third parties tracking platforms, are contributing to consolidate and deliver universal knowledge, as is shown in "The International Classification of Diseases (ICD) example". The process seems to be aligned with the co-creative paradigm and could be the framework to deal with new healthcare challenges. The assumption is, that there aren’t right answers, but evolving conversations open to discussion. The seven step process towards global knowledge in healthcare proposes the stages that should be considered in a global strategy in healthcare on Twitter: Community, Connection, Co-design, Content, Conversation, Consolidation and Co-creation. Unleashing the power of Twitter and co-creative processes are key to meet ICD challenges.

Introduction

Can Twitter be helpful to co-create new solutions for healthcare challenges? If so, we should also, as a result, provide appropriate answers to new research questions: -What community of individuals do we need to connect to solve a problem? -What new interactions will community members want to engage in on Twitter to design a solution? -What valuable professional experiences will the members get out of these interactions? -What value will this new set of experiences generate for the community members, creating a win for all parties?

Methods & Materials

Methods

- Conversation analysis
- Problem solving in public health
- Open innovation
- Socratic method
- Mixed Methods in the social and behavioral research

Materials

- Communities of Interest: University of Colorado (http://bit.ly/ZdwMiM)
- Co-Creation of Content to promote Learning, Activism and Advocacy: Nursing-Informatics (http://bit.ly/1c0gFfi)

Results

THE ICD EXAMPLE

#ICD9
8,929 Impressions
713 Tweets
270 Participants

#ICD10
135,554 Impressions
60,337 Tweets
5,205 Participants

#ICD11
187,892 Impressions
286 Tweets
74 Participants

Conclusions & Recommendations

Conclusions

- A precondition for successful adoption of Twitter in healthcare is a positive attitude and openness toward its innovative information potential.
- The systematic use of ICD hashtags and healthcare content curation platforms, such as Symplur, contribute to the extension of universal health knowledge.

Recommendations

- Unleash the power of Twitter and co-creative processes to meet ICD challenges.
ICD URI Model and Supporting Web Services

Celic C.¹, Della Mea V. ², Noselli M. ¹,³, Vuattolo O. ²
¹ CTS, World Health Organization, Geneva, Switzerland; ² Italian Collaborating Center and University of Udine, Italy; ³ University of Freiburg, Switzerland

Abstract

The present poster briefly describes the ICD URI model that provides unique identifiers to WHO classifications and their entities, and the supporting Web Services that provide classifications and entities in computable format for their adoption into information systems. The poster anticipates a forthcoming guideline regarding ICD-11 and ICD-10, that could be adopted also for the other classifications.

Introduction

In the past, WHO-FIC discussed methods for timely availability of classifications to information systems, as well as more unique identification schemes for classifications and classification entities.

Two main concepts are at the basis of the technologies described here: URI and Web Services. Together, they move the WHO family of International Classifications towards the so called linked data approach.

URIs

A Uniform Resource Identifier (URI) is a compact string of characters for identifying an abstract or physical resource. Even the URIs most known – the subset called URL– are used as addresses for networked resources (web sites and pages, etc), the concept behind allows to identify any kind of resource, not necessarily corresponding to something on the Web.

Web Services

The W3C defines a "Web service" as: [...] a software system designed to support interoperable machine-to-machine interaction over a network, usually based on SOAP and WSDL standards. In the last years a category of web services appeared that is based on simpler representational state transfer (REST) communications.

Linked data

The Linked Data approach exploits URIs and, often, REST-based web services to help interconnection of structured data available on the Web, leading towards the so-called Semantic Web, and in particular towards the specific concept of Semantic Interoperability.

Tim Berners Lee provided four rules for truly useful linked data:
1. Use URIs to identify things.
2. Use HTTP URIs so that these things can be referred to and looked up ("dereferenced") by people and user agents.
3. Provide useful information about the thing when its URI is dereferenced, using standard formats such as RDF/XML.
4. Include links to other, related URIs in the exposed data to improve discovery of other related information on the Web.

