Wanted: Cartography skills in managing health information: data mapping and e-health transformation projects

Rita A Scichilone

Abstract
As the healthcare delivery systems around the world adopt electronic media, links between encoded data systems are needed. This creates a high demand for skills in data analysis and data mapping, including knowledge of coded data structures and their use. Health information management professionals are uniquely qualified for this type of work, when provided with some additional orientation and training for specific mapping, use case development and project staffing. The first phase of the International Healthcare Standards Development Organisation (IHTSDO) and the World Health Organization’s Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) to ICD-10 project is featured as an example of this emerging opportunity for professional development. Skill acquisition and discussion of benefits for e-health projects and for the health information management profession are highlighted.

Keywords (MeSH): Data Linkage; Health Manpower; Health Information Technology; Consumer Health Information.

Transforming data by mapping
Cartography is an ancient skill defined as the science or art of making maps. Data mapping is emerging as an important professional skill set since healthcare delivery today requires a complex array of formats and encoding schemas. As the industry adopts electronic media there is an increasing need to link disparate data sources. When information is collected using a specific format or coding system and a need arises to express the same or similar data in a different system, a map is developed to enable reuse of data already collected for a specific purpose (AHIMA 2011).

Maps are commonly understood as guides to show the user the route from one place to another. Data map construction is frequently more complex when the starting point and the desired destination lack a clear path or meaningful connection. Basic mapping terminology includes the term ‘source’ for the starting point and ‘target’ for the desired destination. Like most highways, maps can provide guidance in more than one direction (forward or backward) depending on the intended use of the results. In the case of code sets such as the International Classification of Diseases (ICD), a forward map links an earlier version to a current version, and a backward or reverse map goes the other way and links the new version to its counterpart in the old version. Before attempting any mapping project a clearly documented and detailed use case is required. Just as a city is quite different from a village, data in health information management systems differ to the extent that maps apply only to a stated purpose.

When health data are transformed from paper-based documents to electronic environments, existing content is linked to new data structures. This occurs for many e-health initiatives which add value to both healthcare providers and the patients they serve. Mapping allows for longitudinal record keeping and continuity of information management when technology provides more efficient methods. Data transformation is clearly within the domain of the health information management profession, and a high demand for skilled personnel to fill new roles is emerging (AMIA 2008; Health Informatics Society of Australia 2009; Healthjobs-Health Jobs View 2010). Encoding clinical information has been a competency for many years and although the knowledge base and skills for mapping require expertise in more than one coding system, additional preparation is essential. Coded data structures are key factors in supporting patient-centered data sharing, frequently included in current e-health projects.

SNOMED CT to ICD-10 Mapping Project underway by IHTSDO and WHO
An important example of mapping roles and competencies involves a current mapping project of global significance. The International Healthcare Standards Development Organisation (IHTSDO) and the World
Health Organization (WHO) established a collaborative agreement in July 2010 to enable harmonisation of WHO classifications and SNOMED CT for the benefit of citizens around the world. The Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT) is owned and maintained by the IHTSDO and the International Statistical Classification of Diseases and Related Health Problems is owned and maintained by WHO. The collaboration arrangement facilitates map development to provide linkage between the two standards for automated processing of data to improve coding and information exchange. This relationship between terminology and the classification enhances current work on the revision of ICD for its 11th Edition.

SNOMED CT and ICD in electronic environments are complementary informatics tools deemed ‘better together’ for use in electronic health records and information derived from record content. Use of the terminology for clinical data processing and the classification for aggregation of these systems enable efficient management of health record content for continuity of care as well as secondary uses common to all health systems. Building a map requires deliberate planning and assembly of a team with a specialised knowledge base and competencies. Once the use case was defined, a detailed project plan and timeline was created. An important first step was the creation of guidance for preparing mapping personnel for the work ahead. Specialised knowledge is required to ensure the quality and integrity of map results from a source terminology to a classification target. No existing standards for educational preparation or established competencies were available at the time the map project began so a document was prepared by a task group affiliated with the IHTSDO Mapping Special Interest Group. This guide is available as a publication of the IHTSDO and available on their website (IHTSDO 2009). This resource is applicable to any SNOMED CT to ICD-10 project. For this project three roles were determined as essential to project success:

