SNOMED CT Editorial Guide

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These guidelines should be applied to new content. While there are many concepts in the existing content that are not in compliance with this guidance, the process of correcting existing content will be carried out as time and resources permit.

The Editorial Guide provides the information necessary to model concepts in SNOMED CT. It is a working document, subject to change and revision. The primary audience is for those who edit content in the International Release, but it may also be useful to those creating extensions. For those editing in extensions, please also see guidance within the Extensions Practical Guide[1].
SNOMED CT is distributed in sets of electronic files. Supporting software tools are not necessarily provided directly by SNOMED International.

Welcome to http://snomed.org/eg

Video introduction to the Editorial Guide[2]

Summary of changes[3]*

> **Changes on this spreadsheet may include those in progress for a future publication date. The in-progress changes are available for viewing but will not be visible in the Editorial Guide until the next publication. Please note dates in bottom tab.*

The Editorial Guide publishes only the rules that apply to precoordinated content. That is, the rules where the 'Content Type' is one of the following - |All SNOMED CT content|, |All precoordinated SNOMED CT content|, or |All new precoordinated SNOMED CT content|. The rules that are **not** published in the Editorial Guide are the ones that apply only to |All postcoordinated content|. See the different content types and rules in the MRCM maintenance tool at https://browser.ihtsdotools.org/mrcm.

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1 https://confluence.ihtsdotools.org/display/DOCEXTPG/Extensions+Practical+Guide
2 https://drive.google.com/file/d/1OuQixcCCM1N-BuKxTH6LDfvggTB1NJM7/view?usp=sharing
3 https://docs.google.com/spreadsheets/d/1xHZNeNQwkCcUPaZGEl28GFGv_WMTHZoeHeAV5cSjOFU/

4 http://www.ihtsdo.org/
5 mailto:info@ihtsdo.org

1 SNOMED CT Introduction

1.0.1 What is SNOMED CT?

SNOMED CT is a high-quality, comprehensive, international, logic-based reference terminology that is used to present clinically relevant information. It began with the union of NHS Clinical Terms Version 3 and SNOMED RT; this provided the initial scope which has since been updated to reflect contemporary clinical practice and changes in medical technology.

Content development is provided by expert clinicians driven by the requirements of user communities. This includes core content for use internationally and content relevant to national extensions for local implementation.

Its logic-based definitions represent terminological knowledge, or what is always true about the meaning of concepts. It consists of codes, that correspond to concepts, arranged in a polyhierarchical manner, as well as relationships between the concepts, which further define the meaning.

Description logic

Description logic (DL) is the formal foundation of meaning in SNOMED CT. The way that concepts have been modeled in SNOMED CT permits them to be represented using description logic. A DL *reasoner* is used to classify SNOMED CT. The DL reasoner also helps test expressions for subsumption and equivalence.

1.0.2 Why use SNOMED CT?

It supports semantic interoperability and multi-purpose use within electronic health applications (primarily electronic health records or EHRs) and has many advantages over other terminologies. They include:

- Consistent, and formal expansion of, content through centralized authoring and maintenance (International Release)
- Flexibility to meet most terminological requirements based on national, regional, language, application, or customer (Extensions)
- Clear, singular meaning of concepts
- Reliable, consistent, and reproducible clinical documentation
- Enhanced high-quality healthcare delivery to individuals and populations

1.1 Intended Use

SNOMED CT is intended to be used in healthcare:

- To provide effective and comprehensive coverage of terms
- As a terminological resource
- For implementation in electronic health applications

The purpose of SNOMED CT is to represent clinically relevant information reliably and reproducibly in electronic health applications, (most often electronic health records or EHRs) to support:

- Delivery of multidisciplinary, high-quality healthcare to individuals and populations
- Optimal retrieval, processing, and rendering of clinical information
- Effective use of clinical information consistently and reproducibly
- Use of clinical information for statistical and reporting purposes

1.1.1 Semantic Interoperability

The overall semantic interoperability of electronic health applications is achieved through the combined functioning of the information architecture of the application and the terminology that populates it. A basic principle of SNOMED CT is to create and maintain semantic interoperability of clinical information. *Semantic interoperability* is the capability of two or more systems to communicate and exchange information. Each system should be able to interpret the meaning of, and effectively use, received information. To achieve this goal, the meaning of the information must be agreed upon, consistent, and clearly expressed.

Context

Context is an important part of representing clinically relevant information.
When entered in an EHR, concepts in the Procedure and Clinical finding hierarchies have the following default contexts.

- The procedure has actually occurred (versus, e.g. being planned or cancelled) or the finding is actually present (versus, e.g. being ruled out or considered)
- The procedure or finding refers to the patient of record (versus, e.g, a family member)
- The procedure or finding is occurring now or at a specified time (versus some time in the past)

When a concept is entered into an EHR, the information in the health record structure or its information model, can provide the context.
In addition to using the record structure to represent context, there may be a need to override the defaults and specify a particular context using the formal logic of the terminology. For that reason, SNOMED CT has developed a context model, i.e Situation with explicit context, to allow users and/or implementers to specify context using the terminology, without depending on a particular record structure. The Situation with explicit context hierarchy, and various attributes assigned to concepts in the hierarchy, accomplish this.

Guidance for Electronic Health Application Users

Designers and implementers of electronic health applications need guidance to identify which fields within their record structure will critically affect the meaning of concepts. They require open strategies to preserve meaning if concepts are retrieved or transferred and to allow detection of equivalence to constructs derived from alternative approaches.

(see also *Situation with Explicit Context* section)

1.2 Structure of Domain Coverage

SNOMED CT includes 19 *domains* arranged in a polyhierarchical structure. Each hierarchy is an ordered organization of concepts linked together through *IS A relationships*. Each concept may have one or more parents.

The hierarchical arrangement is helpful for locating concepts, grouping similar concepts, and conveying meaning. For example, if we see the concept *cell* under the concept *anatomic entity* we will understand the intended meaning as different than if it appeared under the concepts *room* or *power source* (Desiderata for Controlled Medical Vocabularies in the Twenty-First Century by J.J. Cimino published in *Methods of Information in Medicine* 1998:37:394-403).

Concepts are linked to their more general parent concept codes directly above them in a hierarchy. Concepts with more general meanings are usually presented as being at the top of the hierarchy and then at each level down the hierarchy, the meanings become increasingly more specific or specialized.

The domains contain all of the components (clinical, administrative, database structure, as well as other components that express how the domains relate to each other) necessary to create SNOMED CT concepts and maintain the database structure.

Definition	Notes	Examples
A *domain* is a set of concepts which the Concept Model permits to be defined or refined, using a particular set of attributes and ranges[6] Some domains do not have attributes and ranges but may if a concept model is created	A domain, to which an attribute can be applied, is typically defined to include concepts in one or more branches of the subtype hierarchy	The domain of 116676008 | Associated morphology (attribute)|[7] is defined as subtype of 404684003 | Clinical finding (finding)|[8] The range of values of 116676008 | Associated morphology (attribute)|[9] is subtypes of 49755003 | Morphologically abnormal structure (morphologic abnormality)|[10]

The following table lists the domains, definitions, and examples. *Those without a concept model are marked with an asterisk.

Domains			
	Domain/Top-level Hierarchy (alpha-sorted)		Examples
1	Body Structure	• Anatomical or acquired body structure • Morphologic abnormality (subtype of body structure)	• 450807008 | Entire back (body structure)|[11] • 52988006 | Lesion (morphologic abnormality)|[12]
2	Clinical Finding	• Clinical finding: normal/abnormal observations, judgments, or assessments of patients • Disorder: always and necessarily an abnormal clinical state	• 39579001 | Anaphylaxis (disorder)|[13] • 167222005 | Abnormal urinalysis (finding)|[14]

6 https://confluence.ihtsdotools.org/display/DOCGLOSS/range
7 http://snomed.info/id/116676008
8 http://snomed.info/id/404684003
9 http://snomed.info/id/116676008
10 http://snomed.info/id/49755003
11 http://snomed.info/id/450807008
12 http://snomed.info/id/52988006
13 http://snomed.info/id/39579001
14 http://snomed.info/id/167222005

Domains			
3	Environment and Geographical Location*	• Environment: types of environments • Geographical Location: named locations such as countries, states, or regions	• 405607001 | Ambulatory surgery center (environment)|[15] • 223581004 | China (geographic location)|[16]
4	Event	• Occurrences impacting health or health care; not procedures or interventions	• 242039002 | Abuse of partner (event)|[17] • 2641000119104 | Exposure to chlamydia (event)|[18]
5	Observable Entity	• Information about a quality/property to be observed and how it will be observed	• 423493009 | Age at diagnosis (observable entity)|[19] • 416125006 | Concentration of hemoglobin in erythrocyte (observable entity)|[20]
6	Organism*	• Organisms of significance to human and animal medicine; use in modeling cause of disease	• 3265006 | Genus Candida (organism)|[21] • 710877000 | Beta lactam resistant bacteria (organism)|[22]
7	Pharmaceutical/ Biological Product	• Drug products (not Substances)	• 400687000 | Infliximab 100mg/vial powder for reconstitution injection (product)|[23] • 317222006 | Product containing only cimetidine 200 mg/1 each oral tablet (clinical drug)|[24]

15 http://snomed.info/id/405607001
16 http://snomed.info/id/223581004
17 http://snomed.info/id/242039002
18 http://snomed.info/id/2641000119104
19 http://snomed.info/id/423493009
20 http://snomed.info/id/416125006
21 http://snomed.info/id/3265006
22 http://snomed.info/id/710877000
23 http://snomed.info/id/400687000
24 http://snomed.info/id/317222006

Domains			
8	Physical Force*	• Forces applied to the body that may cause injury	• 57955009 | Hot weather (physical force)|[25] • 285719001 | Mechanical abrasion (physical force)|[26]
9	Physical Object*	• Physical devices relevant to health care, or to injuries/accidents	• 15237007 | Sitz bath chair, device (physical object)|[27] • 69861004 | Firearm, device (physical object)|[28]
10	Procedure	• Procedure: activities performed in the provision of health care (includes medical history-taking, physical examination, diagnostic and therapeutic interventions, training and education, and counseling) • Regime/therapy (subtype of procedure): set of procedures focused on a single purpose on one patient over time (e.g. repeated administration of drug in a small dose for an indefinite period of time)	• 54321008 | Cardiac flow imaging (procedure)|[29] • 386513007 | Anesthesia management (regime/therapy)|[30]
11	Qualifier Value*	• One of several possible values for an attribute used to define concepts	• 90734009 | Chronic (qualifier value)|[31] • 255412001 | Appearances (qualifier value)|[32]
12	Record Artifact*	• Clinical documents, or parts thereof	• 445673000 | Original report (record artifact)|[33] • 41000179103 | Immunization record (record artifact)|[34]

25 http://snomed.info/id/57955009
26 http://snomed.info/id/285719001
27 http://snomed.info/id/15237007
28 http://snomed.info/id/69861004
29 http://snomed.info/id/54321008
30 http://snomed.info/id/386513007
31 http://snomed.info/id/90734009
32 http://snomed.info/id/255412001
33 http://snomed.info/id/445673000
34 http://snomed.info/id/41000179103

Domains			
13	Situation with Explicit Context	• Concepts that include context information; a subtype of the situation to which it applies with an attribute associating it with the relevant clinical finding or procedure • May be used to represent conditions/ procedures that already occurred, haven't yet occurred, or refer to someone else (not patients)	• 169589005 | Antenatal care: history of infertility (situation) [35] • 407565004 | Angiotensin II receptor antagonist not tolerated (situation) [36]
14	SNOMED CT Model Component*	• Concepts and attributes necessary to organize and structure SNOMED CT terminology and its derivatives	• 900000000000442005 | Core metadata concept (core metadata concept) [37] • 900000000000454005 | Foundation metadata concept (foundation metadata concept) [38] • 106237007 | Linkage concept (linkage concept) [39] • 370136006 | Namespace concept (namespace concept) [40]
15	Social Context*	• Social conditions and circumstances related to healthcare • Subtypes include: ethnic group, life style, occupation, person, racial group, religion/ philosophy, s ocial concept	• 116060000 | Eating habit (life style) [41] • 58626002 | Legal guardian (person) [42] • 415794004 | Unknown racial group (racial group) [43] • 35359004 | Family (social concept) [44]

35 http://snomed.info/id/169589005
36 http://snomed.info/id/407565004
37 http://snomed.info/id/900000000000442005
38 http://snomed.info/id/900000000000454005
39 http://snomed.info/id/106237007
40 http://snomed.info/id/370136006
41 http://snomed.info/id/116060000
42 http://snomed.info/id/58626002
43 http://snomed.info/id/415794004
44 http://snomed.info/id/35359004

Domains			
16	Special Concept*	• Inactive and navigational (support locating concepts in hierarchies) concept codes	• 363664003 | Erroneous concept (inactive concept) |[45] • 394899003 | Oral administration of treatment (navigational concept) |[46]
17	Specimen	• Entities that are obtained (usually from patients) for examination or analysis	• 373193000 | Lymph node from sentinel lymph node dissection (specimen) |[47] • 258441009 | Exudate sample (specimen) |[48]
18	Staging and Scales*	• Assessment and tumor staging scales	• 273472005 | Functional status index (assessment scale) |[49] • 254294008 | Tumor-node-metastasis (TNM) head and neck tumor staging (tumor staging) |[50]
19	Substance	• Active chemical constituents of allergens, agents, substances, chemicals, drugs, and materials (not Pharmaceutical/Biological Products)	• 116272000 | Dietary fiber (substance) |[51] • 64856004 | Digestive system fluid (substance) |[52]

1.2.1 Granularity

The scale, or level of detail, in a terminology is called *granularity*. Concepts and meanings range from very general, or coarse, to very specific, or fine. SNOMED CT has multiple granularities, which is an important component of terminologies that are multipurpose. The broader meanings are useful for aggregation (e.g. Clinical finding, Procedure, etc.), but are not intended for recording individual patient data.