Scope

The URIs have been designed for the ICD Foundation Component as well as ICD-11 Linearizations and ICD-10. Currently the services have been deployed for the following content: ICD Foundation Component
ICD11 Morbidity Linearization
ICD11 Mortality Linearization
ICD10 2010
ICD10 2008

Content negotiation for the format

The services behind the URIs provide the classification in different formats: The services support html, rdf/xml and json-id formats. To be able to retrieve a specific format, we need to use content negotiation by appropriately setting the Accept Header.

Content Negotiation for the Language

The services want to be multilingual. They support content negotiation using Accept-Language header. Currently only ICD-10 2008 has two languages so this can be demonstrated only with it.

Service URIs: Foundation

The ICD Foundation Component and Releases of ICD are placed in different URI paths.

Top level

http://id.who.int/icd/entity

Returned Properties:
Title, Definition, Child

Individual Entity

http://id.who.int/icd/entity/{id}

Example:
http://id.who.int/icd/entity/1766440644

Returned Properties:
Title, Definition, Child

ICD-11 Linearizations are available in two variants, with or without minor version.

URIs without minor version are as follows:

Top level linearization:
http://id.who.int/release/11/{Linearization Name}

Example:
http://id.who.int/icd/release/11/morbidity

Returned Properties: Title, Latest Version, Version

Entity in a linearization:
http://id.who.int/release/11/{Linearization Name}/{id}

Example:
http://id.who.int/icd/release/11/morbidity/21500692

Returned Properties: Title, Latest Version, Version

URIs without minor version are as follows:

Top level linearization:
http://id.who.int/release/11/{Minor Version}/{Linearization Name}

Example:
http://id.who.int/icd/release/11/beta/morbidity

Returned Properties: Title, Definition, Child

Entity in a linearization:
http://id.who.int/release/11/{Minor Version}/{Linearization Name}/{id}

Example:
http://id.who.int/icd/release/11/beta/morbidity/1012371341

Returned Properties: Code, Parent, Child, Title, Definition, Long Definition, Inclusion, Exclusion, Index Terms, Class Kind, Source

ICD-10 URIs

Similar URIs are available also for ICD-10, e.g.:
http://id.who.int/icd/release/10/A00
http://id.who.int/icd/release/10/400
http://id.who.int/icd/release/10/2010/400

Conclusions

The availability of URI identifiers, and a fully fledged API to access classification entities, makes easier for any software developer to invent new ways of exploiting and combining WHO classifications, thus opening them to a wider and more intelligent use.

Further work is needed for securing access to the API to registered users only.
INTRODUCTION
Health data coded using International Classification of Diseases has been used to identify the occurrence of adverse events that may be linked to suboptimal safety and quality of care. Some countries code timing of diagnosis, which is crucial to determine if the event presented on admission or occurred after admission. Using this unique data element, we took two steps to produce novel patient safety indicators (PSIs).

METHODS & MATERIALS
First, we queried 2,416,413 records in Canadian Discharge Abstract Database (DAD) for April 1, 2009 through March 31, 2010. All listed diagnosis codes were compiled, and 2,613 were found to have a type ‘2’ diagnosis designation, indicating that it was not present at time of admission and thus arose after admission. Twenty three codes were excluded as coding errors or inappropriate use of type ‘2’ diagnosis. Second, 7 Panelists were then asked to review all of the remaining 2,590 codes before meeting face to face and to return their ratings (9-point scale). Highest and lowest ratings were dropped and ratings were then analyzed to determine the number of codes that had agreement as potential PSI (all remaining panelists rated as 7 or higher) or were rejected with agreement (all remaining panelists rated as 1-6).