1. Mapping Specialist
2. Map Lead
3. Consensus Manager.

Sample job descriptions were developed as an annex to the Personnel Guide with details about the main function of each role. In addition a sample course syllabus is included to identify key learning requirements for preparation of personnel for these roles. Due to the heightened interest in adopting the clinical terminology as a foundational terminology for healthcare data capture and storage, mapping projects are expected to increase in order to link clinical concepts from the nomenclature to the corresponding codes in the classification for a variety of use cases. Health information management professionals are uniquely suited, because of their background, for any one of these roles. However, additional training specific to the use case, the mapping tools used and application of quality assurance measures to produce a reliable and valid map will always be required.

In the IHTSDO/WHO mapping project a training plan was established for orientation and assessments conducted before and after the training event. Follow-up training occurred when new personnel joined the project. Additional training specific to the project is always required, although there are core competencies which can be acquired through educational programs. Mapping specialists are required to have a knowledge base concerning the structure and use of the source and targets for the map, but also to be able to apply quality assurance principles to assure reliability of a map from a terminology to another terminology or a terminology to a classification. Advanced knowledge of clinical vocabulary is important, along with coding expertise in the systems involved to be proficient in mapping SNOMED CT concepts to ICD-10 classification codes. Any data mapping work requires a range of well-developed skills where professional judgment is required and all personnel are prepared to take responsibility for their mapped results.

For this project a mapping specialist is described as an individual who is competent to determine whether a SNOMED CT concept within a source terminology has a link to a concept in ICD-10. In addition to evaluating the relationship between the two systems, the mapping specialist must understand and apply the heuristics (rules) designated for the use case and project. Maps today are developed using computer software support, so a mapping specialist is also expected to be facile with the use of electronic tools and the Internet. Competencies are described in the Guidance on the Preparation of Terminology/Classification Mapping Personnel document for the source (SNOMED CT) and the target (ICD-10) for selection of team members aligned with the three roles mentioned previously. An excerpt from this resource is provided in Figure 1 (IHTSDO 2009: 13).

In the sample job description activities or tasks are ranked in order of importance with expected results and measures for evaluation. This is a useful approach for selecting qualified team members for data mapping projects. In the IHTSDO/WHO FIC project the Map leads play a pivotal role in leadership and coordination of the mapping process and use of informatics tools to produce results. Map leads must not only have an advanced knowledge base similar to the map specialists, but also be required to have teaching and

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coaching abilities, management and communication skills for working with map sponsors, and the ability to share information effectively. Map leads review work products, evaluate and process discordance in maps and make decisions about map records requiring application of a defined consensus process.

In this project map records are processed by more than one mapping specialist to identify discordance in the choice of target code(s) or application of the map heuristics. Identification of discrepancy in the choice of codes provides an opportunity for additional review and consultation with appropriate subject matter experts. In the case of a SNOMED CT to ICD-10 map this may involve expert knowledge of the terminology or classification or specific clinical expertise related to the concept. For the current project three consensus managers have been appointed – one from IHTSDO, one from WHO and an independent representative to facilitate discussion and disposition of the issues. Because linking disparate systems together with the goal of identifying the closest ‘match’ to express the same meaning, there are circumstances requiring careful consideration. The goal of any mapping effort is to produce results that follow the ‘URU principle’: to be Understandable, Reproducible and Useful. It is clear that consensus managers have a critical role in the production of maps that fulfill these requirements. Consensus managers convene at the request of Map Leads when discordance in the mapping results requires additional investigation and specialised expertise.