The progressive levels of refinement are used to meet clinical data requirements. There are, however, limits to the degree of precoordination of certain types of complex statements.

45 http://snomed.info/id/363664003
46 http://snomed.info/id/394899003
47 http://snomed.info/id/373193000
48 http://snomed.info/id/258441009
49 http://snomed.info/id/273472005
50 http://snomed.info/id/254294008
51 http://snomed.info/id/116272000
52 http://snomed.info/id/64856004

In general, concepts in SNOMED CT should name things that exist in the real world. The concepts are usually names or short noun phrases, not complete sentences or paragraphs.

SNOMED CT is intended to be used with electronic health applications that can support full clinical statements, along with their attributions, dates, times, and statement interrelationships. It may be challenging to balance SNOMED CT content with the needs of those using electronic health applications. For example, some older applications may require concepts outside of the scope of SNOMED CT. SNOMED CT tries to maximize its usefulness and at the same time minimize precoordination.

1.3 Knowledge Representation

Knowledge representation in SNOMED CT involves modeling what we know about concepts to be necessarily true. Concepts are logically defined by their relationships to each other. Some knowledge provides valuable clues to the diagnostician, while not necessarily always present, i.e. it is uncertain or probabilistic knowledge. Attempts to capture probabilistic or uncertain knowledge are out of the scope of SNOMED CT.

For example,

- 22298006 | Myocardial infarction (disorder)|[53]

Its terminological knowledge includes the following:

- IS A: 64572001 | Disease (disorder)|[54]
- Finding site: 74281007 | Myocardium structure (body structure)|[55]
- Associated morphology: 55641003 | Infarct (morphologic abnormality)|[56]

These additional pieces of knowledge are variably present and therefore represent uncertain or probabilistic knowledge about myocardial infarction:

- Crushing substernal chest pain
- Diaphoresis
- Arrhythmia
- ST-segment elevation on EKG
- Elevated cardiac enzymes

For example,

- 74400008 | Appendicitis (disorder)|[57]

Its terminological knowledge includes the following:

- IS A: 64572001 | Disease (disorder)|[58]
- Finding site: 66754008 | Appendix structure (body structure)|[59]
- Associated morphology: 23583003 | Inflammation (morphologic abnormality)|[60]

These additional pieces of knowledge are variably present and therefore represent uncertain or probabilistic knowledge about appendicitis:

- Central abdominal pain that migrates to the right lower quadrant
- Rebound tenderness over McBurneys point

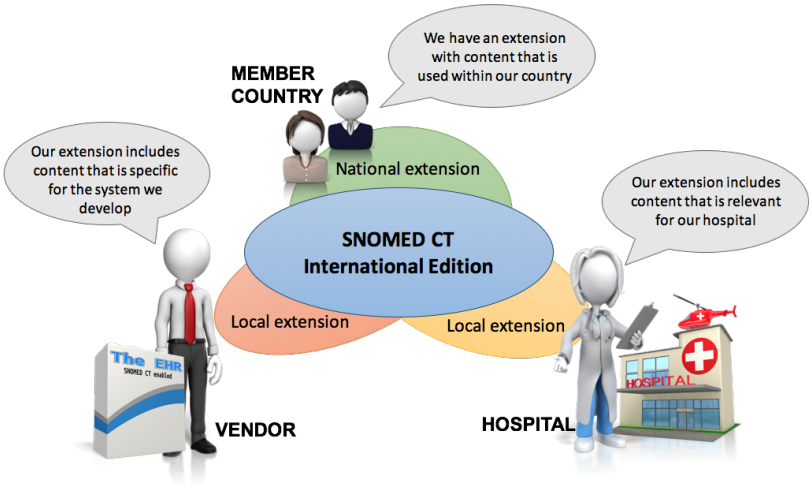
53 http://snomed.info/id/22298006
54 http://snomed.info/id/64572001
55 http://snomed.info/id/74281007
56 http://snomed.info/id/55641003
57 http://snomed.info/id/74400008
58 http://snomed.info/id/64572001
59 http://snomed.info/id/66754008
60 http://snomed.info/id/23583003

- Anorexia
- Nausea
- Elevated white blood count

1.4 Out of Scope

1.4.1 National and local extensions

SNOMED CT has an international and multilingual scope but can be localized to represent meanings and terms unique to particular organizations or localities. A National Extension includes content outside of the scope of the International Release, but necessary for national conformance and interoperability. Each member-state determines the application and interpretation of this scope and whether or not concepts should be added to their extension.



National Extension criteria include affirmative answers to the following:

- Is the concept outside of the scope of the International Release, but necessary for national conformance and interoperability?
- Is it useful throughout the national healthcare system?
- Does it need to be understandable throughout the national healthcare system?
- Does it need to be shared in a reproducible manner within the national healthcare system?

Extensions are created, structured, maintained, and distributed in accordance with SNOMED CT specifications and guidelines to ensure compatibility with the SNOMED CT International Release. Members may create, maintain, and distribute extensions to address specific national, regional, and language requirements. Affiliates may also create, maintain, and distribute extensions to meet the needs of particular software solutions and customers. Content that is within the scope of the International Release is restricted to the International Release and may not be modified or replaced by an extension, unless explicitly permitted by SNOMED International. Please see the *Practical Guide to Extensions* for more information.

1.4.2 Veterinary extension

SNOMED CT is not intended to cover all medical knowledge. Content that is strictly related to animals is out of the scope of the SNOMED CT international release. Non-human content may be included in a request for new content via the SNOMED International Content Request System (CRS) or may be identified in the International Release. Careful consideration is required to differentiate content that belongs in the International Release versus an

extension. The basic principle is that content used in human medicine should be in the core. Content that is strictly non-human may be managed in an extension.

Examples of non-human content,

- Egg-related coelomitis (disorder)
- Dehorning (procedure)
- Bone structure of wing (body structure)

Types of content that should be in the core include the following:

- **Diseases and findings.** Anything that can occur in both humans and animals should be in the core.
- **Material entities.** A material entity is a concept found within the Substance, Physical object, Pharmaceutical/biologic product, Physical force, or Organism subhierarchies. Every substance that can cause adverse effects should be in the core (with the understanding that poisonings and adverse effects in humans may be caused by virtually any substance). Some material entities may be of interest only in a non-human or veterinary context. These entities may be added to, or left in, a veterinary extension.
- **Organisms.** Most organisms should be in the core:
  - In general, microorganisms will be added to the core as they can be either human pathogens or they can change host or take advantage of immunosuppression in humans. Also, human laboratories may need to report animal pathogens.
  - Macroorganisms are added to the core when used in public health or human medicine or when requested by more than one SNOMED International member country. Otherwise, they maybe added the Veterinary Extension maintained by the Veterinary Terminology Services Laboratory (VTSL) at Virginia Tech University. The Veterinary extension content is not transferred to the core, except when used in public health or human medicine or when requested by more than one SNOMED International member country.
  - Breeds are restricted to the veterinary domain.

The Veterinary Extension is publicly available to SNOMED International member countries and to Affiliate Licensees. To access to the Veterinary Extension, please see http://vtsl.vetmed.vt.edu[61], or contact the VTSL at vtsl.e[62]xtension@gmail.com[63].

1.4.3 Classification-derived phrases

Classification-derived phrases are not accepted. Concepts with unclear, unspecified, or ambiguous meaning should not be used. Rejections are expected for requests with the following phrases:

- Not otherwise specified (NOS)
  - For example, Mental disorder, *not otherwise specified*
- Not elsewhere classified (NEC)
  - For example, Chronic hepatitis, *not elsewhere classified*
- No mention
  - For example, Bile duct calculus with *no mention* of cholecystitis and with obstruction
- With or without
  - For example, Tubal pregnancy *with or without* intrauterine pregnancy
- No organism identified
  - For example, Infective myocarditis with *no organism identified*

61 http://vtsl.vetmed.vt.edu/
62 mailto:vtsl.extension@gmail.com
63 mailto:xtension@gmail.com

1.4.4 Regulatory status or characterization

Concepts referring to regulatory status or characterization (e.g., over-the-counter) are out of scope for the International Release. Meaning may vary by jurisdiction and may not be consistent internationally.

A person's citizenship or legal residence is not an intrinsic characteristic of a person and is out of scope. SNOMED International recommends use of ISO country codes for recording residency.

1.4.5 Funding care delivery

Because of the jurisdictional and administrative aspects of medical insurance, this has been deemed out of scope for the SNOMED CT International release. It is up to individual member countries to determine if that type of content should be included in their extensions. Users should contact their country's extension administrator to determine if this type of content is acceptable.

1.5 SNOMED CT Requirements

Key requirements that drive the design, development, and maintenance of SNOMED CT are as follows. They are related to:

1. Electronic health applications (most often electronic health records or EHRs)
    - Support for effective delivery of high quality healthcare to individuals and populations
2. The terminology
3. Implementation and migration
4. The intended user communities
    - International, multilingual applicability
    - Supporting particular localities
5. National and strategic priorities

These requirements are interrelated. The design objective is to enable all user communities to realize the potential benefits. However, the needs of different user communities may vary. To meet the overall objectives, the design must consider the entire range of needs. The approach must also be scalable in order to enable extension to new user communities.

- Medical Vocabularies - J. Cimino(see page 22)
- Electronic Health Applications(see page 24)
- Implementation and Migration(see page 28)
- User Communities(see page 29)
- Summary of SNOMED CT Requirements(see page 30)

1.5.1 Medical Vocabularies - J. Cimino

The headings in this section are the requirements identified in Desiderata for Controlled Medical Vocabularies in the Twenty-First Century by J.J. Cimino published in *Methods of Information in Medicine* 1998:37:394-403. Following each, is an explanation of the way in which SNOMED CT meets the requirement.

1.5.1.1 Content, content, and content

SNOMED CT content must be adequate both in scope and quality and must:

- Cover a wide variety of domains and different organizational needs, clinical disciplines, and medical specialties
- Meet the needs of an expanding scope, while retaining quality, with a structured systematic approach

1.5.1.2 Nonvagueness and nonambiguity

Codes must have one meaning (*nonvagueness*) and no more than one meaning (*nonambiguity*). These characteristics are sometimes called *concept orientation*, but SNOMED CT deprecates the use of the word *concept* to describe codes or their meanings.

A code and its meaning may be expressed by more than one term. The terms vary between languages and dialects. In any language or dialect there may be several synonymous terms.

1.5.1.3 Code permanence

Once assigned a meaning, a code must not change its meaning. Refinements, due to changes in the state of knowledge, may lead to inactivation of codes from SNOMED CT. An inactivated code may be replaced by a new, more precisely defined code.

1.5.1.4 Nonsemantic identifiers

The structure of an identifier (code) should not contain any semantic information about its meaning or relationships.

1.5.1.5 Polyhierarchy

SNOMED CT supports multiple hierarchies. A code may have more than one hierarchical parent and various paths to its root code.

1.5.1.6 Formal definitions

When possible, the meaning of codes should be formally defined by relationships to other codes.

1.5.1.7 Rejection of *Not elsewhere classified*

Codes with the phrase, *not elsewhere classified*, are not allowed in SNOMED CT. However, many classifications contain terms with this phrase. A term with *not elsewhere classified* includes general variants that are not specifically represented. The meaning of such a code may change over time. As codes with more specific meanings are added, this narrows the codes included in the *not elsewhere classified* codes.

1.5.1.8 Multiple granularities

Different users will need to express more or less finely granular meanings. SNOMED CT:

- Must accommodate a wide range of levels of detail
- Must recognize the relationships between meanings at different levels of granularity
- Should allow selection of codes that include navigation to other codes with more or less finely grained meaning
- May need to restrict the levels of granularity used in different applications or in different contexts within the same application

1.5.1.9 Multiple consistent views

The view of a code's meaning, with multiple hierarchical parents, should not depend on reaching it by following the hierarchy from a particular parent.

1.5.1.10 Beyond terminology codes - represent context

The meaning of a code in a patient record may be altered by its context. Standards for patient record architectures and modeled healthcare communication are changing. The role of SNOMED CT in the context of these structures should be evaluated and appropriate recommendations made.

1.5.1.11 Evolve gracefully

Terminologies need to change over time. SNOMED CT should implement these changes in ways that are well-documented and tracked and that provide a path for systems and users.

1.5.1.12 Recognize redundancy

The same information can often be coded in different ways. A controlled terminology, that has an adequate scope, cannot exclude this possibility. Instead it should facilitate recognition of equivalent terms.

1.5.2 Electronic Health Applications

The anticipated benefits of SNOMED CT are derived from use of information to support effective delivery of high quality healthcare to individuals and populations.

1.5.2.1 Individuals

Aide-memoire for clinicians

Clinically relevant information in an electronic health record acts as an *aide-memoire* for the clinician, enabling recall of previous interactions.

Structured data entry

Structured data entry enhances the value of an electronic health record in various ways. It may:

- Simplify recording of frequently collected data
- Ensure that information is collected in a reliable and reproducible way
- Help clinicians to think logically about a patient's condition

Clinical applications may combine several data entry methods. Some of the most commonly used methods are as follows:

- Searching a coded terminology for matching terms using words or phrases
- Navigating a hierarchical structure to refine or generalize meanings
- Using templates or protocols to record structured information; may be based on answers to questions or values entered on a data entry form
- Parsing of natural language to identify and retrospectively code and structure data
- Typing, speech recognition, and document scanning

SNOMED CT requirements for data entry

Data entry may require selection from a list. Such lists must be manageable in size and appropriate to the needs of the user.