RESULTS
Of the 2,590 codes, 219 were agreed upon as potential PSIs in round 1. Another 1,493 diagnosis codes were rejected with agreement. The remaining 878 diagnosis codes produced disagreements in panelist ratings, so these were brought forward to the face-to-face meeting for discussion. The detailed review and discussion of these codes required 2 full days of panel discussion. The second round of reviews produced another 438 diagnosis codes for which there was agreement that they were appropriate as potential PSIs. In total, this 2-step process of reviewing and rating type 2 diagnosis codes produced a list of 640 codes that were determined to be appropriate for consideration as novel PSIs.

CONCLUSION
The methodological work presented here utilizes the unique potential of diagnosis-timing indicators to produce a clinically-relevant listing of diagnosis codes that have potential as patient safety indicators that may overcome some of the notable shortcomings of existing patient safety indicator systems. The resulting work has great potential to inform future approaches to health system monitoring and quality/safety improvement internationally.
Abstract

The ICD Shoreline is the conceptual boundary between the concepts that will exist as precoordinated stem codes and those that will exist as post-coordinated entities. Drawing this shoreline specifies what detail appears in the Mortality and the Morbidity Linearizations, and how. This process requires adopting certain classification principles and addressing issues that will be highlighted. Addressing these will help produce a robust classification system.

Introduction

Establishing a concept-based boundary between entities that are precoordinated and those that will be post-coordinated is a critical component of ICD Revision. In the shoreline analogy, precoordination refers to land and post-coordination refers to the sea. Precoordinated concepts are fully specified stem codes. Post-coordinated concepts are a systematic combination of stem codes extended with sanctioned extension code entities to add detail. Determining which ICD entities should be precoordinated and which post-coordinated will establish the Mortality linearization as well as the substance of the Morbidity linearization. There are many principles which govern this process. The purpose of this poster is to highlight the principles and key issues that are essential to the development of the revised ICD as a robust, fully-comprehensive classification system.

General Concepts

1. Certain ICD concepts will be fully specified in their detail – this is called precoordination, and all precoordinate concepts are “stem codes”.
2. Post-coordinating a concept is accomplished through adding one or more allowed extension codes to an established precoordinated stem code.
3. Post-coordination is not permitted in the Mortality linearization, therefore all concepts required for Mortality will be precoordinated.
4. All precoordinated Mortality concepts will also be precoordinated stem codes in the Morbidity Linearization.
5. For all shoreline decisions, the following rules are considered:
   a) Legacy
   b) Scientific evidence
   c) Taxonomical and ontological rules for consistency
   d) Practicality of coding
   e) Frequency in practice setting
   f) Utility (Clinical and Public health)

Architectural-related issues

1. Additional detail not relevant for the Morbidity linearization should be expressed in the relevant Specialty linearization. For every detailed Specialty linearization child, there will be a parent/ancestor that exists in the Morbidity linearization.
2. There will not be any items in Mortality that are not expressed in the Morbidity linearization.
3. If a proposed new entity is required in the Mortality linearization or in the Morbidity linearization at the 3rd or 4th depth level or lower, then the essential parameters in the content model should be populated with content.

Key issues

1. When generic dimensions exist across chapters they will be contained in the X-Chapter. Precoordinated entities that include this generic detail should instead be post-coordinated. Post-coordination with the R-Chapter works in a similar fashion for clinical forms and findings. Entities that are inappropriate for the Morbidity Linearization and cannot be post-coordinated will appear only in the Foundation Component and possibly in a Specialty linearization.
2. When a category is secondarily parented elsewhere, the order of the children within the category is presently grandfathered from the linearization parent.
3. Linearization parenthood should depend first upon etiology, if it may be known. The two chapters of Infectious Diseases and Neoplasms have been given primacy in the Morbidity linearization; all their children should be linearized there.
4. There is presently underutilization of multiple parenting. Many children that clearly relate to two or more topic areas may not yet have their multiple parents specified.
5. Groupings should be used in a balanced manner. Having either excessive layers of groups before children or too few groups make the classification system inefficient.

