Terminology Binding in DCM

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Content of presentation

- Importance of standardisation
- What is the meaning of ‘terminology binding’
- Why is terminology binding important
- When terminology binding matters
- Terminology binding in DCM, some examples
- Issues in DCM work
- Conclusion
Importance of standardisation: Languages and synonyms

- **Natural language**
- **Synonyms:**
  - Myocard infarct
  - Cardiac infarct
  - Mi
  - Hb SS disease
  - Sickle cell anemia
  - Hereditary hemoglobinopathy disorder homozygous for hemoglobin S
Ambiguity - Fundus

For a gynecologist: uterus

For an ophthalmologist: eye

For a surgeon during a laparoscopic cholectomy: gall bladder
Illustration with 4 different standards:

- **Lab:** LP14410 - pneumococ (LOINC)
- **PACS:** (DICOM)
- **HA:** R80 - pneumonia (ICPC)
- **ZIS:** 481 - pneumococcen pneumonie (ICD9-cm)
Standardizing vocabulary

- It is not what you say (terms), but what you mean (concept).
- Terminology system: a system that assigns terms and definitions to concepts and objects based on the specification of these concepts and objects.

For instance SNOMED CT
Recording standard, coded data

- Is important to reduce medical errors caused by misinterpretation and misrepresentation of data.
- The clinical data model must be unambiguous to increase the quality and accuracy of the data mapping to terminology codes.

(Qamar et al, 2007)
What is the meaning of ‘terminology binding’

Terminology binding *(noun)*: an instance of a link between a terminology component and an information model artefact.

Examples:

- A set of coded values that may be applied to a particular attribute in an information model. The set may be expressed either explicitly (extensionally) or as a definitional constraint (intensionally).
- The association between a named attribute value in the information model and a specific coded value or expression.
- A rule that determines the way that a coded expression is constructed based on multiple attribute values in the information model.

(Sato & Markwell, NHS)
What is the meaning of ‘terminology binding’

*Terminology binding (verb):* is the process of establishing links between elements of a terminology, for example SNOMED CT, and an information model (Benson, 2010).

Examples:

- Reviewing user-specified information requirements and assigning appropriate code values to express the underlying concepts in a way that enables consistent reusable representation of the required information.
- Assigning a set of code values to a field in an information model to express the range of possible meanings that can be expressed within that field. (Sato & Markwell, NHS)
Why is terminology binding important

- For health record information to be reusable it must be processable in a meaningful way by a variety of different applications
- Reliable interpretation of the meaning of information depends on
  - The way information is structured
    - A common reference information model
  - The way clinical concepts are represented
    - A common clinical terminology
  - The way the terminology is used within the structure
    - A consistent approach to the interface between structural and terminological representations of information

(Sato & Markwell, NHS)
Terminology binding supports reusable meaningful health records

- Requirements for meaningful processing of health record information come from different sources including:
  - Clinicians involved in direct patient care
  - Epidemiologists and researchers
  - Service managers at local and national levels

- To meet these varied requirements the health record content must be represented in ways that encompass multiple perspectives

(Sato & Markwell, NHS)
When terminology binding matters

- Clinical information goes through several life-cycle stages ...
  - Entry, storage, retrieval, display and communication
- These stages affect ways people specify data content requirements
  - A consistent view of terminology binding must support all these stages

(Sato & Markwell, NHS)
Several approaches

- Producing separately packaged subsets of SNOMED for particular usage contexts.
- 'Refsets'; based on a mechanism for tagging a set of terms within the SNOMED database as belonging to a predefined constrained use set. Any term can belong to one or more such Refsets.
- Intension; the set of permissible values for a data point is expressed by a query or formula.
- Query-based terminology binding is usually performed for a specific datapoint in an Archetype.

http://www.openehr.org/wiki/display/healthmod/Archetypes+and+Terminology
Issues in terminology binding

- Several possible ways to express the same meaning -> Terminfo Guide recommendations
- Binding time
- Temporal effects
- The effect of changes to the terminology over time, and how different versions of the terminology can be managed,
- The use of more than one terminology in a DCM

Benson, 2010; http://www.openehr.org/wiki/display/healthmod/Archetypes+and+Terminology
Example terminology binding in DCM: Intolerance & allergy

```
class SNOMED CT Modelling

SNOMED CT Concept
- 404684003 Clinical Finding

has (causative agent)

Causative Agent
- 410607006 Organism
- 105590001 Substance
- 373873005 Pharmaceutical/biological product
- (Physical Object)
- (Physical force)
```
In de DCM staan de algemene top X. Elke specialisme kan een specialistische overgevoeligheden hebben (> meer detail).
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Notes</th>
<th>Constraints and tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anafylaxie Public «enum»</td>
<td>Default: [DCM::DefinitionCode = SCT:39579001 Anaphylaxis ]</td>
<td></td>
</tr>
<tr>
<td>Anafylaxie met angio odeem + uticaria Public «enum»</td>
<td>Default: [DCM::DefinitionCode = SCT:39579001</td>
<td>anaphylaxis</td>
</tr>
<tr>
<td>Anafylaxie met tensie daling Public «enum»</td>
<td>Default: [DCM::DefinitionCode = SCT:39579001</td>
<td>anaphylaxis</td>
</tr>
<tr>
<td>Andere huidafwijkingen Public «enum»</td>
<td>Default: [DCM::DefinitionCode = SCT:127334004 Acute skin disorder (disorder) ]</td>
<td></td>
</tr>
</tbody>
</table>
Assessment tool concept model