- A multilingual, multidisciplinary terminology requires mechanisms that limit and/or prioritize access to terms and codes in ways that are appropriate to:
    - Languages and dialects
    - Countries, organizations, disciplines, specialties, and users
    - Contexts within a record or protocol
- To display a code's description in a list that has not been derived from a text search, the term must be intelligible and appropriate to the user.

When a code is entered in a record it may require structured entry of additional qualifying information.

- Qualifying information may be coded.

  For example,

  The code named *removal of kidney* may require a statement of laterality.
- Qualifying information may be numeric.

  For example,

  The code named *hemoglobin measurement* may enable entry of a numeric value expressed in a substance concentration.

To meet all the needs for coded structured data entry in a health record, a terminology must have an adequate scope.

- The main body of SNOMED CT covers the required scope.
    - It may be difficult to meet the needs of some organizations, specialties, and users; they may need specific terms or codes to meet their own operational requirements. Therefore, SNOMED CT is structured to allow for additions to meet specific needs.

A clinical terminology requires frequent changes including new codes, terms, and relationships between codes. Changes may be required due to new:

- Health risks
- Health and disease process information
- Drugs, investigations, therapies, and procedures

Presentation

The presentation of clinical information may:

- Highlight key information and indicate links between items, thus helping clinicians understand patients' conditions.
- Be determined entirely by record structure without regard to the terminological resource (e.g.,may be in chronological order, by author, or by the type of recorded event).
- Be enhanced based on its semantic content (e.g., grouping procedures, investigation results, or observations relevant to a particular disease process).

Decision support

Interfaces between recorded clinical information and appropriate decision support tools and reference works may assist the clinician in selecting diagnostic tests, making diagnoses, and choosing treatment. Decision support requires selective retrieval and processing of information in an individual health record to determine whether the

patient has particular characteristics relevant to the decision support protocol. The algorithms for establishing the presence of characteristics should include relationships between coded meanings and other aspects of record structure. Performance is also important, as decision support algorithms are typically run in real-time during data recording. Decision support algorithms may:

- Depend on numeric or other values (and their units) associated with particular observations
- Include the context in which information is recorded, e.g., the date of recording and any stated relationships between individual items of information
- Include information such as age, sex, clinical conditions, findings, surgical procedures, medication, and social/environmental factors, such as occupation
- Use codes or identifiers from other terminologies, classifications, or proprietary schemes. Mapping tables are required to allow applications that use a terminology to interface with these resources

Communication

Effective delivery of high quality healthcare to individuals requires communication between those involved in providing care. This requires communication within and across teams or organizations.

The primary objective of many clinical communications is to convey information from human to human. Communications with this purpose should include human-readable text. Relying on text from coded data is not recommended. Coded data is therefore not relevant to the requirement for human-to-human communication.

A receiving application may process clinical communications. This information may need to be retrieved and processed to meet terminology requirements. To meet terminology requirements, messages and other means of electronic communication must permit the communication of SNOMED CT identifiers and associated structures.

Communication specifications, such as those produced by HL7 and CENTC251, define the structures to meet requirements. The coded information is used in two distinct situations:

- Coded elements that must be filled with codes enumerated in the specifications. The codes enumerated in the specifications generally communicate, mission critical features of the message. Some of the enumerated codes and the codes in a clinical terminology may have overlapping meanings.
- Coded elements that are populated with clinical codes from appropriate coding schemes. The open coded elements may require the full expressiveness of a terminology. Some of the open coded elements may be restricted to codes that express particular types of meaning.

  For example,

  HL7 requires that coding schemes meet certain criteria, one of which is the ability to express limited subsets of codes appropriate to particular elements.

There are two situations in which communication of coded information may be of value for human-to-human communication. They are where:

- The storage capacity or communication bandwidth is restricted. Receiving applications must contain (or have real-time access to) a table listing the text description associated with each code.
- The translation between the languages of the sender and the recipient is needed. A coded representation of a meaning may allow the appropriate description in the recipient's language.

Recording a particular code may trigger a communication. And, receipt of a code, may trigger specific processing in the receiving application.

For example,

Recording a decision to prescribe a medicine might trigger an electronic prescription sent to the pharmacy. Receipt of such a prescription might trigger dispensing and stocking activities.

⚠ The relationship of a trigger is an additional characteristic of a code that may be context dependent.

Patient involvement

Patients may wish to view, and comprehend, their own records. For SNOMED CT to meet this requirement, the inclusion of patient-friendly terms should be considered. However, this requirement should not take precedence over accurate professional terminology.

Patients may also be allowed to contribute to their own records, i.e. be users of SNOMED CT.

For example,

Patients with diabetes may monitor and record their blood glucose levels.

1.5.2.2 Populations

Identify and monitor health needs

The provision of effective high-quality care to populations requires an understanding of the state of health and healthcare needs of that population. Information recorded about individual patients must be available for analysis to determine trends.

- It must be possible to analyze data recorded with SNOMED CT.

Population trends are usually monitored at a higher level, using codes that are more general than those used in individual patient records. This may be accomplished through one or both of the following methods:

- Using hierarchical relationships and/or equivalences defined within SNOMED CT.
- Mapping SNOMED CT codes to codes in appropriate classifications.

Appropriate analysis of information requires reliable and reproducible queries.

- The scope of SNOMED CT must cover the types of information relevant to analysis.
- Analysis may require data about multiple clinical characteristics. Queries must account for both the terminology and the record structure.

Audit quality of service

The requirements for analysis of quality of service are similar to those for analysis of health needs. The main difference is that the scope of the analysis must be extended to cover consultations, referrals, procedures, medications, and other interventions.

Support research

The requirements for research are also similar to those for analysis of health needs, however, there is a need to allow for:

- Recording interventions in ways that do not compromise blind and double blind trials.
- Adding SNOMED CT content for experimental observations or treatments, which may never require permanent addition to the terminology.

Reduce bureaucracy; manage and fund care delivery

The management and funding of healthcare delivery often depends on recording and reporting of particular information, e.g. bundled or packaged care. Automating this process offers a way of reducing bureaucratic overhead, i.e. mapping clinical information recorded with SNOMED CT to appropriate forms.

Some information required for management and funding purposes is specifically related to claims for particular events or services.

For example,

Funding general practitioners in the NHS is dependent on meeting immunization administration and cervical cytology screening targets.

The scope of SNOMED CT must be adequate to meet these needs, or must be capable of extension to meet these needs, without presenting irrelevant terms or coded meanings to those not requiring them.

Enable reporting of external health statistics

Organizations, such as WHO and some government bodies, require specific data related to healthcare statistics. Organizations should be able to use clinical information recorded with SNOMED CT. When this is not possible, the clinical information should at least support their manual generation. Using structured data entry allows for direct mapping to statutory national and international classifications such as ICD, CPT, OPC, etc.

Identify patients in need of interventions proactively

Population-based preventive care should be offered to specific groups, based on sex, age, medical history, and other factors. Health information applications based on information recorded with SNOMED CT can be used to identify patients, so they can be offered appropriate care.

1.5.3 Implementation and Migration

1.5.3.1 Electronic health application

A terminological resource is only one part of an electronic health application. Implementation of SNOMED CT should support applications in meeting user needs, rather than adding a burden to development.

The functions required to implement a terminology can be divided into those that are:

- Performed without reference to data stored in a particular application record structure.
- Involved in storing, retrieving, or processing application data.

Applications may make use of different aspects of SNOMED CT. Some may require SNOMED CT for a very limited range of uses for which there may be minimal value. These applications may not require all the functions for a full implementation or all the concepts and codes in SNOMED CT.

- There may be a general benefit in consistency with other more terminology rich applications.

1.5.3.2 Existing information

A substantial body of clinical information may already be present in an electronic health application. Much of this information is represented using existing coding schemes, terminologies, and classifications. This information may be of value to individual patient records or to populations. Similarly, there are many queries and decision support protocols that contain information based on existing terminologies.

A new terminology should make provisions for the continuing use of information stored in records, queries, and protocols represented by other terminologies. There are two general approaches to this:

- Conversion of legacy data into a form consistent with SNOMED CT.

- Allowing legacy and SNOMED CT data to coexist. Legacy codes must be recognizably different from SNOMED CT codes. In addition, the relationship between codes in SNOMED CT and legacy codes must be recognized when retrieving data.

1.5.3.3 Reliability and reproducibility

Information represented with SNOMED CT codes must be reliable and reproducible. This means:

- The meaning of a code should not change over time.
- Information should be reproducible independent of the application.
- The query of codes should be reliable. This means:
    - There should be complete recall, including specific, more detailed codes and expressions subsumed by general codes and expressions in the query.
    - There should be specificity and precision excluding codes and expressions that are not subsumed by the codes and expressions in the query.
    - The effects of the following should be taken into account:
        - Precoordinated relationships between codes in records or queries.
        - Postcoordinated qualifications applied to codes or expressions in records or queries.
        - Relationships between codes and other contextual information implied by the record structure.

1.5.4 User Communities

1.5.4.1 Language

The terms required by users of a clinical terminology vary according to the local languages and dialects.

- When using a terminology, users must see terms in a language and dialect with which they are familiar. The terms must be clear and unambiguous independent of any hierarchical context or formal definition.
- The display of terms must not be confused by inclusion of terms in other languages or dialects.
- The terms used in different languages and dialects are not mutually exclusive. A term may be common to several languages or dialects of a language.
- When a code is presented without a specific reference to a term, an appropriate preferred term should be displayed. A term may be a preferred term in one dialect and a synonym in another.

Some terms differ only in spelling conventions (e.g. color vs. colour). The same spelling variants may recur in many different terms.

- It may be appropriate to recognize these cases and handle them differently from other term variants.

An individual instantiation of an application may only require access to a single language or dialect. It is inappropriate to install and maintain all language and dialect variants.

An application may need to support several languages with the ability to switch between languages and dialects in real-time to meet the needs of users.

1.5.4.2 Specialty

Some specialties or disciplines prefer to use different terms to describe the same meaning. A particular specialist may use a precise term, while a generalist may use a different term to describe the same condition.

1.5.4.3 Use of terms

The following table lists factors affecting term use and examples of each.

Factors affecting term use	
Factor	Examples
Geographic and seasonal differences	Malaria is more common in certain regions Hay fever is more common in spring, summer, and fall
Cultural perceptions of health	Acceptance of alternative therapies
Discipline or specialty	Obstetricians use *fundus* to mean *fundus of the uterus;* gastroenterologists use the same term to mean *fundus of the stomach* Surgeons record operative procedures relevant to their specialties
Professional criteria	The definition of hypertension may vary based on professional guidelines
National or organizational requirements, including those for administrative or funding purposes	Performance measure results affecting reimbursement
Topics of special interest to individual clinicians	Infectious disease specialist with an interest in tropical diseases

1.5.4.4 Organization, country, and user

Particular terms may be specific to an organization. They may not be included in the International Release of SNOMED CT. Organizations and users must be able to add terms or codes to SNOMED CT, without devaluing the main body of SNOMED CT.

It may be necessary to combine several subsets and extensions to meet the needs of a country, an organization, or a specialty. There must be consistent rules for combining subsets and extensions.

The requirements of a particular user may change according to the role they are performing. A single instance of an application may need to support different requirements of several users.

1.5.5 Summary of SNOMED CT Requirements

A summary of the SNOMED CT requirements is as follows. Additional information may be found throughout this guide, as well as in other documents on the SNOMED International website at at: http://www.snomed.org/snomed-ct/learn-more.

Terminology Structure	
Coded meaning	• The central component is coded meanings • Each code must have a single clear and unambiguous meaning
Identifier	• Components must have unique identifiers • The internal structure of these identifiers must not imply the meaning or relationships of a code
Description	• Represents the association between terms (text strings) and the meanings that they describe (may be language or dialect dependent)
Preferred Term	• Represents the special association between each code and a preferred term (used to display the meaning, unless there is an alternative preference) • The preferred term association is language or dialect dependent
Fully Specified Name	• Provides each code with a structured fully specified name that unambiguously describes its meaning • The fully specified name is defined in a reference language (the language of first use) • Translations of the fully specified name may also be required
Hierarchy	• Represents hierarchical relationships between coded meanings • The form of representation allows a coded meaning to have multiple hierarchical parents (supertypes) • It guarantees that any alternative hierarchical view of a coded meaning is consistent
Relationship	• Represents non-hierarchical relationships between coded meanings
Content	

Scope	• The scope is adequate to meet the requirements of various countries, organizations, disciplines, and specialties
	• The extent to which the content requirements are covered develops over time
	• However, the initial release should cover:
	  • The scope of the existing clinical terminologies
	  • All versions of the *Read Codes* and NHS Clinical Terms
	  • All versions
	  • Other scope requirements identified by the Editorial Board

Updates	• The content is regularly updated

Content	
Granularity	• Allows coded meanings to be expressed at different levels of granularity
Not Elsewhere Classified (NEC); Not Otherwise Specified (NOS)	• Codes with *not elsewhere classified* or *not otherwise specified* must be inactivated and no new ones may be added
Extension	• Allows extensions to the main body of work • Extensions are distinguishable from components of the main body; should be traceable to a responsible organization • Allows for distinguishing and tracing the code source or identifier used in patient records
Maintenance and Distribution	
Distribution	• Distributed in a format that is readily usable by application developers • This format is fully specified and is not changed from release to release • May be distributed for use with associated software, such as a browser
Persistence	• The meaning of a code is persistent; It is not changed or deleted by updates • A code may be marked as inactivated when its meaning is found to be ambiguous, redundant or otherwise incorrect • Changes to the association between a concept and a code do not change or delete the description. The description is marked as inactivated, and a new corrected description is created
History	• All changes to components are tracked and saved in history files (includes details about new components and changes to the status of components) • When a component is made inactive, relationships or references indicate the replacement or equivalent component
Subsets	