**Skill acquisition for mapping projects**
Health information management professionals normally receive foundational instruction concerning the International Classification of Disease since it is used in many countries for statistical reporting and a variety of other data management activities. Academic programs may or may not include SNOMED CT in the standard curriculum since its use in health information workflows has become more widespread with the adoption of electronic health records and the use of computer software in the healthcare provider community. Most people working with clinical terminologies including SNOMED CT do so by receiving education through standards organisation tutorials, seminars sponsored by professional associations, or on the job training programs. There is currently no recognised certification process for SNOMED CT competency or skill assessment. As use is expanded and demand for expertise appears in job descriptions, academic programs and training centers will include appropriate courses. Until this occurs, health information management professionals interested in acquiring additional knowledge and skills for mapping from SNOMED CT to other terminologies or classifications should look for a source that provides a minimum of the following:
- basic definitions, structure and use of the nomenclature
- detailed descriptions of the SNOMED CT hierarchies and relationships between concepts
- how to find and use a SNOMED browser
- instruction about the terms of importance associated including pre-coordinated and post-coordinated expression use and compositional grammar.

In the case of maps between SNOMED CT and ICD-10 each standards organisation provides resources for basic instruction or to use as refresher courses for personnel who already have some understanding of the code sets, but need to update their knowledge base. A variety of resources are available free for downloading from the official website, for example:
- IHTSDO provides the SNOMED Clinical Terms User Guide and both Overview and Basics presentation slides online (IHTSDO n.d.).

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**Table: PRINCIPAL ACTIVITIES, END RESULTS, AND PERFORMANCE**

<table>
<thead>
<tr>
<th>Rank of Importance</th>
<th>What Do Mapping Specialists Do? (Major Activities)</th>
<th>Why Is This Function Performed? (Desired End Result)</th>
<th>Ways to Measure Accomplishment of End Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Provide content subject matter expertise for mapping projects appropriate to the use case. Foundational knowledge of SNOMED CT as the source terminology and experience with ICD-10 is required (e.g. ICD-10 conventions and guidelines are applied to candidate SNOMED CT concepts and a match rating is determined).</td>
<td>To enable data capture in one terminology and link it to classification system for specific use cases. Data maps are used in healthcare information systems to provide semi-automated match to increase efficiency through re-use of data.</td>
<td>High quality, successful maps are developed according to the project plan and timeline.</td>
</tr>
<tr>
<td>2.</td>
<td>Review meaning of the SNOMED CT concept and the fully</td>
<td>To support an efficient map creation process by</td>
<td>Efficient, track-able, mappings</td>
</tr>
</tbody>
</table>

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**Figure 1: Excerpt from Guidance on the Preparation of Terminology/Classification Mapping Personnel**
WHO-FIC provides a comprehensive ICD-10 e-learning tool online.

The international team working on the current project includes health information management professionals with experience in map development, but additional training specific to the project was required for proficiency. Self-learning packages for reading combined with virtual meetings and face-to-face sessions where hands-on mapping tool orientation and practice mapping exercises prepared the team for the project.

Conclusion

Benefits for e-health projects and the health information management profession

The transformation of traditional paper-based systems for collection, storage and sharing of health information is occurring in many countries. International standards are increasingly used to enable interoperability between systems and data sharing between countries. Data maps to link local terms to the standard are an important health information management process. Maps designed to reuse information already collected in one code system to another code system save time and money. Accomplishing this transformation requires specific competencies and skills which are a natural fit for Health Information Managers.

Benefits to the healthcare industry for data maps include: workflow efficiency gains from reuse and re-purposing data from one format to another; timely sharing of vital patient information by automation or semi-automation made possible by reliable and useful maps; and support for e-health projects designed for supporting a patient-centered health data management approach. Benefits to the health information management profession include: enhanced job opportunities and career advancement; eligibility to work with an interdisciplinary map development team; and professional recognition and potential for international work. Clearly, benefits to the profession and the industry make a solid case for additional professional development in this emerging role.

References


Useful sites and further reading


Rita A. Scichilone, MHSA, RHIA, CCS, CCS-P
Director, Practice Leadership
American Health Information Management Association (AHIMA)
233 N. Michigan Ave. 21st Floor, Chicago, IL 60601, USA.
email: rita.scichilone@ahima.org