Do SNOMED CT Relationships Qualify?

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In other words

- Using post-coordination …
  - Is SNOMED CT sensibly complete?
  - Is SNOMED CT completely sensible?
Outline

- Introduction
  - Post-coordination: why and how?
  - Representation of Relationships in SNOMED CT
- Analyses regarding refinability
- Refinability results
- Discussion
- Conclusion
Post-coordination

- SNOMED Pre-RT (e.g., SNOMED 3.5)
  - Axes, e.g.,
    - D – Disease
    - M – Morphology
    - T – Topography
SNOMED Pre-RT Post-coordination

- Freely combine Morphology and Topography axis
  - M-54700 + T-32020 = D3-15000
  - Infarct+ Myocardium = Myocardial Infarction
Post-coordination Problems

- Detection of iso-semantic expressions
  - How to know that
    \[ M-54700 + T-32020 = D3-15000 \]
- Prevention of impossible compositions
  - \[ M-12000 + T-28000 = ??? \]
  - Fracture + Lung = ???
Relationships in SNOMED CT

◆ Defining relationships:
  Myocardial Infarction ≡ disease: {
  associated morphology=infarct,
  finding site=myocardium structure }

◆ Qualifying relationships:
  Severity, Episodicity, Clinical Course
Benefit of new representation

- Explicit relationships enable detection of iso-semantic expressions
- Qualifiers restrict the possibility of post-coordination, enabling prevention of impossible compositions
Refinability analyses

- How do qualifying and defining relationships interact?
- Hypotheses
  - Defining relationships are allowed by qualifying relationships (sanctioning)
  - Post-coordination is limited to sensible compositions
## Material & Method

### SNOMED “Relationships” table (July 2007)

<table>
<thead>
<tr>
<th>Relationships CharacteristicType</th>
<th>0</th>
<th>Defining</th>
<th>This Relationship represents a defining characteristic of the source concept. Hierarchical Relationships (e.g. “IS_A”) are also regarded as defining Relationships.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Qualifier</td>
<td>This Relationship represents an optional qualifying characteristic.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Additional</td>
<td>This Relationship represents a context-specific characteristic. This is used to convey characteristics of a Concept that apply at a particular time within a particular organization but which are not intrinsic to the Concept.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relationships Refinability</th>
<th>0</th>
<th>Not refinable</th>
<th>Not refinable.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Optional</td>
<td>May be refined by selecting subtypes.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mandatory</td>
<td>Must be refined by selecting a subtype.</td>
<td></td>
</tr>
</tbody>
</table>
Results

- Types of Relationships
- Defining Relationships
- Qualifier Relationships
- Interplay between Defining and Qualifier Relationships
Types of Relationships

◆ 61 Relationships + IS A

◆ Usage varies:
  - Finding site: 86,403
  - Time aspect: 1
  - Subject of information: 0
Types of Relationships
Defining Relationships

- *IS A* relationship is always *defining* and not *refinable*
- All other *defining* relationships are *optionally* refinable
Qualifier Relationships

- 2 only used as qualifiers
  - *Episodicity* and *Severity*
- 8 used both as qualifiers and defining
  - *Access*, *Approach*, *Associated Finding*, *Associated Procedure*, *Clinical Course*, *Laterality*, *Priority*, *Using Device*
- 50 only used as defining relationship
Interplay between Defining and Qualifier Relationships

- 2 only used as qualifiers
  - Episodicity and Severity
- 8 used both as qualifiers and defining
- 50 only used as defining relationship
Discussion: Hypothesis I

Are defining relationships allowed by qualifying relationships (sanctioning)?

- Not systematically in SNOMED CT definitions
  “Table 1 contains the allowable Defining Attributes that can be applied to each hierarchy or domain.”
<table>
<thead>
<tr>
<th>Domain</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body structure</td>
<td>Laterality</td>
</tr>
<tr>
<td>Clinical Finding</td>
<td>After</td>
</tr>
<tr>
<td></td>
<td>Associated morphology</td>
</tr>
<tr>
<td></td>
<td>…</td>
</tr>
<tr>
<td></td>
<td>Causative agent</td>
</tr>
<tr>
<td></td>
<td>…</td>
</tr>
<tr>
<td></td>
<td>Subject of information (!)</td>
</tr>
</tbody>
</table>
Hypothesis II

- Is post-coordination limited to sensible compositions?
  - No guarantee, in many cases the target of qualifiers is generic (e.g., access: surgical access values)

  procedure on foot:
  access =

  minimal access approach via frontal sinus
Conclusion

- Using post-coordination …
  - Is SNOMED CT sensibly complete?  NOT YET
  - Is SNOMED CT completely sensible? NOT YET

- But…
SNOMED CT beyond the horizon
SNOMED CT beyond the horizon

Cliffs of insensible postcoordination can be sailed around

Get the lighthouse man from the documentation into the model
There is a (e)Healthy SNOMED CT beyond the horizon

Get IT there!