Concepts	• Includes a mechanism for representing subsets of concepts appropriate for a language, dialect, or specialty. It should allow:
	  • Specification of the synonyms, preferred terms, and translated fully specified names in each language or dialect
	  • Rational combination of languages and modification of language subsets to meet the needs of organizations or specialties

Subsets	

Codes	• Includes mechanisms for representing subsets of codes for a country, organization, discipline, or specialty. The form of representation should allow:
	  • An indication of the priority, or frequency of use
	  • Rational combinations of subsets to meet the needs of users or groups of users

Specified Contexts	• Includes mechanisms for representing subsets of codes and concepts for particular contexts in a record, decision support protocol, or data entry field
Combinations	• Include consistent rules for combining subsets to meet the requirements of users

Distribution and Installation	• Subsets are distributed in a format that is readily usable by system developers. The format is fully specified and does not vary from release to release. The distribution format allows:
	  • Subsets to be installed separately
	  • Related or interdependent subsets to be selected and installed as groups
	  • Subsets to be updated with each new release

Configuration	• It is possible to configure an application to use a particular subset or combination of subsets; changing configurations does not require reinstallation
Relationships	
Navigating Relationships	• Includes relationships that allow hierarchical navigation from a chosen code to a code that represents either a subtype or part of the chosen code • Supports navigation from a specific code to more general codes that represent a supertype of that code • Navigational concepts are not supported by SNOMED International
Aggregation of Related Codes	• Includes relationships that allow aggregation of related codes to enable comprehensive and accurate retrieval from patient records • These relationships, together with appropriate history and cross-reference tables, enable the aggregation to include inactivated codes with similar or equivalent meanings

Relationships	
Defining Characteristics	• Includes formal definitions of codes represented by relationships with defining characteristics (e.g. the anatomical site of the code named *appendicitis* is the *vermiform appendix*)
Qualifying Characteristics	• Enables a code recorded in a patient record to be qualified by adding relevant qualifying characteristics • Each qualifying characteristic is itself a code with a specified relationship to a qualified code • Specifies possible qualifying characteristics for each code or for a group of related codes (e.g. an anatomical site could be added to the code named *osteoarthrosis*)
Kind-of-Value	• Enables codes to be qualified by the addition of relevant values • Specifies the types of values that can be added to particular codes (e.g. a substance concentration value can be added to the code named *hemoglobin concentration*)
Additional Characteristics	• Is able to assert other characteristics of a code that may be time- or context-dependent (e.g. new medical information may require updates to some codes)
Retrieval	

Analysis	• Enables the consistent and reproducible storage of information, which is subsequently retrieved for analysis; this requires retrieval that allows the inclusion of subtypes and equivalent codes to be included. Equivalent codes may include:
	  • Codes represented in another (legacy) coding scheme
	  • Redundant codes that were inactivated
	  • Combinations of general codes and qualifying characteristics
	• Analysis usually requires retrieval of selected records from a population of patient records; usually performed in batch

Patient Review	• Enables the consistent and reproducible storage of information, which is subsequently retrieved for patient recall for preventive procedures or review; requirements similar to those for analysis

Retrieval	

Decision Support	• Enables the consistent and reproducible storage of information, which is subsequently retrieved for decision support
	• Requirements are broadly similar to those for analysis
	  • Decision support requires retrieval of selected records from an individual patient record
	  • Requires real-time processing to determine code meaning equivalence

Presentation	• Enables the consistent and reproducible storage of information, which is subsequently retrieved for presentation • Requirements are similar to those for decision support • Must be real-time, but usually involves filtering by broad categories of code; less precise than for decision support

Searches and Text Parsing	

Searches and Text Parsing	• SNOMED CT facilitates searches for descriptions
	  • A simple keyword index may be generated from the descriptions and used for more effective searching although this may not be optimal due to:
	  • Use of abbreviations
	  • Word form variants
	  • Word order variants
	  • Word equivalences and combinations
	  • Locally added mnemonics for frequently used descriptions
	  • Composite coded meanings that can only be represented by:
	  • Combinations of a code with one or more qualifying characteristics
	  • Multiple codes related together by the patient record structure components
	  • Searches with multiple redundant hits for a single code
	  • When several synonyms of the same code match the search key
	  • When techniques for word equivalences and combination are applied and return alternative descriptions related to the same code for two or more word equivalences
	  • Searches with multiple redundant hits for a large number of closely related coded meanings
	  • Search keys matching descriptions associated with a code with a more general meaning and many of its more specific hierarchical descendants
	A further complication is the application of searches within subsets. This restricts the range of available concepts or codes; efficiency may depend on the relationships of keyword indices and subsets

Parsing or Encoding Free Text	• The use of natural language parsing to encode free-text derived from typing, scanning, or voice recognition is increasing; the text of descriptions and associated search indices may assist with this process
Implementation	
Terminology Services	• Terminology services should be implemented independent of application data; by individual applications or by terminology servers accessible by many applications

Implementation	
Advice	• Application data cannot be specified to the same level of detail as terminology services. It us dependent on the general functionality of the application and its record structure • Providing advice early in the SNOMED CT implementation process is required. This helps with some issues that may not be immediately apparent to developers
Limited Applications	• The advice provided should not place onerous requirements on applications with limited needs for the SNOMED CT terminology • It is inappropriate to have *all-or-nothing* requirements for SNOMED CT enabled applications
Legacy Data and Migration	
Code Recognition	• It should be possible to distinguish a code from an earlier coding schemes (SNOMED, Read Codes, or NHS Clinical Terms) from the identifiers used in SNOMED CT
Equivalence	• It must be possible to relate each code in early coding schemes (SNOMED, Read Codes, or NHS Clinical Terms) to a code in SNOMED CT
Query/Protocol Conversion	• There must be support to convert queries and protocols, based early coding schemes (SNOMED, Read Codes, or NHS Clinical Terms), to SNOMED CT compatible forms
Record Conversion	• It should be possible to convert legacy data, based on early coding schemes (SNOMED, Read Codes, or NHS Clinical Terms), to SNOMED CT compatible forms. This is subject to medico-legal constraints
Migration of Terminology-Dependent Products	• Projects in the UK NHS, that currently make use of Read Codes or NHS Clinical Terms, must plan migration to allow future use of SNOMED CT

Data Structure	

Patient Record Architectures	• SNOMED CT is intended to represent clinical meanings in patient records
	  • A patient record consists of a series of related statements that are organized under headings
	  • The statements and headings may contain clinical codes derived from SNOMED CT
	  • Headings, and other contextual elements, may modify the meaning of related statements
	• The relationship between a terminology, such as SNOMED CT, and a record architecture can be summarized as follows:
	  • SNOMED CT codes and terms may populate different elements in the record structure
	  • Different SNOMED CT codes may be applicable to different elements in the record
	  • Some codes may not be appropriate for inclusion in the record
	  • The meaning of a SNOMED CT code may be modified by its context within the record structure
	• SNOMED CT should be evaluated within the context of evolving standards for patient record architectures. Recommendations based on the evaluations may include:
	  • Possible changes to record architectures in order to realize benefits from SNOMED CT
	  • Changes to SNOMED CT to better fit into record structures
	  • Selecting SNOMED CT codes for use in specific record structure contexts

Data Structure	
Expression Coordination and Equivalence	• Some codes may be entered in a precoordinated or a post-coordinated manner For example, "excision of ovary" might be entered by: selecting the precoordinated code 83152002 |Oophorectomy (procedure)|, or alternatively by selecting the codes for 71388002 |Procedure (procedure)| and adding the qualifying characteristics: 260686004 |Method (attribute)| = 129304002 |Excision - action (qualifier value)| 405813007 |Procedure site - Direct (attribute)| = 15497006 |Ovarian structure (body structure)| • The coded meanings are stored in the forms entered. This may be using a single precoordinated code, a single post-coordinated expression, or a set of separate codes that together represent the clinical meaning. • A retrieval query must therefore search for the precoordinated and all possible post-coordinated ways of expressing equivalent meanings. This can be done using the Expression Constraint Language (http://snomed.org/ecl) and a terminology service that can compute subsumption between expressions. • These methods for retrieving records based on their clinical meaning rely on the formal definitions of SNOMED CT concepts being as complete as possible. Missing defining characteristics may result in problems with equivalence testing and therefore data retrieval.
Communication	
Clinical Information	• The ability to communicate clinical information (represented by SNOMED CT) between applications must be supported • Message specifications and other communication structures must accommodate SNOMED CT identifiers, and combinations of identifiers, in order to express postcoordinated coded meaning
Message Specifications	• Current message specifications (e.g EDIFACT, HL7, and XML) use plain text files; SNOMED CT identifiers must use plain text so that they are appropriate for these messages

Communication	
Postcoordinated Expressions	• Communication of postcoordinated expressions may be possible using specific qualifier fields in messages. This can also be accomplished by using syntactic representation of identifier combinations; these must be consistent with message syntax and field size limitations
Mapping	
Classification	• Based on recorded codes, mapping tables are used to generate statistical and administrative data • Automation of the process depends on the nature of the classification, the richness of the mapping table, and the functionality of the mapping software
Grouping	• Mapping tables are used to generate groupings for funding, administration, etc. • Mapping to a classification, then using the classification codes to generate groupings, is an alternative method
Communication Specifications	• Codes are mapped to specific values, in an enumerated list, associated with a message or communication specification • Recognizing these mappings may prevent double data entry, when sending or receiving such messages
Reference Works	• Codes are used to establish links with decisions-support protocols or other references • Mapping between these codes and reference sources may help to facilitate their use
Availability	
Limited Applications	• Applications vary in their ability to use terminological components • Special consideration may be necessary for applications that require only limited use of SNOMED CT
Concepts in Different Languages	• Translating SNOMED CT into other languages is required • Multiple translations may support communication of clinical information across language barriers
Patients	• Patients may be users of SNOMED CT if they record information in their own medical records • This may require limited licensing of SNOMED CT for populations, in general

2 Concept Model Overview

The *Concept Model* is used to specify logical definitions of *SNOMED CT* concepts. It is based on a combination of formal logic and editorial rules. It includes the attributes and values that may be applied to the concepts.

Definition	Note
The set of rules that determines the permitted sets of relationships between particular types of concepts	The *Concept Model* specifies the attributes that can be applied to concepts in particular domains and the ranges of permitted values for each of these attributes. There are also additional rules on the cardinality and grouping of particular types of relationships

2.1 Root and Top-level Concepts

2.1.1 Concept

A *concept* is defined as a clinical idea to which a unique concept identifier[64] has been assigned. Concepts are associated with descriptions[65] that contain human-readable terms describing the concept.

> **Term**
>
> A *term* is defined as a human-readable phrase that names or describes a concept[66]. A term is one of the properties of a description[67]. Other properties of a description[68] link the term to an identified concept[69] and indicate the type of description, e.g. Fully Specified Name, Preferred Term, Synonym.

Concepts are linked to their more general parent concepts directly above them in a hierarchy. More general meanings, are usually at the top of the hierarchy. Descending levels of the hierarchy contain more specific or specialized meanings.

Concepts are logically defined by their relationships to each other.

In SNOMED CT, the default meaning of a concept is defined above. However, a concept may have other meanings in SNOMED CT, such as an:

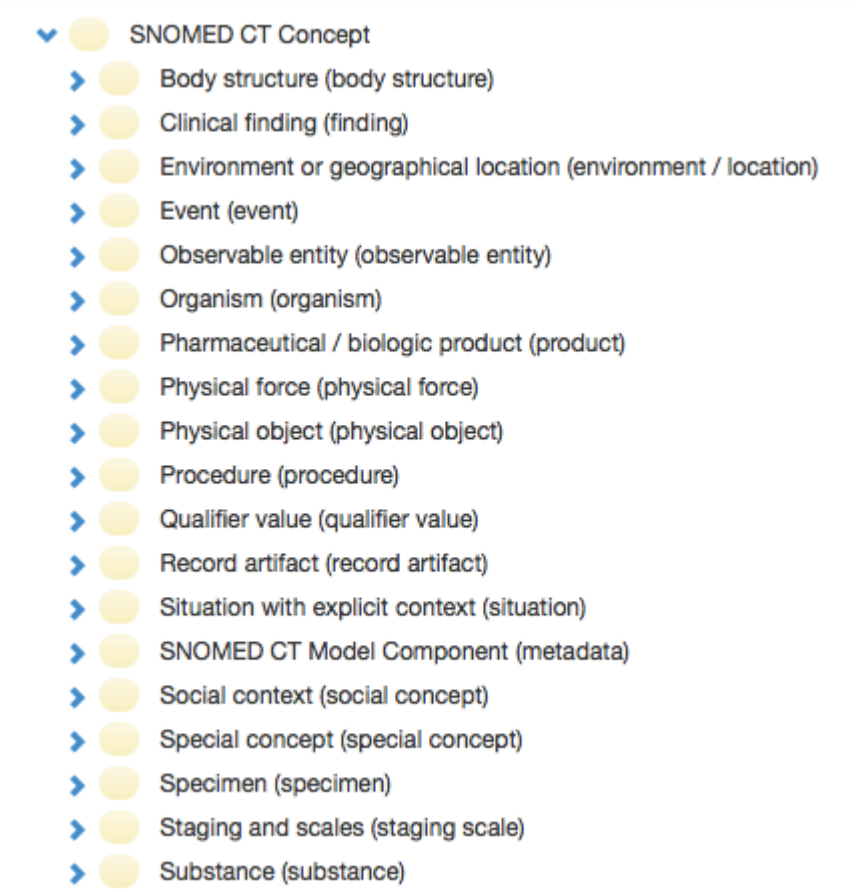
- Abbreviated name for the concept identifier[70]. For clarity, this is should be referred to as an *identifier* (*ID*), *code,* or *concept identifier* (*ID*).

