User-Directed Coordination in SNOMED CT

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"With great power comes great responsibility"
~Voltaire
The power of ... coordination

- **Pre-coordination**
  - concepts that have a **single** concept identifier
  - **37871000** (acute hepatitis)
- **Post-coordination**
  - expressions of **combined** concept identifiers
  - **128241005 : 263502005 = 90734009**
  - (hepatitis : clinical course = chronic)
- **User-directed coordination**
  - **User** represents a clinical concept using a set of concepts
Responsibilities

- To create sensible and consistent interfaces
  - What options to offer users to allow refinement of specific concepts
  - How to represent the meaning that results from selecting options on a structured data entry form as a SNOMED CT expression
  - (How to encode meaning derived from natural language processing)
percutaneous endoscopic insertion of gastrostomy tube using fluoroscopic guidance
Using access device: bronchoscope
Direct device: balloon gastrostomy tube
Procedure site: camelid stomach compartment 2

*percutaneous bronchoscopic insertion of balloon gastrostomy tube into camelid stomach compartment 2 using fluoroscopic guidance*
Fine enough?

- Hepatitis: clinical course = chronic
- Is this the same as chronic hepatitis?
Structured data entry forms

Severe non-proliferative diabetic retinopathy: Finding site = structure of retina of right eye
Clinically significant macular edema: finding site = 

{macula lutea structure: laterality = right}, 
associated with: diabetes mellitus
Structured data entry forms

<table>
<thead>
<tr>
<th>Diagnosis:</th>
<th>OD</th>
<th>OS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Diabetic Retinopathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Proliferative Diabetic Retinopathy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mild</td>
<td>□</td>
<td>□</td>
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<tr>
<td>Moderate</td>
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<td>□</td>
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<tr>
<td>Severe</td>
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<tr>
<td>Proliferative Diabetic Retinopathy</td>
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<tr>
<td>Clinically Significant Macular Edema</td>
<td>□</td>
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</tr>
</tbody>
</table>

severe nonproliferative diabetic retinopathy with clinically significant macular oedema: finding site=

{macula lutea structure: laterality = right}
In short (so far)

- A (technically) correct post-coordination is not necessarily sensible
  - Options offered to users should be sensible
- A (technically) correct post-coordination is not necessarily complete
  - Think of chronic hepatitis
  - Try “Acute infective gastroenteritis due to Norwalk virus” at home
- A simple entry form may pose challenges
RESPONSIBILITY

You made the mess, you clean it up
Fine-grained constraints on the values that are sensible in a given context

Can be realized by specification of so-called "relationship refinability reference sets"
Tooling for post-coordination

if
(clinical course == chronic) AND
(associated morphology == inflammation)
then
associated morphology := chronic inflammation

Classifier for hierarchical placement of post-coordinate concept
Dealing with forms

- Rules are needed taking into account
  - Context (e.g., diabetes)
  - Combinations
  - Exclusion / absence (e.g., “no retinopathy”)

- Consistency of SNOMED CT is crucial
  - In July 2012 release, alternative approaches fail
Conclusion

- Post-coordination is powerful
- Hard to provide guidance in construction of complete and correct expressions
- Post-coordinate expressions need to be evaluated
- SNOMED CT content requires further improvement to ensure consistent modeling