Technical Track
Definitions, Assumptions and Issues

10 a.m.-11 a.m  Core Set of Problems with Maps

James Campbell, MD, University of Nebraska, SNOMED-CT© Editorial Board

Mark Tuttle, FACMI, Vice-President
Mapping:
Why is it important?
Why is it so hard?

James R. Campbell MD
October 15, 2005
Overview

• US vocabulary architecture and mapping requirements
• Barriers to implementation of reliable map products
• Features of next generation maps
US Terminology architecture for patient care: Milestones

- November 2003: NCVHS deliberations conclude for content recommendations under HIPAA
- May 2004: HHS announcement of SNOMED CT public funding
US Integrated Model for Terminology Deployment

• Core reference terminology serves central patient care needs of health care systems
• Important clinical code sets not well represented in core modeled and integrated into scheme
• Administrative, statistical and epidemiologic classifications mapped from the core
A reference terminology is a concept-based vocabulary system which employs compositional forms adhering to a logically defined definitional model which is maintained and distributed with the terminology as a knowledge base.
Core Convergent Reference Terminology

SNOMED CT
LOINC
RxNORM / NDF-RT
UMDNS

Information Model

Clinical Code Sets

Core vocabulary model

ICPC
ICFDH

Layer II: Clinical legacy vocabularies modeled to core and mapped back to source

US Integration: Clinical code sets
US Integration: Administrative classifications

Layer III: Administrative classifications mapped from core reference terminologies

Core Convergent Reference Terminology
SNOMED CT
LOINC
RxNORM / NDF-RT
UMDNS

Information Model
ICFDH
Core vocabulary model

Nursing Outcomes Classification
ICD-10
ICD-9CM
ICD-10-CM
CPT*
CDT*
HCPCS*
DSM*
ICPC
MedDRA*
Drug Knowledge Bases
NDC*

Layer III: Administrative classifications mapped from core reference terminologies
What is mapping?

• **Mapping** is the process of creating directed interoperable links from a fully coordinated concept within a reference terminology to one or more codes in a legacy vocabulary or administrative classification.

• Mapping may also refer to creating equivalence links between two legacy systems for purposes of merging or update.
Purpose of mapping?

• Core terminologies work to achieve the vision of a comprehensive and useful vocabulary system to serve clinical care

• However, there are many parties who need to employ that data in vocabulary schemes designed for other purposes:
  – Government
  – Payers
  – Scientists

• Mapping is employed to translate clinical data into alternative representations without compromising the primary clinical mission.
Barriers to successful mapping

- Terminology differences:
  - Scope
  - Editorial policy
  - Differences in granularity
  - Management of context
  - Version control

- Vendor implementation issues:
  - Matching with use case
  - Information model
  - Implementation infrastructure
Technical Barriers to Mapping: Vocabulary Systems

- Terminologies and classifications differ in scope of content.
- Discrepancies in total content may be resolved by clear definition of map domains, however...
- RT statements are often clinically general and may not adhere to definitional requirements of the classification, contributing to:
  - Source of variability in the map
  - Contention between RT and classification editorial use cases
What constitutes an injury?
Technical Barriers to Mapping: Vocabulary Systems

• Terminologies and classifications differ in editorial policies for uniqueness, permanence and definition
• RT seek to uniquely define each concept in the pre-coordinated space with a necessary and sufficient coordination of attributes
• Classifications attempt to sort every concept to a unique category of a mutually exclusive set of categories
• Equivalence mapping may not be strictly possible; proper classification of an RT concept is dependent upon the version of the classification
• NEC defeats any permanent logical definition in a changing environment for standards
287 Purpura and hemorrhagic conditions
  287.0 Allergic purpura
  287.1 Qualitative platelet defects
  287.2 Other nonthrombocytopenic purpura
  287.3 Primary thrombocytopenia
  287.4 Secondary thrombocytopenia
  287.5 Thrombocytopenia unspecified
  288.8 Other specified hemorrhagic condition
  288.9 Unspecified hemorrhagic condition
287 Purpura and hemorrhagic conditions
287.0 Allergic purpura
287.1 Qualitative platelet defects
287.2 Other nonthrombocytopenic purpura
287.3 Primary thrombocytopenia
  287.31 ITP
  287.32 Evans syndrome
  287.33 Congenital and hereditary TP
  287.39 Other primary TP
287.4 Secondary thrombocytopenia
287.5 Thrombocytopenia unspecified
288.8 Other specified hemorrhagic condition
288.9 Unspecified hemorrhagic condition
Technical Barriers to Mapping: Vocabulary Systems

