Briefing Note for the MF, CMAG, EAG, and Clinical Leads

27 November 2023

Changes to 706437002 |Container (physical object)| and the physical object MRCM

Purpose

To expand the MRCM for the Physical object hierarchy.
Goals:

1. Enable pre-coordination and post-coordination of prefabricated specimen containers (e.g. which contain coating, separator and additives that have been applied by the manufacturer)
2. Enable pre-coordination and post-coordination of specimens linked to a particular container and/or containing additives.
3. Reorganize existing content pertaining to container types, removing duplicate concepts and improving definitions of the remaining concepts. This includes the substance hierarchy with respect to coating and additive substances.

Background

Several SNOMED member countries, including Czech Republic, the Netherlands and Sweden, have identified a requirement to specify specimen container types in more detail than is currently available in SNOMED. It should be possible to link these container types both to the specimen they contain or are meant to contain, and to any additives that were added during production of the container or to facilitate analysis of the specimen. This requires a change in, or rather an extension of, the machine-readable concept model.

These countries have collaborated in the X-eHealth project to design a proposal for this change, which is outlined in this briefing note.

Currently SNOMED contains separate concepts for 706437002 |Container (physical object)| and 434711009 |Specimen container (physical object)|. We believe this distinction is unhelpful. The only thing that makes a container a specimen container is the fact that it contains a specimen, which may not be known in advance. In forensics, many different types of objects can act as specimen containers, making it difficult to draw a clear line between a specimen container and other containers.

The current MRCM allows the following property types for physical object:

- *Has coating material* (range substance; cardinality 0..1). A coating protects the sample from the compositional material of the container; only use the attribute for that purpose. That means it does not apply to many blood tube coatings, which are meant to mingle with the specimen. We recommend that the editorial guidance is enhanced to state that the coating may be on the interior or the exterior of a container surface.
- *Has compositional material* (range substance, cardinality 0..*). Can be used to distinguish a glass from a plastic test tube.
- *Is sterile* (range boolean, cardinality 0..1). This attribute could be used to model sterile subtype concepts for microbiology containers that are not necessarily sterile, e.g. urine containers for 24 hour collection.
- Unlikely to be used to model containers:
    - *Has device intended site*: used for defining implants and catheters.
    - *Has filling*: used to model for instance the filling of a breast implant, thus different from an additive substance.
    - *Has surface texture:* has not come up in the requirements analysis

Issues

The lack of a concept model for containers as well as support for specimens in containers makes curation difficult and prevents the effective use of these hierarchies for analytics.

Next Steps

Change the MRCM for physical objects by adding the following properties:

- *Has additive*
    - Summary: This attribute represents a substance that is intended to mix with a sample, e.g. a fluid, granular substance or spray coating on the inside of a container. An additive can be added to a container at time of manufacture, or to a specimen while or after the specimen is added to the container.
    - Domain: < 706437002 |Container (physical object)| & < 123038009 |Specimen (specimen)|
    - Range: < 105590001 |Substance (substance)|
    - Cardinality: 0..*
- *Has separator*
    - Summary: This attribute represents a separator, something that is intended to separate parts of the sample. A separator can be a substance, such as a gel separator, but also a mechanical separator, such as a plastic barrier.
    - Domain: < 706437002 |Container (physical object)|
    - Range: < 105590001 |Substance (substance)| & < 260787004 |Physical object (physical object)|

    - Cardinality: 0..1
- *Intended content*
    - Summary: This attribute represents the type of specimen that the container was meant for by its manufacturer. This attribute is necessary to sufficiently define intermediate primitives such as 706049005 |Blood tube (physical object)| or 706054001 |Urine specimen container (physical object)|.
    - Domain: < 706437002 |Container (physical object)|
    - Range: < 105590001 |Substance (substance)|
    - Cardinality: 0..1
- *In container*
    - Summary: This attribute can be used to link a specimen to its container.
    - Domain: 123038009 |Specimen (specimen)|
    - Range: 706437002 |Container (physical object)|
    - Cardinality 0..1

These changes will support the following inference:
If <specimen, in container, container> AND <container, has additive, substance>
THEN
<specimen, has additive, substance>

Remodel current content as follows:

1. Use 706437002 |Container (physical object)| as the grouper concept for all container types.
2. Inactivate 434711009 |Specimen container (physical object)| and 706041008 |Device for body fluid and tissue collection/transfer/processing (physical object)| as non-conforming to editorial guidelines & replaced by 706437002 |Container (physical object)|.
3. Move <<337386000 |Test tube (physical object)| and <<706046003 |Specimen receptacle (physical object)| under 706437002 |Container (physical object)|.
4. Identify any other concepts in the 260787004 |Physical object (physical object)| hierarchy that should be moved under 706437002 |Container (physical object)|, e.g. 469844003 |Ampule (physical object)|.
5. Remodel all concepts in the 706437002 |Container (physical object)| branch according to the new MRCM. The relevant subhierarchies we have identified contain 176 concepts.

Add a number of container type concepts to support the requirements identified by the X-eHealth project. We will submit a project plan for a new working group, similar to the micro-organism working group, which will focus on promoting content from the extensions of participating countries prior to new content being added.

Additional questions

1. The attribute *intended content* is meant to reduce the number of intermediate primitives by enabling us to model containers such as *blood tube* and *urine container.* There is a strong use case for these concepts; they appear in container lists of at least three separate countries. However, it has been noted that the proposed attribute *intended content* is not necessarily true, because other substances could be added to the container (e.g. body fluid in a blood tube). On the other hand, there is precedence in the attributes 836358009 |Has device intended site (attribute)| and 736474004 |Has dose form intended site (attribute)|.

Should we include this attribute? Is there another way to reduce the number of intermediate primitives?

2. What are the pro's and con's of adding the attribute *in container*?
3. Will the proposed model be sufficient to model the container concepts in your edition?

Recommendations

Request: Comments and questions from the SNOMED Advisory Groups and Community of Practice on this proposal as well as potential impacts on existing implementation. Send comments and questions to the Chief Terminologist (jca@snomed.org) by December 15, 2023

Approvals	**Date**	**Name**
Chief Terminologist	2023-11-07	James T. Case
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Daniel Karlsson, Feikje Hielkema, 2023-11-07