Naming convention issues

1. Entities that include ‘classified elsewhere’ will be deprecated.
2. Entities that contain the words ‘Specific’ or ‘Certain’ in the title should have corresponding children, and will be reviewed for possible reorganization.
3. There should be no acronyms or abbreviations in ICD entity titles. Desired alternate terms should be included as a synonyms.
4. The use of disease, disorder, and syndrome must be consistent with the WHO definition of these entities.
5. WHO has created a feature on the ICD Beta browser, under the ‘More’ tab called ‘Errors’ (one must be logged in). Here, a list of duplicate terms and various linearization errors are identified, highlighting priority corrections to be made.
ICD foundation entities will be presented and organized into several different, overlapping lists called linearizations. A primary goal of ICD Revision is to address multiple use-cases with a coherent, fully-comprehensive classification. Currently, the Mortality and Morbidity linearizations are the priority linearizations. Other linearizations may include those for High and Low Resource Primary Care Settings, National and other Specialty Linearizations, Research, or Verbal Autopsy. Given these myriad options, a clear description of the purpose of each linearization may be useful.

**Mortality Linearization**

In the Mortality linearization, included entities should be relevant causes of death. Post-coordination is not used in Mortality, therefore the entire Mortality linearization consists of precoordinated concepts. ICD-10 legacy has strong influence when debating inclusion of a Mortality item in ICD. Reporting frequency, both national and international, is also an important consideration in the inclusion of an entity in the ICD Mortality linearization.

The Mortality linearization is a proper subset of the Mortality Linearization. All entities included in the Mortality linearization will also be included as precoordinated concepts in the Morbidity linearization where, as stem codes, they may be expanded with additional detail taken from the post-coordination space.

There is a telescoping principle within the various ICD linearizations, with particular focus on the Mortality and Morbidity linearizations. The Mortality linearization codes will essentially be added to, ‘zooming in’ or condensed, ‘zooming out’. This principle is merely a guide, rather than a hard rule. (Figure 1: red arrow).

**Morbidity Linearization**

The ICD Morbidity linearization is the primary international reference for reporting and data exchange. The Morbidity linearization will be fully-comprehensive, while avoiding unnecessary explosion of the coding space. Additional detail in the Morbidity linearization will be expressed through extension codes, but may still remain precoordinated in the ICD Foundation to be expressed in other linearizations. In keeping with the telescoping principle, additional linearizations may be created as an extensions of the Morbidity linearization. This permits other linearizations to include more detailed stem codes, if desired.

**National Linearizations**

For national purposes, countries that require additional detail when adopting ICD may create National Linearizations. These will be similar to the Clinical Modifications generated previously. The new mechanism, however, will engender better coordination mechanisms to avoid non-standard development. This will require that countries add all additional items to the Foundation and identify the linearization parents and shoreline (either precoordination or post-coordination). WHO will provide the infrastructure and the tools. In this way, it is envisaged that comparability between different national linearizations will be maintained through the Foundation.

**Primary Care Linearizations**

WHO will generate specific linearizations for both high and low resource settings in Primary Care (PC). These linearizations will be condensed from the Mortality and Morbidity linearizations, and include the most relevant entities in primary care. The Low Resource PC linearization will be a condensed version of the High Resource PC linearization.

**Verbal Autopsy Linearization**

In certain low resource settings, verbal dictation of causes deaths is utilized, a process known as Verbal Autopsy. To support reporting in this manner, WHO will provide a linearization which mirrors the Low Resource PC linearization while supporting this use-case.

