Alpha Prototype File Release of LOINC - SNOMED Cooperation Project

18 April 2014

Introduction
One goal of the LOINC - SNOMED Cooperative Project is to provide relationships between laboratory LOINC terms and SNOMED CT concepts through the creation of equivalent SNOMED expressions that follow the draft SNOMED Observables model (see section "Draft SNOMED Observables model" below). We have produced an alpha prototype of 117 LOINC terms for community review to assist us in evaluating our model and proposed plan for creating appropriate links. Please note that this version of the prototype is focused on content development and issues rather than on implementation and delivery formats. The final product will be released in a sanctioned SNOMED distribution format (not necessarily an OWL file).

How to provide feedback
We would appreciate feedback on our approach to link LOINC and SNOMED. Please provide comments on the content of this prototype to Kent Spackman (ksp@ihtsdo.org), Farzaneh Ashrafi (fas@ihtsdo.org) or Suzanne Santamaria (ssa@ihtsdo.org) using the standard IHTSDO feedback form. Questions about implementation of work resulting from this project should be directed to David Markwell (dma@ihtsdo.org).

Please provide feedback by 20 June, 2014.

Where to find the alpha prototype
The alpha prototype is in an OWL file named obsAlpha.owl located in the SNOMED CT International Releases - Other Releases area of CollabNet (IHTSDO's collaborative document management system). Please download this file and save it on your computer.

A spreadsheet containing the 117 LOINC terms from the OWL file, titled "LOINC-SNOMEDalphaPrototype.xlsx", is also available on CollabNet. Headers of columns D through K are SNOMED attribute names for which the appropriate value is listed in the cell. All LOINC terms in the sheet are subtypes of 363787002 | Observable entity (observable entity) in SNOMED. Comments are included for further consideration.

Why are we using an OWL file?
One of the benefits of creating the prototype as an ontology in an OWL file is the application of description logic to LOINC terms and use of a reasoner to highlight additional classifications of terms. We will work to correct the identified issues as the project progresses. This is expected to help people apply LOINC lab codes more correctly to existing test dictionaries because we will identify and correct semantic issues that could not be found through manual review.

How to view the alpha prototype OWL file

1. You will need a piece of software capable of importing OWL data. Most commonly people use a free open source package called **Protege.** It can be installed on your computer to view the file and classify the content. To get Protege, go to http://protege.stanford.edu/ and navigate to Downloads. You will need to pick the correct download version for your computer (Mac vs PC, with or without Java Virtual Machine, etc.). Information about which version to choose are available on this site.

2. Open Protege on your computer and go to *File - Open* then find the alpha prototype OWL file wherever you stored it on your computer. Once the file opens click on the *Entities* tab - *Class hierarchy* to see the concepts in the file. Note that the LOINC terms are subtypes of "Observable entity" in this file. Concepts used to define the LOINC terms are subtypes of other hierarchies in this file (e.g. "Material entity," "Technique," etc.)
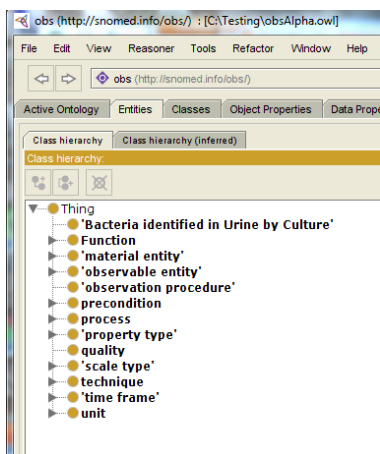
3. Click open the arrows next to the concepts to view subtypes. Click on a concept to highlight it and then look at that concept definitions in the right hand side of the screen. These definitions align with the draft SNOMED Observables model. Comments about terms can be seen on the right hand side of the screen under "Class Annotations."

4. Classify the content with a reasoner
   a. At the top of frame go to *Reasoner* and choose a reasoner (e.g. Hermit, Snorocket, ELK). Note that the reasoner may need to install updates the first time

you open **Protege**. It will likely be necessary to close **Protege** and reopen it for the updates to take effect.

