Making the connection between standard terminologies, use cases, and mapping

Kathy Giannangelo

Abstract
Clinical data captured at the point of care using a standard terminology can be efficiently and effectively used for a variety of administrative and secondary purposes such as reimbursement, vital and health statistics trending, and health policy decision making. Maps are created with a specific purpose in mind and refined for particular use cases. They should be understandable, reproducible and useful. Driven by a philosophy of ‘code once, use many times’, after clinical care is recorded in an electronic health record (EHR) using a standard terminology, mapping tables can be used to identify the related code(s) in legacy terminologies.

Key Words (MeSH):
Terminology; Medical Records; Standards; Informatics

Introduction
When clinical terminologies are discussed in relation to electronic health record (EHR) systems, standard terminologies have been recognised as being a significant piece that is needed to obtain the full benefits of EHR systems (Amatayakul 2004; Cohn & Chute 1997; Institute of Medicine 2003; President’s Information Technology Advisory Committee 2004). Terminologies form the basis of all coded data sets and provide the data structure required for a fully functional EHR system.

According to Giannangelo (2004), standard clinical terminology interacting within an EHR system enables:
- access to complete and legible clinical data with links to medical knowledge for real-time clinical decision support
- information exchange between providers, thereby speeding care delivery and reducing duplicate testing and prescribing
- information retrieval to produce practitioner alerts (e.g. allergy alerts, reminders for preventive medicine screening tests, notifications of potential drug interactions or abnormal test results)
- access to standards of care for benchmarking, measuring and interpreting effectiveness, improving quality of care, measuring outcomes, developing and monitoring pay-for-performance programs, and measuring performance.

Selecting a Standard
In the United States, various studies have been conducted that identified terminologies available for use as a standard and included an evaluation against specific criteria (Department of Health and Human Services 2005; Institute of Medicine 2004; National Committee on Vital and Health Statistics 2003). The study by the National Committee on Vital and Health Statistics (NCVHS) recommended the Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT®) as one of the core set of patient medical record information (PMRI) terminology standards. SNOMED CT® was also adopted as a Consolidated Health Informatics standard for the following domains: laboratory result contents,
non-laboratory interventions and procedures, anatomy, diagnosis/problem lists, and nursing (Department of Health and Human Services 2005). In May 2006 SNOMED CT® was identified as one of the preferred terminologies in the ASTM International's Continuity of Care Record (SNOMED International 2006).

Terminologies other than SNOMED CT® have also been named in the United States of America (US) as a standard. For instance, the National Committee on Vital and Health Statistics (2003) also identified important related PMRI terminologies, for example the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). In addition, the Health Insurance Portability and Accountability Act of 1996 (HIPAA) named standard medical code sets for administrative applications. These include ICD-9-CM, Volumes 1-3, Current Procedural Terminology, Fourth Edition (CPT®), Code on Dental Procedures and Nomenclature (CDT), National Drug Codes (NDC), and the Centers for Medicare and Medicaid Services (CMS) Healthcare Common Procedure Coding System (HCPCS).

**Use cases**

There is a difference between coding for direct patient care and for statistical purposes. Depending on the use case, certain terminology systems are appropriate for chosen applications. For example, by definition classification systems group together similar diseases and procedures and organise related entities for easy retrieval. However, they are inadequate for primary identification of terms used in clinical care. In the same vein, because of their size, significant granularity, intricate hierarchies, and lack of reporting rules, clinical terminologies are insufficient for serving the purposes for which classification systems are used.

Taking ICD-9-CM, a legacy terminology system, as an example, one use case would be reimbursement, an administrative application. Regarding SNOMED, it is designed to capture clinical information for use in the computerised patient record (Kudla & Rallins 1998). An expectation of SNOMED CT® embedded in EHR systems is that it will work behind the scenes to encode the clinical information. Designed to support the EHR, Bowman (2005) states SNOMED CT® enables:

- the development of richer computer-aided clinical decision support systems
- critical care monitoring (e.g. standardised capture of clinical details such as vital signs, signs/symptoms, medications, interventions, tests, and problem lists)
- the development of clinical alert and reminder systems
- integration of medical device data output with EHR systems
- improved communication among clinicians
- use in clinical trials
- use in computerised physician order entry (CPOE) systems (e.g. standardised capture of type of diagnostic test being ordered)
- improvements in quality of data available for research and measurement of clinical outcomes
- improvements in completeness, accuracy, and consistency of health record documentation
- advancements in disease management programs
- the practice of evidence-based medicine.

**Maps**

The National Committee on Vital and Health Statistics (2003) also recognised that mappings between terminologies need to be created and maintained. Terminologies in administrative applications will continue to be used and
therefore compatibility with the recommended clinical terminology standards is necessary.

At its simplest, mapping is linking content from one terminology or classification scheme to another. It requires deciding how they match or in some instances, are similar or don’t match at all. Mapping considers different purposes, levels of detail, and coding guidelines of source and target. It also involves a specific procedure in which the terminology context or classification description principles are interpreted between systems.