• **Differences in granularity** of classification systems require assumptions / heuristics to deal with this problem
  – Editorial focus organizes classifications for epidemiologic or reimbursement aggregation; reference terminologies define concepts for clinical relevance
  – Procedural decisions in developing equivalence maps are often un-documented and arbitrary
  – Classifications may have inconsistent definitions and conflict with specificity of RT
Granularity issue

Reproducible map requires agreement on clinical assumption of nature of fracture
Technical Barriers to Mapping: Vocabulary Systems

• Classifications have implementation guidelines dependent on **context:**
  – **Patient** co-morbidities (ICD-9 exclusions)
  – **Encounter** information not within patient record (payer constraints)
  – **Episode of care** data (ICD 5\textsuperscript{th} digit extension for episodicity)
Technical Barriers to Mapping: Vocabulary Systems

- Classifications have implementation guidelines dependent on **context:**
  - Patient co-morbidities (ICD-9 exclusions)
  - **Encounter** information not within patient record (payer constraints)
  - **Episode of care** data (ICD 5th digit extension for episodicity)
Technical Barriers to Mapping: Vocabulary Systems

• Classifications have implementation guidelines dependent on context:
  – **Patient** co-morbidities (ICD-9 exclusions)
  – **Encounter** information not within patient record (payer constraints)
  – **Episode of care** data (ICD 5th digit extension for episodicity)
Technical Barriers to Mapping: Vocabulary Systems

- Release schedules, update frequencies and map versioning require a responsive release management strategy.
- Maps change content with new release of either source or target vocabulary.
- Responsive and useful map products require agreement for synchronization of publication cycles, or revision of map with change in either scheme.
Technical Barriers to Mapping: Vendor implementation

• Application of maps is dependent upon the vendor/software **use case**; this is often not clear or inconsistent with map development

• Vendor use cases may span different context-laden scenarios which employ different assumptions regarding approach to mapping
Vendor use case

- Best mapping for epidemiological reporting may be limited for use in reimbursement map
- Context assumptions may be embedded in deployment use case, altering goals of map
- Maps may not be inverted although legacy data conversions require such tools
Technical Barriers to Mapping: Vendor implementation

- Interactions between the reference terminology and the vendor information model create differences in meaning of record instances which are inconsistent with map assumptions.
- Conceptual meaning is only complete with binding of information and vocabulary models.
- No universal static model for clinical information systems is available.
- Such a virtual medical record model is required for unambiguous and reproducible maps.
Information model binding

- V18.0 - “Family history of diabetes”
- V12.2 - “History of diabetes”
- 790.29 - “Risk for diabetes”
- 250.9 - “Complication of diabetes”
Technical Barriers to Mapping: Vendor implementation

- Software infrastructure for implementation of knowledge-based maps is rare:
  - No accepted standard for knowledge representation
  - Vendors employ different utilities for inference and reasoning
Principles moving forward

• Understandable
  – All mappings have stated purpose and audience
  – Map documentation is complete, clear and unambiguous
  – Defines source and target domain scope for the map
Principles moving forward

• Reproducible
  – Employs 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
Principles moving forward

• Useful
  – All mappings have a business case, a purpose and an audience
  – Use cases are defined for the map which are relevant to the implementation of electronic health records
  – Publication cycle is timely and linked to version change for source and target vocabularies
  – Agreement is reached for standards of knowledge representation in mapping
  – Stable business plan supports map creation and maintenance for all NCVHS approved terminologies
QUESTIONS