b. Go to *Reasoner* and click *Start reasoner*. When the reasoner finishes classifying, click on the *Entities* tab - *Class hierarchy (inferred)* to see the results of the classification. You will now see that some concepts inferred a different (more specific) concept as a supertype. See the example below where multiple cholesterol terms are now subtypes of "Cholesterol [Mass/volume] in Serum or Plasma" whereas prior to reasoning they were siblings.
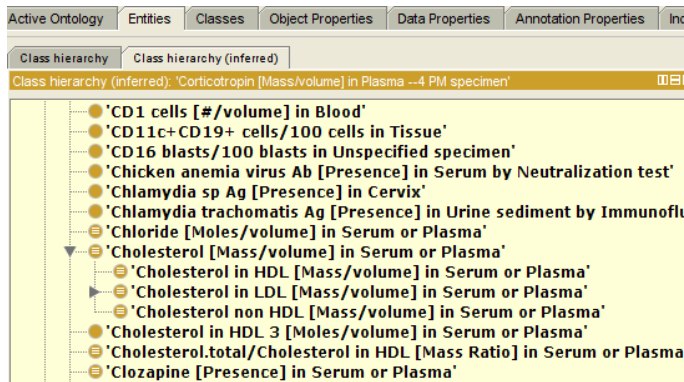
Desired feedback

Please review the LOINC term definitions and the inferred hierarchy under "Observable entity" which results from running the reasoner. We are seeking feedback regarding any existing issues (with the exception of spelling mistakes, minor formatting) that you can identify. Some of our comments are included as annotations in the file. We are also seeking specific feedback on some issues that we believe may be problematic:

● Some of the inferences appear incorrect, e.g. the LOINC term "Cholesterol in HDL [Mass/volume] in Serum or Plasma" is being classified as a subtype of "Cholesterol [Mass/volume] in Serum or Plasma" in this version. But LOINC term "Cholesterol [Mass/volume] in Serum or Plasma" really referring to total cholesterol in which case it should not be a supertype of a test for HDL only. This would be corrected by future modifications that properly represent the semantics

Source of material

The data set that served as the basis of LOINC terms for this alpha prototype was a list of top 200 laboratory tests in use by Kaiser Permanente (KP). We excluded 83 tests for the following reasons: were duplicates, were not LOINC terms, were not in the top 2000 LOINC terms (US or SI version), or were not lab tests.

The prototype is a result of execution of a test plan developed by the IHTSDO. Participants in the test plan included Kent Spackman (IHTSDO Head of Terminology), Farzaneh Ashrafi (IHTSDO Terminologist), Suzanne Santamaria (IHTSDO Senior Terminologist), Bruce Goldberg (Kaiser Permanente Allergist) and Michael Smith (Kaiser Permanente CMT Laboratory Terminologist).

The plan applied the IHTSDO Quality-Assurance Framework for testing *Function* and *Reproducibility*.

We appreciate the contributions of the test material by KP and participation of the KP editors in completing this test plan.

Draft SNOMED Observables model
Linking LOINC terms to SNOMED concepts in the alpha prototype comports with the draft SNOMED Observables model. Diagrams of the model are shown below. Note that this model and the alpha prototype contain nesting whereas the final product of this work may or may not contain nesting. Also note that all the LOINC terms in this alpha prototype have the LOINC part "Time aspect" with the value of "Point in time." When translating to the SNOMED observables model, all these terms result in an observable that is about an entity that necessarily exists at a single point in time (an ontological "dependent continuant"). Thus "point in time" is already implied and does not require an additional object property in the observables model to represent it. Future releases of the prototype will contain LOINC terms where "Time aspect" is something other than a point in time, e.g. the time aspect is over a 24 hour period, and these will utilize the "process duration" object property to represent the time aspect.