64 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept+identifier
65 https://confluence.ihtsdotools.org/display/DOCGLOSS/description
66 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
67 https://confluence.ihtsdotools.org/display/DOCGLOSS/description
68 https://confluence.ihtsdotools.org/display/DOCGLOSS/description
69 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
70 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept+identifier

- Idea or class of real-world entities (common usage meaning). For clarity, this is should be referred to as a *clinical idea*, *clinical meaning,* or *code meaning*.

2.1.2 Root Concept

The concept file includes a special concept referred to as the *root concep*t. It is the single concept that is at the top of the SNOMED CT concept hierarchy. All other concepts are descended from this root concept via at least one series of relationships of the Relationship type 116680003 | Is a (attribute)|[71], i.e. all other concepts are regarded as subclasses of this concept. The root concept code is 138875005 | SNOMED CT Concept (SNOMED RT+CTV3)|[72]. All other SNOMED CT concepts are subtypes of the root concept. Unlike other SNOMED CT concepts, the root concept is not a subtype of any other concept.



2.1.3 Top-level Concepts

Concepts that are directly related to the root concept by a single relationship of the Relationship type 116680003 | Is a (attribute)|[73] are referred to as *top-level concepts*. All other concepts are descended from at least one top-level concept via at least one series of relationships of the Relationship type 116680003 | Is a (attribute)|[74], i.e. all other concepts represent subclasses of the meaning of at least one top-level concept.

71 http://snomed.info/id/116680003
72 http://snomed.info/id/138875005
73 http://snomed.info/id/116680003
74 http://snomed.info/id/116680003

2.1.3.1 Top-level metadata concepts

A concept that is directly related to the root metadata concept, 900000000000441003 | SNOMED CT Model Component (metadata)|[75] by a single relationship of the relationship type IS_A. All metadata concepts are descended from at least one top-level metadata concept via at least one series of relationships with Relationship type IS_A. Metadata codes represent structural information about the terminology itself. The top-level metadata concepts represent broad groups of metadata.

2.1.4 Subtype relationships

Subtype relationships provide the main semantic hierarchy that relates concepts to one another. All active concepts, except the root concept, have subtype relationships with one or more concept. Each of these relationships indicate that a concept is a subtype of another concept.

Subtype relationships are expressed in the same way as other SNOMED CT relationships. They are identifiable by their fully specified names, e.g 116680003 |Is a (attribute)|[76].

For example,

- 53084003 |Bacterial pneumonia (disorder)|[77] is a subtype of 233604007 |Pneumonia (disorder)|[78] because it is a subtype of 312342009 |Infective pneumonia (disorder)|[79] which is also a subtype of 233604007 |Pneumonia (disorder)|[80]

2.2 Attributes

Attribute		
Definition	Notes	Example
Represents a characteristic of the meaning of a concept or the nature of a refinement	An attribute has a name which is represented by a concept. All of the concepts that can be used to name attributes are subtypes of the concept 410662002 | Concept model attribute (attribute)|[81] . An attribute is assigned a value (that creates an attribute-value pair) when used in the definition of a concept or in a postcoordinated expression. The permitted range of values for an attribute depends on the rules specified in the concept model.	• 116676008 | Associated morphology (attribute)|[82]

75 http://snomed.info/id/900000000000441003
76 http://snomed.info/id/116680003
77 http://snomed.info/id/53084003
78 http://snomed.info/id/233604007
79 http://snomed.info/id/312342009
80 http://snomed.info/id/233604007
81 http://snomed.info/id/410662002
82 http://snomed.info/id/116676008

Range		
Definition	Note	Example
A constrained set of values that the Concept Model[83] permits to be applied to a specific attribute[84] when that attribute[85] is applied to a concept in a particular domain[86]	The range of permitted values that can be applied to an attribute[87] is typically defined to include concepts in one or more branches of the subtype hierarchy. The range for an attribute may include intensional or extensional definitions or both. An example of a range with an intensional definition is 370130000 |Property (attribute)| which has a range of << 118598001 |Property (qualifier value)|. An example of a range with an extensional definition is 1148969005 |Has absorbability (attribute)| with range of 860574003 |Bioabsorbable (qualifier value)| OR 863965006 |Nonbioabsorbable (qualifier value)| OR 863968008 |Partially bioabsorbable (qualifier value)|."	• The range for values of 116676008 | Associated morphology (attribute)|[88] is a subtype of 49755003 | Morphologically abnormal structure (morphologic abnormality)|[89] .

Not all hierarchies in SNOMED CT have defining attributes. Many attributes apply to top-level domain hierarchies, some to more than one. Some attributes to a lower-level, or a more specific, domain hierarchy. Primitive concepts in some hierarchies may be attribute values in top-level hierarchies.

2.2.1 Attribute definitions

New attributes should include a text definition clearly indicating what the attribute means in the context of SNOMED CT.

2.2.2 Attribute naming

Attributes should be named to clearly communicate the property they specify and should refer to only one distinct property. The meaning of the attribute should not change if new values are added to the range.
If a new attribute is needed, look at existing unapproved SNOMED CT attributes and as well as other ontologies to see if a suitable attribute exists, including Basic Formal Ontology (BFO) (https://basic-formal-ontology.org[90]), Relations Ontology (RO) (http://www.obofoundry.org/ontology/ro.html), and Gene Ontology (GO) (http://geneontology.org/) as example ontologies to review.

Attributes should be named as verb senses, so that object-attribute-value relationships may actually be read. For example, a name of "Has filling (attribute)" is preferred over "Filling (attribute)" and "Has property (attribute)" is preferred over "Property (attribute)." Then a concept such as 464376000 |Saline-filled breast implant (physical object)| could be defined with the attribute "Has filling (attribute)" and a value of 387390002 |Sodium chloride (substance)|.

83 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+Model
84 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute
85 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute
86 https://confluence.ihtsdotools.org/display/DOCGLOSS/domain
87 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute
88 http://snomed.info/id/116676008
89 http://snomed.info/id/49755003
90 https://basic-formal-ontology.org/

2.2.3 Attribute datatype

Many of the attributes in SNOMED CT have a range that includes SCTIDs as an allowed value. Attributes which have a binary (e.g., Boolean) value shall be valued using a descendant of 1119301001 |Boolean value (qualifier value)|: 31874001 |True (qualifier value)|; 64100000 |False (qualifier value)|. In the July 2021 release, a new attribute was created which uses Boolean style value: 1148965004 |Is sterile (attribute)|.

2.2.4 Attribute hierarchy

Selected SNOMED CT attributes have a hierarchical relationship to one another known as *attribute hierarchies*. In an attribute hierarchy, one general attribute is the parent of one or more specific subtypes of that attribute. Concepts defined using the more general attribute can inherit concepts modeled with the more specific subtypes of that attribute providing the attribute value is the same or a subtype of the attribute value used for the concept that is defined with the more general attribute.

Clinical finding and Event attribute hierarchies

- Associated with
    - Causative agent
    - Due to
    - Temporally related to
        - After
        - Before
        - During

Procedure attribute hierarchies

- Procedure Site
    - Procedure site - Direct
    - Procedure site - Indirect
- Procedure device
    - Direct device
    - Indirect device
    - Using device
        - Using access device
- Procedure morphology
    - Direct morphology
    - Indirect morphology

Body structure attribute hierarchy

- All or part of
    - Proper part of
        - Constitutional part of
        - Regional part of
            - Lateral half of
        - Systemic part of

Medicinal product attribute hierarchy

- Has ingredient (not used in the international edition)
    - Has active ingredient
    - Has precise active ingredient

2.3 Defining Characteristics

2.3.1 Role of defining characteristics

Defining characteristics represent the values of a range of relevant attributes. Depending on the nature of the concept, they may include etiology, topography, method, etc.

The attributes that can be applied depend on the domain of the concept. For example, a procedure may have a method, and a disorder may have an etiology, but a procedure cannot have an etiology, and disorder cannot have a method. Defining characteristics using a particular attribute will be applied consistently to all concepts to which it is relevant. Note that this design principle may not be fully realized for all attributes in each release.

2.3.2 Representation of defining characteristics

Defining characteristics are represented as relationships. The fields are used as follows:

- SourceId refers to the concept to which a defining characteristic applies;
- TypeId indicates the nature of the defining attribute;
- DestinationId refers to the concept that represents the value of that attribute.

2.3.3 Relationships

The defining characteristics can be divided into 116680003 | Is a (attribute)|[91] relationships and defining attribute relationships.

The IS_A relationship (also called supertype-subtype or parent-child relationship) builds the hierarchies in SNOMED CT. Every concept has at least one IS_A relationship to a supertype or parent concept.

Exception

138875005 | SNOMED CT Concept (SNOMED RT+CTV3)|[92] has no supertype or parent relationship.

Each concept in SNOMED CT is logically defined through its relationships to other concepts. A *relationship* is defined as an association between a source concept and a destination concept. The type of association is indicated by an attribute concept. It is the relationships that make up the defining characteristics of the concepts. A *defining characteristic* is a relationship to a target concept that is always necessarily true for any instance of the source concept.

For example, the defining relationships of the concept 53442002 |Excision of stomach structure (procedure)| include:

- 116680003 | Is a (attribute)|[93] = 65801008 | Excision (procedure)|[94]
- 260686004 | Method (attribute)|[95] = 129304002 | Excision - action (qualifier value)|[96]
- 405813007 | Procedure site - Direct (attribute)|[97] = 69695003 | Stomach structure (body structure)|[98]

91 http://snomed.info/id/116680003
92 http://snomed.info/id/138875005
93 http://snomed.info/id/116680003
94 http://snomed.info/id/65801008
95 http://snomed.info/id/260686004
96 http://snomed.info/id/129304002
97 http://snomed.info/id/405813007
98 http://snomed.info/id/69695003

2.4 Qualifying Characteristics

A *qualifying characteristic* is expressed by an attribute-value pair. The attribute may have one value, from a range of values, based on the domain's concept model. If a particular qualifying characteristic is applied to a concept, the resulting expression represents a more tightly defined subtype of that concept.

> ⚠ Clinical expressions using SNOMED CT concepts can be of two types: precoordinated expressions, which use a single SNOMED CT concept identifier; and postcoordinated expressions, which contain more than one SNOMED CT concept identifier.

For example,

- It might be possible to qualify a disorder such as 53084003 | Bacterial pneumonia (disorder)|[99] according to its clinical course (373933003 | Acute onset (qualifier value)|[100] or 90734009 | Chronic (qualifier value)|[101]) or severity (255604002 | Mild (qualifier value)|[102] , 6736007 | Moderate (severity modifier) (qualifier value)|[103] , or 24484000 | Severe (severity modifier) (qualifier value)|[104])
- 125605004 | Fracture of bone (disorder)|[105] can be refined by qualifying it with 12611008 | Bone structure of tibia (body structure)|[106] to represent the concept 31978002 | Fracture of tibia (disorder)|[107]

99 http://snomed.info/id/53084003
100 http://snomed.info/id/373933003
101 http://snomed.info/id/90734009
102 http://snomed.info/id/255604002
103 http://snomed.info/id/6736007
104 http://snomed.info/id/24484000
105 http://snomed.info/id/125605004
106 http://snomed.info/id/12611008
107 http://snomed.info/id/31978002

3 Authoring

3.1 Modeling philosophy of SNOMED CT

SNOMED CT authors use a zero-based, *proximal primitive* approach when modeling or editing logical definitions of concepts, i.e. a concept is newly defined, as opposed to inheriting the definition from the parent and then refining it. This is accomplished by assigning the immediate proximal primitive parent and attribute relationships based on their relevance to the defining characteristics of the concept, again, instead of relying on inheritance and refinement of relevant attributes from immediate, sufficiently defined supertypes.

The steps are as follows:

1. The author states the proximal primitive supertype/s.
2. The author states all of the defining *attribute-value pairs* required to express the meaning of the concept.
    a. An attribute-value pair is explicitly stated, even if it is already present on a supertype concept.
    b. The attribute-value pairs are grouped as required.
3. The classifier infers all appropriate proximal supertype/s.
    a. With sufficiently defined concepts, the subtypes are also inferred.

3.2 Advantages of the approach

- Enhances ability to maintain content
- Supports identification of equivalences

3.3 Content that does not conform

SNOMED CT contains content that does not conform to the current modeling patterns. A quality initiative is currently underway to correct these non-conforming concepts.

Exceptions

Exceptions exist where the current concept model is not expressive enough to represent critical defining characteristics of a concept that would allow for its sufficient definition.

For example, disorders where the clinical manifestations are variably present (i.e. genetic diseases)

3.4 Authoring information

- Scope(see page 49)
- General Naming Conventions(see page 55)
- General Modeling(see page 84)
- Domain Specific Modeling(see page 114)

3.5 Scope

International release criteria include affirmative answers to the following:

- Does it need to be understandable in electronic health applications in more than one national healthcare system?

- Can it be used in electronic health applications beyond a patient's national healthcare system, i.e. if a patient were to travel or relocate to a different country?
- Is it useful in more than one national healthcare system?

The guiding principle underlying the creation of a clinical reference terminology is the facilitation of semantic interoperability. To this end, content in SNOMED CT must represent unambiguous, clinically relevant information which can be exchanged and understood internationally. A reproducible and consistent approach to incorporating terminology into electronic health applications is, therefore, mandatory.