**Sanctioning Tables**

Post-coordination mechanisms may apply to all linearizations other than the Mortality linearization, and will be widely implemented in the morbidity linearization. To avoid double coding within these linearizations, sanctioning tables are being created. These tables will identify the combination of a stem codes and relevant extension codes as:

- Applicable,
- Required, or
- Non-applicable.
Ensuring a Seamless Transition: Results of the Morbidity Stability Analysis

Authors: Molly Meri Robinson Nicol, Linda Best, Maren Hopfe
World Health Organization, Geneva, Switzerland

Abstract
Several key stakeholders to ICD Revision have expressed concern regarding the potential for disruption to existing health information systems, DRG systems, data collection systems, or other environments into which ICD-10 or a national clinical modification of ICD-10 has been integrated. This poster describes the methodology of the work undertaken to complete a stability analysis of the revised ICD and the existing ICD-10, with the addition of the national clinical modifications thereof, specifically with a focus on the Morbidity Linearization.

These efforts ensure that each entity, both those from the selected national clinical modifications and from the international version, can be accounted for within the revised ICD. This work is done to prepare for, and facilitate, a seamless transition at the time of ICD publication by ensuring continuity in data collection between ICD-10 and the revised ICD.

Introduction

Several countries, such as Australia, Canada, Germany and the United States of America, have extended and modified ICD in order to address specific country requirements. Given that these modifications may be the basis for existing national health information systems, data collection, reimbursement, and health policies, the current revision process raises concerns regarding transition to the revised ICD.

Main objectives:

- identification of national modification specific codes
- identification of all ICD-10 codes relevant for the DRG systems
- identification of the status of the ICD-10 codes within the ongoing revision process, and
- mapping of the ICD-10 codes to the revised ICD.

The goal is to ensure that each individual ICD-10 code (country specific and WHO) is identified and accounted for in the revised ICD.

Methods & Materials

The source files used for the analyses are listed in table 1. The status (see below) of each country specific code (XM codes) as related to the revised ICD was identified using the Vlookup function in Excel 2010 followed by manual verification of matched and unmatched codes.

- XM Codes already included in the Foundation unchanged (code match & title match) – automatic mapping
- XM Codes which have a code match but title mismatch in the Foundation – manual mapping
- XM Codes which have a title match but code mismatch in the Foundation – automatic map, manually verified
- XM Codes which have a title match but with a different code match – automatic map, manually verified
- XM Codes which have a title match but no code at all in the Foundation – automatic map, manually verified
- XM Codes which have neither a code match nor a title match in the Foundation – manual mapping

Results

After finalizing the manual check the following mapping results emerged (table 2, figures 1-5).

<table>
<thead>
<tr>
<th>Group Type</th>
<th>XM Codes</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATCH</td>
<td>43,429</td>
<td></td>
</tr>
<tr>
<td>CONCEPTUAL MATCH</td>
<td>766</td>
<td></td>
</tr>
<tr>
<td>CONCEPTUAL MATCH - synonyms</td>
<td>24,776</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - linked</td>
<td>163,164</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location</td>
<td>1,874,630</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - matched</td>
<td>2,983,150</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - unmatched</td>
<td>1,579,006</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match</td>
<td>1,976,987</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - linked</td>
<td>2,722,998</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - unmatched</td>
<td>2,145,987</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - no link</td>
<td>1,579,006</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - no link - linked</td>
<td>2,722,998</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - no link - unmatched</td>
<td>2,145,987</td>
<td></td>
</tr>
<tr>
<td>MAPPING LOCATION - suggested location - no match - no link - no link</td>
<td>1,579,006</td>
<td></td>
</tr>
<tr>
<td>DELETION</td>
<td>198,093</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match</td>
<td>198,093</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - linked</td>
<td>3,417,595</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - unmatched</td>
<td>1,897,836</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - no link</td>
<td>1,579,006</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - no link - linked</td>
<td>3,417,595</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - no link - unmatched</td>
<td>1,897,836</td>
<td></td>
</tr>
<tr>
<td>DELETION - no match - no link - no link</td>
<td>1,579,006</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Mapping results of the country specific codes to the revised ICD

C322 - FAMILY OF INTERNATIONAL CLASSIFICATIONS NETWORK ANNUAL MEETING 2013

World Health Organization, Geneva, Switzerland

Conclusions

The concerns raised by stakeholders are valid and do require investigation. The methodology devised for this investigation was termed Stability Analysis.