Combined models for | observable entity | and | observation procedure |
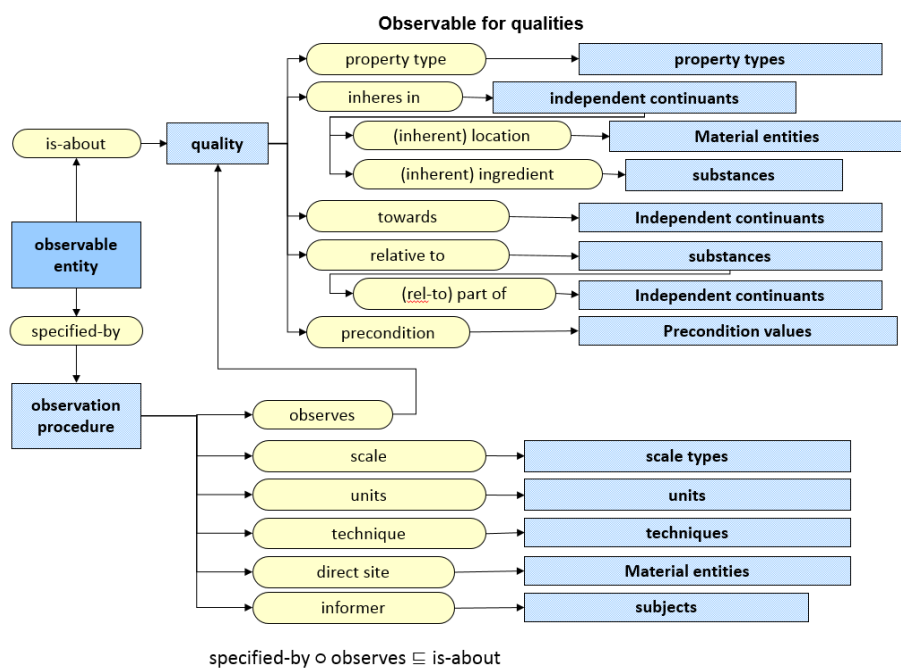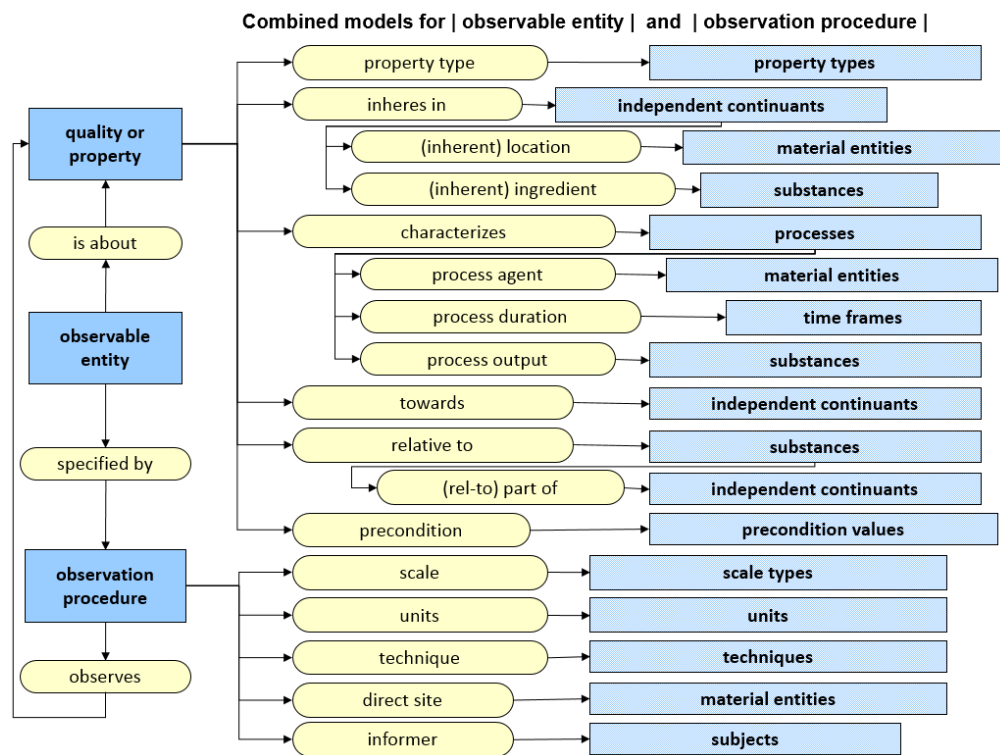
References

1. The International Health Terminology Standards Organization (IHTSDO): http://www.ihtsdo.org/
2. Information about LOINC - SNOMED CT cooperative agreement: http://www.ihtsdo.org/about-ihtsdo/governance-and-advisory/harmonization/loinc
3. IHTSDO CollabNet: https://csfe.aceworkspace.net/sf/sfmain/do/home
4. Alpha prototype release file of LOINC - SNOMED Cooperation Project: https://csfe.aceworkspace.net/sf/frs/do/viewRelease/projects.snomed_ct_international_releases/frs.3_other_releases.loinc_snomed_alpha_prototype
   a. Note that downloading this file requires being a user in the SNOMED CT International Releases project on CollabNet. If you are not yet a user of this project on CollabNet, please request addition through the site.
5. Logical Identifiers Names and Codes (LOINC): http://loinc.org/
6. Draft SNOMED Observables Model described in a PowerPoint presentation titled "Observables model in the context of the concept model" (https://csfe.aceworkspace.net/sf/go/doc9931?nav=1)
   a. Note that viewing this presentation requires being a user in the Observable and Investigation Model Project on CollabNet. If you are not yet a user of this project on CollabNet, please request addition through the site.
7. "LOINC – SNOMED CT Cooperation Project Test Plan - Phase I" (doc9923 on CollabNet): https://csfe.aceworkspace.net/sf/go/doc9923?nav=1

a. Note that downloading this file requires being a user in the Observable and Investigation Model Project on CollabNet. If you are not yet a user of this project on CollabNet, please request addition through the site.