The International Release includes content necessary for international conformance and interoperability (the International Release was formerly and is colloquially known as *the core*). The range of concepts, attributes, qualifiers, and other components of SNOMED CT is comprehensive compared to classification systems. This supports the terminological needs of those using SNOMED CT within electronic health applications.

3.5.1 Requests for Inclusion

Addition of new content to SNOMED CT requires careful consideration. Changes and additions to the International Release of SNOMED CT follow a formal process executed by SNOMED CT authors. For content to be included in the International Release, the following criteria must be met.

3.5.1.1 References

Content must be submitted with:

- Submissions for a change to the international release of SNOMED CT must be supported by at least one reference that is of international relevance. Please remember that requests for change need to be of international application and not confined to one member country. We may require more than one reference to assess the validity and international applicability for some areas of content.
- Definitions and literature references. All reference material must be publicly available. Wiki references are unacceptable.
- Evidence of international applicability. Without international applicability, a concept should, instead, be added to the submitter's extension.

> **Change Requests**
>
> For details on SNOMED International Content Request Service (CRS) Customer Guidance, see our website[108] or the Confluence site[109].

3.5.1.2 Broad use

It must be applicable within and across healthcare disciplines internationally.

3.5.1.3 Provision of use case

Changes and additions must follow SNOMED CT Content Request Service (CRS) Guidelines. It is very important to incorporate a clear justification for any change or addition request for the International Edition of SNOMED CT.

108 https://www.snomed.org/change-or-add
109 https://confluence.ihtsdotools.org/display/SCTCR/CRS+User+Guide

3.5.1.4 Principle of URU

- Understandable: The terminology must be able to communicate to recipients the intended meaning of the healthcare provider in terms that are unambiguous and comprehensible without reference to inaccessible, hidden, or private meanings.
- Reproducible: Concepts should be names that are human-understandable representations of the codes. It is not enough for an individual to say they think they understand a meaning. It must be shown that multiple people interpret and use the meaning in the same way. Can it be used in electronic health applications beyond a patient's national healthcare system, i.e. if a patient were to travel or relocate to a different country?
- Useful: The meaning must have demonstrable use or applicability to health or healthcare.

Usefulness

Content submitted for inclusion in the International Release shall be required to pass a test for "usefulness." The usefulness test can be passed in more than one way. At least one of the following must be satisfied:

1. Content that is used by more than one major user (a *National Release Center* such as NHS, a vendor/supplier of clinical information systems with international scope, or a large intra-national system user such as VA or Kaiser) will be considered to have passed the "usefulness" criterion.
2. Data demonstrating significant frequency of use, or frequency of need, by a single user (single national center, or single vendor, or single health care system) can also be used as evidence in support of usefulness.

Additional means of passing the usefulness test may be added in the future. Submissions that pass the usefulness criterion must also pass understandability and reproducibility tests, and conform to style rules.

3.5.2 Naming of classes of things rather than instances

SNOMED CT concepts should name *classes of things*. Concepts that refer to a particular instance are unacceptable.

For example, *Doctor Jones pre-operative order set* should not be included because it is an individual instance, not a class.

(See also Appendix: *Principles for Accepting Content in the International Release*)

3.5.3 Adjudication for Content Requests

There are processes for making decisions about adding or changing content in SNOMED CT.

3.5.3.1 Change requests

All change requests, whether for new content or for change to existing content, go through a request submission approval process. It involves review by authors to determine that there is:

- International applicability
- Compliance with Understandable, Reproducible, Useful (URU) principles
- No duplication with existing content
- No link to existing larger projects, as detailed in a Content Tracker document
- No conflict with existing collaboration agreements (e.g. *Logical Observation Identifiers Names and Codes (LOINC)* agreement)

Legacy concepts

Legacy concepts, i.e. concepts not in the current draft/work-in-progress version of SNOMED CT, may not follow current guidelines. Requests based on legacy concepts are unacceptable.

3.5.3.2 Appeals, deferrals, and resolution

Appeals

Requests that are rejected may be appealed by the submitter.

Deferrals

Requests may be deferred for a number of reasons including questions about:

- How to model the concept; which attributes may be used
- Concept meaning
- Literature reference missing or inadequate
- Use case unclear
- Size of required change (attached to a Content Tracker)

Resolution

Resolution of deferrals may result in a decision delay requiring:

- A larger project or work item or
- Referral, internally, to other groups for decision. This depends on the complexity of the request and understanding of the wider impact.

3.5.3.3 Results

Results of adjudication are received by email from the Content Request System (CRS). Simpler issues can be resolved expeditiously (e.g. by a ruling from the Chief Terminologist).

3.5.4 Proprietary Names and Works

This section considers scope as it relates to the incorporation of proprietary names (e.g. brand names of drugs, devices, clinical forms or tools) into SNOMED CT.

3.5.4.1 Brand name of drugs and devices

Proprietary names are the names that have been assigned to products, usually drugs and devices, by their corporate producers. They do not require a license from the producer. It is both necessary and useful to include proprietary names in a health terminology. SNOMED International does not need to obtain the permission of the trademark owner simply to include a reference to the brand name drug in SNOMED CT. However, they should not be included in the International Release but instead in National Extensions. This is because proprietary names may refer to different products depending on the country and the meaning of these names are dependent on the country or jurisdiction in which the product is approved.

Modeling

A brand or trade name may stand for a category of product and not the particular brand itself. These *proprietary* names may be included in the International Release as descriptions (non-FSN descriptions). They should not be included in FSNs.

For example,

- Kleenex, band aid, popsicle

3.5.4.2 Clinical forms, tools, or assessment scales

The owner of a form or tool may be an individual or organization that created it; the healthcare organization that employed the individual; or it may be a commercial organization to which the rights were assigned.

Names

Incorporating the name of a clinical form or tool (e.g. the *XYZ Test (staging scale)*), or the name of the score generated by a form or tool (e.g. the *XYZ Test Score (observable entity)*) into SNOMED CT does not require a license from the owner. Reference to the *owner* of a clinical form or tool loosely refers to the person or organization that owns the intellectual property rights of the form or tool. This may be the individual or group that originally created the form or tool, the organization that employed the creators, or a commercial organization to whom the creators assigned their intellectual property rights. It is possible that the owner holds a trademark (which may be registered or unregistered) representing the name or score, but simply incorporating that word into SNOMED CT does not infringe on the trademark.

Concepts representing questions, answers, or scores

A *concept* may be introduced into SNOMED CT that represents the text of questions, answers, or scores. For example, a form may include a question about a person's ability to dress and a range of possible answers. SNOMED CT may incorporate neither the text of the question nor any of the possible answers, but instead may incorporate a concept such as *ability to dress*. Similarly, if the form contains 20 questions, SNOMED CT may want introduce 20 concepts, for *XYZTest_Result1*, *XYZTest_Result2,* etc. to *XYZTest_Result20*.

The incorporation of a single concept into *SNOMED CT*, based on a question, answer, or score on a clinical form is highly unlikely to infringe on the copyright. However, if SNOMED CT systematically introduces a concept for every single question on a clinical form, it is likely to infringe on the copyright.

These concepts (e.g. *ability to dress*) may already exist in SNOMED CT, or they may be added in other contexts (This does not apply to concepts that represent specific questions within a form). This is unlikely to result in a copyright infringement.

Questions

A clinical form or tool, including the wording of the individual questions within the form or tool, is generally a literary work and qualifies for copyright protection (except in the case of the simplest of forms). The copying of all or any substantial part of a literary work, without a license from the owner, infringes on the copyright.

Answers

Certain questions may have a range of pre-determined answers. This could be as simple as *Yes/No* or a number within a specific range, but may also be more substantial (e.g. *needs help cutting, spreading butter, etc.*, or *requires modified diet*). Incorporating very simple answers into SNOMED CT does not require permission. However,

incorporating more substantial textual answers into SNOMED CT generally infringes on the copyright. This usually does not apply to individual answers, but it almost always applies when entire sets of answers are incorporated.

Scores

The principles that apply to individual answers also apply to the overall score generated by a clinical form or tool. The incorporation of numbers does not infringe on the copyright. However, when each possible score has an associated textual description and all possible scores and descriptions are incorporated into SNOMED CT, a license is required.

For example,

- 443807003 | EuroQoL five dimension questionnaire (assessment scale) |[110] is a SNOMED CT concept. However, these scores are subject to copyright protection, therefore cannot be added to SNOMED CT:
  - EuroQol Five Dimension (youth) doing usual activities score
  - EuroQol Five Dimension (youth) feeling worried, sad or unhappy score

3.5.4.3 Implementation of brand, trademark, and copyright

Names

The use of the name of a clinical form or tool or of a brand name drug will usually not infringe on the copyright. However, caution should be exercised by implementers who wish to use trademarks in a *commercial* context, i.e. a system that enables drugs to be purchased electronically. SNOMED International does not advise implementers on this matter, but recommends that implementers, who are in any doubt, contact the trademark owner.

In general, implementers should make no greater use of a trademark than is necessary. For example, displaying a graphical mark (e.g. a logo) on a screen or in printed material should be avoided.

Questions, answers, and scores

Implementers should manage questions, answers, and scores in the same way as SNOMED International (see above). When the incorporation of content from a clinical form or tool infringes on the copyright, the system the reproduces (by display or print) the content also usually infringes. This means that the license to incorporate content by SNOMED International should also cover the system implementer.

Preexisting terms

As noted above, terms in a clinical form may already exist within SNOMED CT, even though they have not been copied from the form. This is not copyright infringement by SNOMED International. If, however, a system implementer chooses to arrange a collection of these pre-existing terms in a way that reproduces all or a substantial part of a clinical form (e.g. by populating a drop-down box with all of the possible answers to a specific question on the form), that may infringe on the copyright.

Form structure

A system may reproduce the structure and layout of a clinical form on a screen display or printed output (e.g. to make the system more accessible to users who are familiar with a paper-based form). This may infringe on the copyright, unless the structure or layout is very minimal (e.g. a bulleted list). An implementer who wishes to emulate the *look and feel* of a clinical form should seek a license from the owner.

110 http://snomed.info/id/443807003

Algorithms or logic

System implementers may use the algorithm or logic inherent in a clinical form or tool (e.g. the method by which an overall score is calculated). For example, a clinical form may instruct the user to perform a mathematical operation on the individual answers to produce the overall score, and the same operation may be carried out by the system. The use of the algorithm or logic is an infringement. SNOMED International avoids such use and encourages system implementers to contact the owner to discuss possible infringement.

3.6 General Naming Conventions

In addition to the general naming conventions below, please also see any applicable naming conventions for specific hierarchies in their respective domain[111].

Generally, names should:

- Be consistent and reproducible
- Follow natural or human language when possible
- Be unambiguous to users
- Be clear for translation purposes

Naming conventions should not be based on word order preferences (e.g. to facilitate search or display). Creating multiple word order variants for these purposes is outside the scope of the International Release of SNOMED CT.

Pre-coordination Pattern

SNOMED CT relies on the rules for *usefulness* to avoid excessive pre-coordination (see Scope(see page 49)). Approved pre-coordination naming patterns have been created and are available at Pre-coordination Naming Patterns Project[112].

3.6.1 Articles

Descriptions should not include articles such as *a, an,* and *the*. There are legacy descriptions that contain articles such as *the* that will be corrected over time.

For example,

- Use description of *Neoplasm of respiratory tract (disorder)*, not *Neoplasm of the respiratory tract (disorder)*
- Use description of *Rupture of diaphragm (disorder)*, not *Rupture of the diaphragm (disorder)*

3.6.2 Abbreviations and acronyms

Abbreviations are shortened forms of words or phrases. An acronym is a specific type of abbreviation formed from the initial letters of words and is sometimes pronounced as a word (e.g. AIDS for *Acquired Immunodeficiency Syndrome*; NICU for *Neonatal Intensive Care Unit*). Neither abbreviation nor acronym is permitted in a fully specified name (FSN).

For example,

111 https://confluence.ihtsdotools.org/display/WIPEG/Domain+Specific+Modeling
112 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project

- *Sperm* is a shortened form of the word *spermatozoa*. The proper term of *spermatozoa* should be used in the FSN, while *sperm* can be used as a synonym.

Abbreviations and acronyms are allowed in a preferred term or synonym when followed by the term expansion. If the abbreviation or acronym stands alone (meaning, no additional terms are included; the letters represent the entire meaning of the description without any other text), it is followed by a space, a hyphen, and another space, then the expanded term. The first word after the dash should be lower case as per usual capitalization rules.

For example,

- 30549001 |Removal of suture (procedure)|[113] has a synonym of *ROS - removal of suture*
- 24526004 |Inflammatory bowel disease (disorder)| has a synonym of *IBD - inflammatory bowel disease*

If the abbreviation or acronym forms only part of the description's meaning, it is followed by a space, then the expanded term in parentheses. The first word in the parentheses should be lower case as per usual capitalization rules.

For example,

- 140031000119103 |Acute nontraumatic kidney injury (disorder)|[114] has a synonym of *Nontraumatic AKI (acute kidney injury)*

3.6.2.1 Exceptions

Official names of organism, which is represented as organism preferred term, may include abbreviations. The abbreviations do not need to be accompanied by the fully expanded term.

- For example,
  - 448945001 |Campylobacter lari subspecies lari (organism)| has a synonym of Campylobacter lari subsp. Lari

Abbreviated organism part names are allowed in a preferred term (and other synonyms). The abbreviations do not need to be accompanied by the fully expanded term

- For example,
  - 24771000087106 |Antigen of Streptococcus pneumoniae Danish serotype 1 capsular polysaccharide conjugated to Corynebacterium diphtheriae cross-reacting material 197 protein (substance)| has a synonym |Streptococcus pneumoniae Danish serotype 1 capsular polysaccharide antigen conjugated to Corynebacterium diphtheriae CRM197 protein| that includes CRM197 which is the abbreviated form for cross-reacting material.