Mapping is not the same as coding. Coding means designating descriptions of diseases, injuries, and procedures into numeric or alphabetic-designations by using the health record as the source for determining code assignment within the patient context. The mapping process employs a standard method and the use case is the core upon which the guidelines for creating the map are stipulated (McBride et al. 2006). It begins with the development of heuristics and guidelines that support the use case or purpose of the map, respecting the conventions of the source and target to preserve the granularity and flexibility of both. Defined mapping rules must be developed and consistently applied to minimise incompatibilities without compromising clinical integrity. To do this the map must remain context free, meaning care must be taken not to introduce any assumptions or assertions. In order for diagnosis and procedure codes resulting from a map to be appropriate for use in meeting reimbursement requirements, algorithms that consider coding rules and conventions and reporting requirements (such as adhering to coding guidelines and identifying the principal diagnosis) need to be developed and applied to the mapping process.

Since a map is always created with a specific purpose in mind and must be refined for particular use cases, a number of them exist. For example, equivalence maps from SNOMED CT® to ICD-9-CM have been developed by SNOMED International and a map for reimbursement is under development. Maps are available through SNOMED International, the National Library of Medicine, and various healthcare information technology vendors.

Fully automating the process of mapping from SNOMED CT® to a legacy terminology is challenging because of the inherent differences between the terminologies. Sometimes the mapping process is straightforward when the source terminology and the target match up. However, this is often not the case. Either way, having mapping best practices to follow help address problems that may be encountered and therefore facilitate more accurate mapping results.

**Mapping best practices**

Creation of an accurate and reliable mapping is beset with many technical and scientific problems including:

- the size and constantly varying nature of the terminologies
- differences in granularity and definitions between the reference terminology and the classification
- interactions between the terminologies and the information models employed by the vendor
- identification and management of the varying context in which the map is to be used, since classification algorithms often include multiple references to patient record or the encounter in which the classification is employed.

A symposium held by the Clinical Vocabulary Mapping Methods Institute in October 2005 brought together researchers, vocabulary developers, vendors and end-users in one place to discuss issues around mapping. Some of the recommendations made to facilitate more and better automatic mapping included ensuring that the map interact with the EHR information model and vendor systems, and be computable. Those in the technical trade track agreed that to move terminology mapping forward, it must meet be understandable, reproducible, and useful (URU). Below are the URU criteria: (Experts: clinical terminology mapping will be essential tool 2005).

**Understandable**

- All mappings have stated purpose and audience.
- Map documentation is complete, clear, and unambiguous.
- Mappings define source and target domain scope for the map.

**Reproducible**

- Mappings employ authoritative reference
sources uniformly.

- Documentation defines all assumptions, heuristics, and procedures required to manage context and create the map.
- All terminology developers move to compliance with sound principles of permanence and version management.
- A standard for the EHR static information model is developed and employed in mapping procedures.

Useful

Connecting terminologies, use cases, and mapping

Clinical information within medical records has many legitimate ‘use communities’, including care givers, patients, hospitals and healthcare institutions, payers, government, and medical researchers. In order to provide information to all with legitimate need, healthcare data must be translated between standard clinical terminologies such as SNOMED CT®, which maintain highly specific and descriptive patient care data, and standard legacy terminologies which are organised for aggregate reporting.

Mapping maximises the benefits of an EHR by utilising the clinical data being entered through automated coding practices thereby avoiding duplication of data capture. Automated maps create efficiency by minimising duplicative data entry and patient data integration across a wide variety of applications (Brouch 2003).

In addition, mapping from a clinical terminology to a legacy terminology system increases the value of clinical data contained in electronic health record systems and enables its use for multiple purposes. Mappings also provide an opportunity to significantly improve quality measurement data and ultimately lead to improvements in the quality of medical care and reductions in medical errors. Connecting terminologies through the use of maps means improved capture of information about the increasingly complex delivery of healthcare.

Conclusion

Information management is one of the most important methods to improve the quality of health data and patient care processes. The foundation of healthcare information is the encoded data of which standard terminologies are key and necessary for electronic health record interoperability. Standardising and codifying data provides for better data for measuring the quality, safety, and efficacy of care.

The mapping process employs a standard method and the use case is the core upon which the guidelines for creating the map are stipulated (McBride et al. 2006). Given the various use cases, terminologies should be utilised according to their purpose(s) and design to accomplish interoperability. The creation of a link between terminology systems for the purpose of generating health information necessary for secondary uses also avoids duplicate data capture, while facilitating enhanced health reporting, billing, and statistical analysis.

References


**Kathy Giannangelo** RHIA, CCS
Manager, Practice Leadership
American Health Information Management Association
233 N. Michigan Ave., 21st Floor
Chicago, IL 62707
Phone: 001 312 233 1520
demail: kathy.giannangelo@ahima.org

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