Although not yet completed, the interim results of stability analysis presented at this time provide a generally positive view, supporting the idea that the transition to the revised ICD in countries will be reasonably feasible with minimal disruption to existing health systems from a purely coding-based perspective, political implications aside, for Germany and Australia. Accommodations for the United States modification can be made through judicious expansion of the ICD foundation paired with development of mappings which utilize the post-coordination dimensions of the ICD X-chapter, particularly severity and laterality.

Future work will include update the analyses after the Morbidity linearization shoreline is stabilized, a process now underway. It will also be necessary to work with the owners of each clinical modification, generally the relevant WHO Collaborating Centre, to verify the results of these analyses and to prepare the strategies necessary to move forward with a seamless transition from ICD-10 to the revised ICD.
ICD-11 Field Trials

Kostanjsek N1 on behalf of WHO CTS, RSG and the WHO FIC Network

1CTS, World Health Organization, Geneva, Switzerland

Abstract: To ensure that ICD-11 is working well, it needs to be systematically field tested in different settings, across the world. Only through exposure and testing in the real world can we assess the “fitness of ICD-11” and make the necessary enhancements as needed. This poster provides an overview of the envisaged Field Trial objectives, core study protocols and management arrangements.

Objectives & key assessments

The overarching objective of the Field Trials is to ensure systematic testing of ICD-11 before its use to increase consistency, identify improvement paths, and reduce errors.

The basic aims include:

• the testing the "fitness of ICD-11 for multiple purposes";

• and ensuring the comparability between ICD-10 and ICD-11.

To achieve the overall objective and specific aims the Field Trials will focus on the following key assessments and questions:

Applicability (Feasibility): Is the classification easy to use in real-life contexts and settings? How easy can first time ICD-11 user accomplish their documentation or coding tasks? Once familiarized with ICD-11, how quickly can users perform their tasks? How can the use of ICD-11 made a pleasant experience?

Reliability (Consistency) Is the classification rendering the same results when applied by different users? Do two or more different users code the same diagnosis with the same ICD code? What are the sources of discrepancy? What are the factors to improve comparability and consistency?

Utility (Benefits) Is the classification providing useful information and adding value for guiding diagnosis and enhancing data capture. Does the classification enable better documentation, aggregation, comparability and re-use of data? Does it allow better resource allocation?

Field Trial Studies

The Field Trials will comprise a series of (mandatory) core studies and a range of (optional) additional studies.

Core studies
The core studies include the following three study protocols:

Study 1: Reliability and Feasibility
The study aim is to test the reliability and feasibility of ICD-11 in various settings, formats and versions; aiming to maximize consistency and limit errors.

Study 2: Bridge Coding
The study will assess the level of agreement between coders when coding the same diagnosis using ICD-10 and ICD-11 in an effort to ascertain and enhance the comparability between ICD-10 and ICD-11.

Study 3: Basic Questions
Through a Key Informant Survey and a Consensus Conference this study is seeking to identify the spectrum of opinions as well as a consensus statement on conceptual as well as operational issues related to ICD-11.

The Basic Question will address topics such as:

• needs and usage;
• diseases conceptions & delineation;
• coverage & structure;
• terminology principles;
• coding;
• ICD-11 and other WHO FIC.

Additional studies
In addition to the core studies additional study protocols on specific issues may be developed for optional implementation.

Field Trial Structure

The field trial structure will be two tiered, the first tier at national level consisting of Field Trial Centers (FTCs).

A Field Trial Centre is a WHO approved study centre that will manage the implementation of Field Trials at country level and report directly to WHO. WHO Collaborating Centers, ICD-11 Topic Advisory Groups or other organization with sufficient implementation capacity can serve as FTC.

The second tier is consisting of multiple Field Trial Sites (FTS) coordinated and supervised by a FTC. FTS should represent different settings (e.g primary care, general health care, research settings).