The preferred term for allergen components in the Substance hierarchy follows the rules established by the World Health Organization/ International Union of Immunological Societies Nomenclature Sub Committee: allergen names consist of the first three letters from the genus, one letter from the species epithet, followed by an Arabic numeral. e.g. 1157148000 |Arachis hypogaea 2 protein (substance)| has a preferred term of "Ara h 2".

An acronym is allowed in an FSN when it has become a word in its own right, i.e. included in dictionaries; understood without expansion to its original full form.

For example,

- Concept 122456005 | Laser device (physical object)|[115] uses the term "laser", which originated as an acronym for "light amplification by stimulated emission of radiation"

113 http://snomed.info/id/30549001
114 http://snomed.info/id/140031000119103
115 http://snomed.info/id/122456005

The preferred term for imaging procedures involving imaging modalities commonly referred to by an acronym (such as CT, MRI, SPECT, PET) omits the expanded term after the acronym.

For example,

- |CT of head| is the preferred term for 303653007 | Computed tomography of head (procedure)|[116]

Acronyms in rare and genetic diseases have been included for the concepts as part of the Orphanet project that do not include expansion of the abbreviation, as some of the diseases are commonly known by the acronym.

For example,

GLOW syndrome is a synonym of 782722002 |Global developmental delay, lung cysts, overgrowth, Wilms tumor syndrome (disorder)|. Although the FSN and other descriptions have full expansions, there is a description included for |GLOW syndrome|, which does not further delineate the GLOW acronym.

Second example,
BRESEK syndrome is a synonym of 717945001 |Brain anomaly, severe mental retardation, ectodermal dysplasia, skeletal deformity, ear anomaly, kidney dysplasia syndrome (disorder)|. Although the FSN and other descriptions have full expansions, there is a description included for |BRESEK syndrome|, which does not further delineate the BRESEK acronym.

Based on recommendation by the International Protein Nomenclature Guidelines, an abbreviation may be part of a protein name:

- For example, 1222711007 |ALK tyrosine kinase receptor (substance)| where ALK stands for Anaplastic lymphoma kinase
- For example, 1222739008 |DNA mismatch repair protein Msh6 (substance)| where DNA stands for deoxyribonucleic acid

Msh6 in "DNA mismatch repair protein Msh6 (substance)" is a protein symbol standing for "mutS homolog 6" protein. Gene and Protein symbols are short identifiers, typically 3 to 8 characters, that are usually created by contraction or acronymic abbreviation. They are pseudo-acronyms, in the sense that they are complete identifiers or short names. They are considered synonymous with (rather than standing for) the gene/protein name (or any of its aliases), regardless of whether the initial letters "match". Gene and protein symbols maybe part of protein name:

- For example, 1229847004 |Ubiquitin carboxyl-terminal hydrolase BAP1 (substance)|

3.6.3 Eponyms

Eponyms are names that are derived from proper names (usually the person who made the discovery or created the original description). It is neither desirable nor possible, to completely avoid using eponyms in a medical terminology. They are found in many areas of medical terminology, including anatomic structures, morphologic abnormalities, diseases, findings, and procedures (e.g. Rutherford Morison's pouch, vein of Galen, Aschoff body, Kell blood group, Down syndrome, Moro reflex, and Whipple procedure).

Fully specified names (FSN) should be full descriptions, whereas synonyms may be eponymous terms.

For example,

- Structure of great cerebral vein (body structure) has the synonym Vein of Galen
- Complete trisomy 21 syndrome (disorder) has the synonym Down syndrome

116 http://snomed.info/id/303653007

- Pancreaticoduodenectomy (procedure) has the synonym Whipple procedure

Eponymous descriptions should not include an apostrophe or final *s*, unless the name normally ends in *s*.

For example,

- Down syndrome, a synonym for Complete trisomy 21 syndrome (disorder)
- Meigs syndrome (disorder)

When common usage requires it, there should be at least one description that has the apostrophe *s*. For descriptions with a possessive apostrophe where the name normally ends in *s*, the apostrophe should follow the *s*.

For example,

- Alzheimer's disease (disorder)
- Bowen's disease (disorder)
- Meigs' syndrome (disorder)

It is permitted and encouraged to include eponyms as descriptions (non-FSN descriptions) whenever they are understandable, reproducible, and useful in a given context.

3.6.3.1 Exceptions

Exceptions require careful consideration since eponyms meanings may change over time. They are allowed when:

- The full description is exceptionally long and unwieldy (e.g. Hemi-Fontan operation (procedure) instead of *bidirectional Glenn shunt with end-to-side anastomosis of proximal superior vena cava to right pulmonary artery with isolation from right atrium)*.
- The eponym is the only precise, clinically relevant name available.
- A non-eponymous name would necessarily be vague or subject to misinterpretation (e.g. Hodgkin lymphoma, Burkitt lymphoma).
- A brand name has become an eponym. In this case, some brand names have come to stand for a category of product and not the particular brand itself (examples in US English: Kleenex, Band-Aid, Popsicle, Dacron and Teflon).
  - These *proprietary* eponyms may be included in the International Release as descriptions (non-FSN descriptions) if they meet the criteria for international inclusion.
  - They should follow the same rules as other eponyms. Whenever possible, they should not be included in FSNs (e.g. plastic adhesive bandage strip for Band-Aid).

3.6.4 Preferred prepositions

When constructing an FSN, the preposition 'of' is preferred over using the preposition 'in' to describe the morphology of an anatomic structure.

For example,

- *Cyst of scalp* should be used for the FSN and not *Cyst in scalp* because the latter may indicate a morphology within a layer of the structure, whereas 'of' indicates the morphology is within the region of the anatomic structure.

3.6.5 Foundation hierarchies (body structure, substance, or organism) referenced in other hierarchy descriptions

When creating the descriptions for a concept (e.g. a disorder concept) that name an entity such as a body structure, substance or organism, the conventions that are applied for naming the entity in the source hierarchy should be used.

For example,

- 11218009 | Infection caused by Pseudomonas aeruginosa (disorder)|[117]

  This concept references the organism hierarchy in the causative agent of 52499004 | Pseudomonas aeruginosa (organism)| and uses that description in the FSN.

- 143491000146106 |Felis catus protein (substance)|

  448169003 |Felis catus (organism)| has a preferred term of “Domestic cat”. As a result a related concept in the Substance hierarchy, 143491000146106 |Felis catus protein (substance)| has a preferred term of “Domestic cat protein”.

- 337311000119101 | Blepharochalasis of left upper eyelid (disorder)|[118]

  This concept references the body structure hierarchy in the finding site of |Structure of left upper eyelid (body structure)| and uses "left upper eyelid" in the FSN.

- 126885006 | Neoplasm of urinary bladder (disorder)|[119]

  This concept references the body structure hierarchy in the finding site of 89837001 |Urinary bladder structure (body structure)| and uses "urinary bladder" in the FSN and PT.

> The term *bladder* must be include *urinary* to distinguish from gallbladder in order to aid in translation. *Urinary bladder* must be used in both the fully specified name and preferred term.

The descriptions should be context neutral for these foundation hierarchies. Where context is explicit for a disease or procedure, the preferred term from foundation hierarchies can be used instead. For example, procedure *CT of abdomen* indicates that the context of CT imaging is cross-sectional. The procedure site should be modeled with the cross-sectional abdomen. However, it is not necessary to change 'Computed tomography of abdomen (procedure)' to 'Computed tomography of cross-sectional abdomen (procedure)'. It is the same reason for the preferred term 'CT of abdomen'.

3.6.5.1 Exceptions

- Where an infection caused by a microorganism has a common name, the common name of the disease can be used in the preferred term if accompanied by the explicitly-stated organism.
- If a common name is shared between more than one organism, the organism preferred term may include the scientific name with annotated common name. Generally, a dash is used to separate the two names. However, if the organism name falls in the middle of the term, parentheses should be used to separate the two names.
- When defining concepts in other hierarchies by referring to an organism, the taxonomical rank of the organism should not be included in the FSN or synonyms.
  - For example,

117 http://snomed.info/id/11218009
118 http://snomed.info/id/337311000119101
119 http://snomed.info/id/126885006

        - Instead of |Gingivitis caused by Genus Candida (disorder)|, drop the taxonomical rank of Genus, as in |Gingivitis caused by Candida (disorder)|.
- There are instances where the requested term for a concept containing an organism common name doesn't correspond to specific taxa. Rather, the term is found as part of common names in multiple taxa belonging to a higher level taxon. For example, "parakeet" and "parrot" are not common names to any specific taxa, but are found as part of common names in multiple genera in 447329007 |Subfamily Psittacinae (organism)|. To avoid ambiguity, a grouper concept referring to high-level taxon should be created.
    - For example, In the Substance hierarchy, a grouper concept, 1149419004 |Psittacidae protein (substance)|, was created as a parent concept to the following two concepts:
        - 146711000146102 |Parakeet protein (substance)|
        - 146701000146104 |Parrot protein (substance)|

Structure, Structure of

Outside of the body structure hierarchy, concepts should not include the words *structure* or *structure of* in the concept descriptions.
For example,

- For the body structure concept, 266005 |Structure of lower lobe of right lung (body structure)|[120], a disorder concept with this body structure is 724056005 |Malignant neoplasm of lower lobe of right lung (disorder)|[121].
- For the body structure concept, 266005 |Structure of lower lobe of right lung (body structure)|[122], a procedure with this body structure is 726425007 |Lobectomy of lower lobe of right lung (procedure)|[123].

3.6.6 Description Length Limitations

In the rare event that the 255-character limit of the fully specified name is reached, standard naming conventions may be circumvented in order to adhere to the 255-term string limit.

For example, the use of commas may be used instead of the word "and".

Considerations can include language nuances, content use case, etc. The decision on which standard naming conventions to circumvent will depend on the circumstances.

3.6.7 Descriptions

3.6.7.1 Descriptions

A concept has multiple associated *descriptions*.

Each description has a *description type* and a unique numeric *description identifier.*

Fully specified name (FSN) and synonym (SYN) are description types in SNOMED CT.

A preferred term (PT) is a synonym that has been marked as preferred in a particular dialect.

Every concept may have only one preferred term in a specific dialect. Two preferred terms for the same language may coexist if they belong to two distinct dialects (e.g. variant US and GB of English language).

120 http://snomed.info/id/266005
121 http://snomed.info/id/724056005
122 http://snomed.info/id/266005
123 http://snomed.info/id/726425007

For example,

22490002 | Bleeding of mouth (disorder)|[124]	
Description type	Description
FSN	Bleeding of mouth (disorder)
PT	Bleeding of mouth
SYN	Bleeding in mouth
SYN - US English	Oral hemorrhage
SYN - GB English	Oral haemorrhage
SYN	Stomatorrhagia
241563001 | Computed tomography of upper limb (procedure)|[125]	
Description type	Description
FSN	Computed tomography of upper limb (procedure)
PT	CT of upper limb
SYN	Computed tomography of upper limb
32849002 | Esophageal structure (body structure)|[126]	
Description type	Description
FSN	Esophageal structure (body structure)
PT - US English	Esophageal structure
PT - GB English	Oesophageal structure

124 http://snomed.info/id/22490002
125 http://snomed.info/id/241563001
126 http://snomed.info/id/32849002

3.6.7.2 Fully Specified Name

Fully specified name (FSN) definition

A term unique among active descriptions in SNOMED CT that provides the meaning of a concept in a manner that is intended to be unambiguous and stable across multiple contexts.

Precoordinated patterns

For information on acceptable precoordinated naming patterns, see the Pre-coordination Naming Patterns project[127]. New content should conform with the naming patterns; however, legacy content may not yet be updated.

An FSN is one type of description, unique among active descriptions in SNOMED CT. It provides the meaning of a concept so that it is unambiguous, stable across multiple contexts, and optimally understandable to those whose first language is not English. Consequently, it is not always clinician-friendly or in common use. In the majority of cases, where the FSN is clinician-friendly and in common use, a description matching the FSN should be added to the concept. This description is not required to be the preferred term (PT). In certain instances, where the FSN does not provide a clinically useful description, a matching description without the semantic tag is unnecessary.

For example,

- FSN: Repair of common bile duct (procedure) - *the meaning*
- PT: Choledochoplasty - *commonly understood clinical name*

Choledochoplasty is marked as *preferred* in the US English Language *Reference Set;* choledochoplasty is the *preferred term* for this *concept* in US English.

Each new content request should have an FSN that conforms to spelling, language, and style guidelines. It should also have SNOMED CT parent concepts that conform to editorial guidelines and show where in the hierarchy it belongs. In the Content Request System (CRS), if the meaning of the FSN is unclear or the parent codes are not provided, authors should request the information from the submitter.

A well formed FSN includes:

- Correct US spelling, not GB (General British) spelling
- Singular form, not plural form
- Procedures in present tense, not past tense
- A semantic tag in parentheses at the end

An FSN with an approved disjunctive (although not often used), e.g. Traumatic **and/or** non-traumatic injury of back (disorder), should have lower case *and/or*.