**Scale elements**
- Name of the scale
- ‘Topic’ of the assessment
- Scale score
- Scale result interpretation
- Scale sub item score
- Scale sub item finding

**Example**
- Braden scale
- Pressure sore risk assessment
- Braden score
- High risk of pressure sore etc
- Mobility etc
- No limitation (in mobility) etc

Guidance for users of SNOMED CT – Assessment scales, 2010 draft 7
Assigning codes from appropriate SNOMED CT hierarchies

<table>
<thead>
<tr>
<th>Component</th>
<th>Example Term</th>
<th>Hierarchy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of scale</td>
<td>Braden scale</td>
<td>Staging and Scales</td>
</tr>
<tr>
<td>Procedure (assessment of X using Y instrument)</td>
<td>Assessment of pressure sore risk [using Braden scale]</td>
<td>Procedure (is this using = means?)</td>
</tr>
<tr>
<td>Scale score</td>
<td>Braden score</td>
<td>Observable entity</td>
</tr>
<tr>
<td>Scale score interpretation</td>
<td>High risk of pressure sore</td>
<td>Clinical finding</td>
</tr>
<tr>
<td>Scale sub item score</td>
<td>Mobility, Nutrition etc</td>
<td>Observable entity (‘authority dependent concepts’ issue e.g. Braden mobility’)</td>
</tr>
<tr>
<td>Scale sub item finding</td>
<td>no limitation of mobility, at risk of pressure sore etc</td>
<td>Clinical finding</td>
</tr>
</tbody>
</table>
Representing values as findings

- Example A – an instrument item ‘neurological deficit’ with values of:
  - 1 (none)
  - 2 (mild)
  - 3 (moderate)
  - 4 (severe)

  We can say that the score 3 in the context of this instrument represents the concept ‘moderate neurological deficit’.
Representing values as findings

Example B – an instrument item ‘mobility’ with values of:

- none
- partial
- full

In the context of this scale the term ‘full’ represents the concept ‘fully mobile’.
Representing values as findings

SNOMED CT® policy regarding inclusion of enumerated instrument values is as follows:

- **A decision about whether to model complete value sets should be made on a case by case basis depending on user need (clinical utility) and common sense e.g. it would not be sensible to model contextualized values for a ten point pain assessment scale.**
Representing values as findings

- System developers who are setting up assessment screens will need to decide whether they have a use case for assigning SNOMED CT codes to the values, for example, a code is required as it represents a clinically useful concept required in other parts of the application, for analysis or messaging.

- Discussion needs more input
DCM Assessment Pattern

Information Model
Name: Information Model
Author: ZelM
Version: 1.0
Created: 5-3-2010 9:50:24
Updated: 13-8-2010 14:24:08

«rootconcept»
{AssessmentScaleOrScoreName}

«derivation»
{TotalScore}

«enumeration»
{Variable#1}

«enumeration»
{Variable#2}

«enumeration»
{Variable#3}
DCM Assessment Pattern

- Rootconcept = Name of the scale -> Staging and Scales
- Derivation = Scale score -> Observable entity
- Enumeration = Scale sub item score -> Observable entity (‘authority dependent concepts’ issue e.g. Braden mobility’)
- Valueset in Enumeration = Scale sub item finding -> Clinical finding
Issues in DCM work

- HL7 v3: vocabulary
- 5.1.3.2 Unique Meaning Rule
- HL7 International recommends that, whenever possible, a *Value Set be drawn from a single Code System.*
A Value Set Definition can change over time. New codes may be added to or removed from an Extensional Value Set definition, and/or the rules used to construct an intensionally defined Value Set may be changed.

When a Value Set Definition changes, it should be done in a way that ensures both the old and new versions are available for comparison, and for the use of models that explicitly reference the old version.
Conclusions

- For semantic interoperability EHR / HIT systems need to be able to handle terminology.
- Hence, terminology must be bound to information models.
- Terminology binding has rules and issues
- Terminology binding is essential part of DCM
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References

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- Nursing Special Interest Group Snomed CT, (2010). Guidance for users of SNOMED CT – Assessment scales. IHTSDO
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