LOINC MAPPING GUIDELINE:

Laboratory

LOINC

Introduction videos: https://loinc.org/videos/

LOINC is a terminology for laboratory tests, developed by the Regenstrief Institute. Each LOINC code represents a "question" for a test or measurement and it consists of a unique combination of six data elements or axes (Figure 1): the component, the property, the time, the system, the scale and the method.

Component (Analyte)

The Component is the primary part of the LOINC name. It names the "thing" that is being measured. Examples of components are "Glucose", "Sodium" and "Hematocrit". For component subclasses, LOINC uses a "dot notation", for instance, "Calcium.ionized". Another optional information provided by the Component is the "challenge" (or loading or tolerance) substance and period of time between its administration and the test. The challenge information is specified after a "^".

Property

The property is the kind of quantity that is being measured in the test.

The main property categories are:

- **Mass**: Observations reported with mass in the numerator of their units.
- **Substance**: Observations reported with moles or milliequivalents in the numerator of their units.
- **Catalytic activity**: Observations that report enzymatic activity have properties that begin with catalytic.
- **Arbitrary**: Results that report arbitrary units in the numerator of their units of measure.
- **Number**: Results associated with properties that begin with number of counts, e.g. a white blood cell count reported as number of WBCs divided by volume of blood, would have a property of Number Concentration.

The main category subtypes are:

- **Concentrations**: An amount divided by a volume
- **Contents**: An amount divided by a mass
- **Ratios**: A measure divided by another one taken from the same system
- **Fractions**: Ratios of a part over a whole. E.g. Creatinine kinase.MB/Creatinine kinase.total
- **Rates**: A measure per a time period.

Time

The Time Aspect specifies the interval of time over which the observation or measurement was made. For the vast majority of LOINC terms (96%), the *Timing* is simply "point in time" (Pt)

System (Specimen)

The *System* indicates the specimen type or "unit of analysis" upon which the observation was made. For laboratory tests, the *System* includes familiar specimens, such as Serum, Serum/Plasma (used when testing serum or plasma is clinically equivalent), Urine, CSF, (whole) Blood, etc.

Scale

The Scale distinguishes quantitative measurements from qualitative ones. The different possibilities of LOINC Scale are:

- **Quantitative**: Tests that can be reported as an integer, ratio, real number or range
- **Ordinal**: Test results can be placed in a rank (e.g. 1+, 2+, 3+; mild, moderate, severe; negative, positive).
- **Nominal**: Test values belong to an unranked collection (e.g. bacteria species or genetic variations).
- **Document**: The result is a discharge summary or a report
- **Narrative**: The result of the test is other kind of text.

Method

The Method is the only axis of LOINC that is optional. LOINC distinguishes observations by Method only when it affects the clinical interpretation or when different techniques produce significantly different normal ranges or test sensitivities.

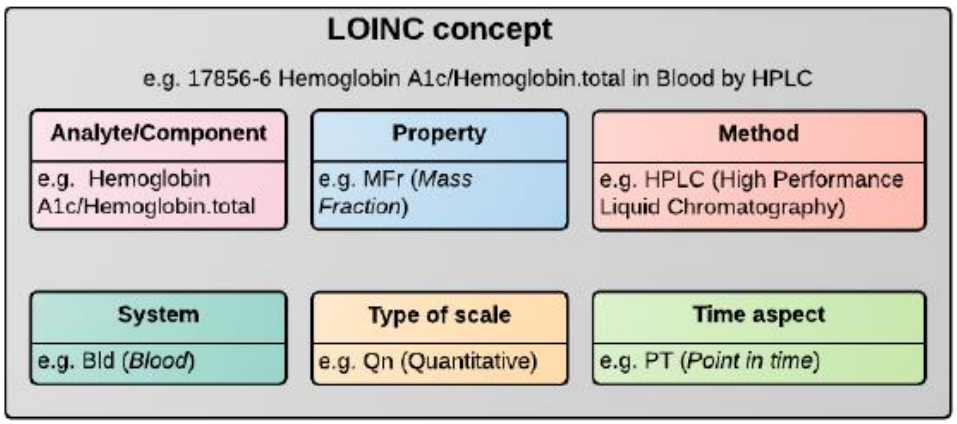

Figure 1. Diagram of LOINC concepts structure

Laboratory mapping

Catalogue preparation

The first step of the laboratory mapping is the integration of all the catalogue data provided by the hospital in a catalogue into a standard structure. For this task, the mapper must collect the following information:

- **Local codes**: The unique identifiers of the hospital tests.

- **Local labels**: The descriptions associated to the local codes. This text is used to describe the laboratory tests. It is essential that it includes the *Component* and the *Specimen* information. It is quite desirable that it also includes the *Property* (although most times it can be guessed from the unit), the *Method* and the *Time* aspect, when it is not a "point in time" test.
- **Units**: Unit information, it is highly useful to identify the *Property*, and *Scale* values of a laboratory test.

Mapping rules

Mapping a laboratory test consists in finding the best translation to LOINC for that test. Due to the lack of standardization of laboratory systems, this task can be quite challenging so the mapper must try to stick as much as possible to the following rules:

- First, the mapper must search the LOINC concept that matches exactly the local laboratory test description. It is mandatory that the *Component* and the *System* are explicitly the same. The *Property* and *Scale* are hardly explicitly provided in the source files, but most of the times they can be guessed from the unit. The *Time* aspect and the *Method* must either match or be missing in both local and LOINC concept to consider the map as an exact match. Exact match mappings are identified with the symbol "=" in the "Mapping relation" field.
- If an exact match cannot be found, a broader or an approximate match will be looked for. This can be done using different strategies, which ranked by descending priority are:
    - If the exact match cannot be found because the local concept is more specific than any LOINC concept, the local code must be mapped to LOINC concept with the closest meaning and the "Mapping relation" must be set to ">".
    - If the exact match cannot be found because the local *System* is not provided or not present in LOINC, the map must be set to the LOINC concept with the closest meaning and with "Body fluid" or "Unspecified specimen" as *System* and the "Mapping relation" must be set to ">".
    - If the mapping is from a local concept to a LOINC concept whose only difference is the *Property* value and both properties are compatible (there is a conversion formula between their units) the mapping is admissible and the "Mapping relation" must be set as "~".
    - If the *Component* of the local concept is not exactly the same as the LOINC concept with the closest meaning, it must be mapped to this LOINC code and the "Mapping relation" must be set as "~".

LOINC website search tool

LOINC website search tool is available in https://search.loinc.org/searchLOINC/. The mapper needs to introduce his LOINC credentials to have access to it. This tool requires the user to enter manually the search text, so it will be useful only when a small number of queries are needed.