An FSN should **not** have:

- Abbreviations or acronyms
- Hyphens
- Duplicate concepts
- Ambiguity
- The word OR (not including the disjunctive *and/or*)
- Forward or backslash (/ \)
- Precoordinated numeric ranges
- Reference to a particular instance

127 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project

- Reason or indication for a procedure, unless this directly impacts the method

Exceptions that should not be amended include:
- Trademark names
- Latin names of organism
- Scientific names

Structure, Structure of

When constructing the FSN for a disorder, finding, or procedure containing a body structure, the wording of the body structure should follow the naming convention of the body structure concept. However, it should not include the words *structure* or *structure of.*

For example,

- For the body structure concept, 266005 | Structure of lower lobe of right lung (body structure)|[128] , a procedure with this body structure is 726425007 | Lobectomy of lower lobe of right lung (procedure)|[129] .
- For the body structure concept, 74386004 | Nasal bone structure (body structure)|[130] , a disorder concept with this body structure is 413878002 | Closed, displaced fracture of nasal bone (disorder)|[131] .

Unique

The FSN is unique among active concepts. The SNOMED International Authoring Platform automatically creates a matching description to the FSN. Authors then determine the clinical usefulness of a synonym that matches the FSN. Those that are useful are maintained in SNOMED CT; those that are not useful are removed. The Authoring Platform displays a warning when the matching description is removed; however, this does not prevent the author from saving the concept.

The FSN should provide a linguistic representation of the concept in an unambiguous way. It is considered an anchor for the representation of meaning of a concept, to which modelers can refer, when assigning a logic-based definition. The FSN does not necessarily follow the usual phrasing used in clinical practice; it may be phrased differently and may be longer and more fully spelled out in order to represent the meaning as clearly as possible and globally communicate the intended meaning of the concept.

The characters comprising the description, as well as case significance, must be taken into account to provide for a unique FSN. Uniqueness maintained through case sensitivity is handled by the "case significance indicator"[132]. It is possible to alter the semantics of concepts whose FSN uniqueness depends upon case significance.

For example,

38194003 |Weak e phenotype (finding)|

6800004 |Weak E phenotype (finding)|

The two referenced concepts above could easily be mistaken for duplicates if not for varying case sensitivity indicators that demarcate each concept's uniqueness.

128 http://snomed.info/id/266005
129 http://snomed.info/id/726425007
130 http://snomed.info/id/74386004
131 http://snomed.info/id/413878002
132 https://confluence.ihtsdotools.org/display/WIPEG/Case+Significance

Unambiguous

A single term may have more than one meaning. Therefore, FSNs should be checked for ambiguity.

For example, *immunosuppression* may mean the state of being immunosuppressed, or it may mean the application procedure of immunosuppressive therapy.

The following FSNs are clear and acceptable.

For example,

- Benign neoplasm of clavicle (disorder)
- Excision of cyst of spleen (procedure)

The following FSNs are ambiguous, and the concept should be inactivated.

For example,

- Standing in water side toward (finding); does not indicate *which side of what is toward what*
- Lumbar ache - renal (finding); does not convey whether the lumbar ache is specifically a renal etiology or is merely located in the renal area

Changes to FSN

Minor Changes - Only the FSN changes but not the concept

Minor changes to an FSN are allowed without inactivation of the concept. When making a minor change to an FSN, a new description must be created and the old description must be inactivated. While the description ID will change, the concept ID remains the same. FSN changes cannot change the meaning of the FSN. Minor changes include:

- Changing case; i.e. capitalizing, or changing from upper to lower case
- Changing punctuation
- Changing spelling
- Replacing an acronym with its expansion (only if it is commonly understood and not ambiguous)
- Expanding an abbreviation
- Correcting word order without changing the meaning (only for an error)
- Correcting typos
- Removing articles, such as '*the'*
- Where a change to the FSN does not result in a change to the preferred term
- Aligning with editorial policy, e.g. changing *appendectomy* to *excision of appendix**

**Updating an FSN to align with editorial policy*
Where an active concept requires an update to the FSN to conform to current editorial guidance, this may result in duplication with the FSN on an inactive concept.

In this scenario:

- The current active concept should be retained. There is no requirement to inactivate the currently active concept and reactivate the inactive concept.
- For the concept that is inactive, the inactivation reason should be updated to ‘Duplicate’ and the association type ‘SAME_AS’ to the active concept with the same FSN.

For example,

Concept 27215002 had an FSN of Uterine inversion (disorder). Editorial policy instructs this to be formatted as Inversion of uterus (disorder). However, an inactive concept of 156232008 |Inversion of uterus (disorder)| already exists with that FSN. 156232008 |Inversion of uterus| is named

correctly but has been inactive since 2002. In this case, the concept 27215002 should remain active with its FSN updated.

The inactive concept, 156232008 |Inversion of uterus|, should be checked to ensure its inactivation reason is 'Duplicate' and the Association type 'SAME_AS' to the active concept 27215002 with the same FSN.

For circumstances where a new concept duplicates an inactive concept with the same FSN, the inactive concept should be reactivated rather than adding a new concept.

Some FSN changes are necessary for style consistency; again, changes are only acceptable if the meaning does not change.

They may include changing:

- Semantic tag type within a single top-level hierarchy

  For example,

  - A *finding* tag to a *disorder* tag
  - A *procedure* tag to a *regime/therapy* tag

  When changing a concept's semantic tag within the same top-level hierarchy, use the description inactivation reason of *Non-conformance to editorial policy*.

- Changing a concept's semantic tag to *navigational concept*
- A substance or product name to reflect the International Nonproprietary Name (INN)
- The current scientific name of an organism (only applies to 410607006 |Organism (organism)| hierarchy)

Major Changes - When to inactivate the concept

Major changes to FSNs require inactivation of the concept. The following are examples of major changes, when:

- Changing the FSN changes the meaning
- FSN is ambiguous
- FSN meaning is more specific than the modeling; inactivation is determined case-by-case as this could simply be a primitive concept which cannot be defined
- Moving to a different top-level hierarchy
  - Exception: Concept inactivation is not required for moving a concept to the *navigational concept* hierarchy.
- Changing the common name to the scientific name
- Ancestors and descendants (if any) of the concept are inconsistent with what is implied by the FSN - inactivate concepts

International FSNs

The FSN for a concept in the International Release is designated an *International FSN*. The International FSN is considered the *gold standard* for interpretation of the meaning of the concept, from a linguistic standpoint.

The logical definitions, represented using the concept model, should represent the same meaning. Spelling of the International FSN follows United States (US) English spelling conventions. Other English language spelling and conventions, such as Great Britain (GB) English, may be represented in preferred terms and other descriptions. They should be appropriately tagged using the Language Reference Set mechanism.

For example,

- 191268006 | Chronic anemia (disorder)|[133]
  - FSN: Chronic anemia (disorder)
  - US PT: Chronic anemia
  - GB PT: Chronic anaemia
- 414545008 | Ischemic heart disease (disorder)|[134]
  - FSN: Ischemic heart disease (disorder)
  - US PT: Ischemic heart disease
  - GB PT: Ischaemic heart disease

Acronyms

Acronyms are easily misinterpreted. For this reason, all acronyms are unacceptable in FSNs.

> For example, the FSN should be the expanded form, Computed tomography of chest (procedure), however as a preferred term, CT of chest (procedure) is acceptable.

If there is an acronym in an existing FSN, the FSN DescriptionId is inactivated and a new FSN is created (regardless of whether or not the acronym was in parentheses with the expanded form). The replacement FSN concept has the expanded description with the acronym entirely removed. Inactivating the ConceptId is not necessarily required, unless the FSN had significant ambiguity before changing it to its expanded form.

Imported FSNs

Before any changes are made to an FSN, imported directly with an extension (local) ID, the submitter should be notified and confirmation sought that no loss of meaning has occurred. This helps to ensure that the original meaning is understood and maintained. Authors should:

- Adhere to naming conventions.
- Advise the submitter of changes and confirm that they are acceptable.
- Check for existing concepts with the same FSN; the term may be added as a preferred term or synonym.

> **Original submitter**
>
> Changes to existing SNOMED CT concepts do not necessitate notifying the original submitter.

Semantic Tag

Semantic tags are part of FSN descriptions. They are placed in parentheses at the end of FSNs when authoring concepts. They indicate the domain to which a concept belongs. For example, body structure, disorder, or specimen.

The purpose of semantic tags is to disambiguate concepts which have the same commonly used word or phrase.

> For example,
>
> - Hematoma (morphologic abnormality)
> - Hematoma (disorder)

The following table contains the semantic tags for each domain.

Domain	Semantic tags

133 http://snomed.info/id/191268006
134 http://snomed.info/id/414545008

Body structure (body structure)	• (body structure)
	  • (cell)
	  • (cell structure)
	  • (morphologic abnormality)

Clinical finding (finding)	• (finding) • (disorder)
Environment or geographical location (environment / location)	• (environment) • (geographic location)
Event (event)	• (event)
Observable entity (observable entity)	• (observable entity)
Organism (organism)	• (organism)
Pharmaceutical / biologic product (product)	• (clinical drug) • (medicinal product) • (medicinal product form) • (physical object) • (product)
Physical force (physical force)	• (physical force)
Physical object (physical object)	• (physical object) • (product)
Procedure (procedure)	• (procedure) • (regime/therapy)

Qualifier value (qualifier value)	• (qualifier value)
	  • (administration method)
	  • (basic dose form)
	  • (disposition)
	  • (dose form)
	  • (intended site)
	  • (number)
	  • (product name)
	  • (release characteristic)
	  • (role)
	  • (state of matter)
	  • (transformation)
	  • (supplier)
	  • (unit of presentation)

Record artifact (record artifact)	• (record artifact)
Situation with explicit context (situation)	• (situation)
SNOMED CT Model Component (metadata)	• (attribute) • (core metadata concept) • (foundation metadata concept) • (link assertion) • (linkage concept) • (namespace concept) • (OWL metadata concept)

Social context (social concept)	• (social concept)
	  • (ethnic group)
	  • (life style)
	  • (occupation)
	  • (person)
	  • (racial group)
	  • (religion/philosophy)

Special concept (special concept)	• (inactive concept) • (navigational concept)
Specimen (specimen)	• (specimen)

Staging and scales (staging scales)	• (staging scale)
	  • (assessment scale)
	  • (tumor staging)

Substance (substance)	• (substance)

3.6.7.3 Preferred Term

A *preferred term (PT)* is the description that is deemed to be the most clinically appropriate way of expressing a concept[135] in a clinical record. It represents a common word or phrase used by clinicians to name a concept in clinical practice or in the literature. It is the synonym that is *preferred* in a language or dialect.

The use of a description can vary between different languages, dialects and contexts. A description may be preferred in some dialects, acceptable in others, and may not be used in some dialects. A Language Reference Set is used to specify the descriptions that are preferred or acceptable in each language or dialect.

A concept may have two descriptions marked as PT, one for each language.

For example, 32849002 | Esophageal structure (body structure) |[136] has

135 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept
136 http://snomed.info/id/32849002

- PT: Esophageal structure (US)
- PT: Oesophageal structure (GB)

A PT for one concept may also be a synonym for another concept.

For example,

- 84162001 | Cold sensation quality (qualifier value)|[137] has a preferred term[138] of *cold*
- 82272006 | Common cold (disorder)|[139] also has a synonym[140] of *cold*

In both concepts, *cold* represents a common clinical phrase used to capture the meaning of the concept[141].

The PT is indicated by the acceptabilityId field, for a particular language or dialect.

3.6.7.4 Synonym

In SNOMED CT, a *synonym (SYN)* is a description that is an acceptable way to express the meaning of a concept in a particular language or dialect, i.e. it is a word or phrase, other than the FSN, that represents a concept. Unlike FSNs, synonyms are not required to be unique.

Each concept may have one or more synonyms.

For example,

- US English synonyms for 22298006 | Myocardial infarction (disorder)|[142] are:
  - Myocardial infarction
  - Cardiac infarction
  - Heart attack
  - Infarction of heart
  - MI - myocardial infarction
  - Myocardial infarct

Modeling

A synonym may not change to, i.e. replace, an existing FSN.

Duplicate terms as synonyms

In most cases, it is unacceptable to add the same term as a synonym to more than one concept. However, some terms have more than one meaning and can be synonyms for more than one concept.

When concepts have the same term as synonyms, they are checked to determine whether or not they are duplicates. If they are duplicates, one concept is inactivated with a historical association link of SAME_AS to the other concept.

A synonym with a single meaning may be erroneously associated with more than one concept. If the concepts are not duplicates, the synonym should be retained with only one of the concepts and inactivated on the others.

Exceptions

137 http://snomed.info/id/84162001
138 https://confluence.ihtsdotools.org/display/DOCGLOSS/preferred+term
139 http://snomed.info/id/82272006
140 https://confluence.ihtsdotools.org/display/DOCGLOSS/synonym
141 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
142 http://snomed.info/id/22298006

Although uncommon, a term may be acceptable as a synonym for two or more concepts. This depends on the context.

For example,

- *Blister* in the context of a drug administration unit vs a skin disorder

Narrower synonym

When a synonym is more specific than the FSN, it does not have the same meaning, and should be inactivated. The description inactivation value of 723278000 |Not semantically equivalent component (foundation metadata concept)| is used.

For example:

- FSN: Removal of device (procedure)
- SYN: Replacement of prosthetic device (procedure) - more specific meaning than the FSN

Broader synonym

When a synonym is more general than the FSN, and there is no context in which it has the same meaning as the FSN, the synonym should be inactivated. The description inactivation value of 723278000 |Not semantically equivalent component (foundation metadata concept)| is used.

For example,

- FSN: Sprain (morphologic abnormality)
- SYN: Joint injury - more general meaning than the FSN

However, a more general synonym is acceptable when there is a context in which the synonym has the same meaning as the FSN.

For example:

- FSN: Entire fundus uteri (body structure)
- SYN: Fundus in the context of obstetrics - same meaning as the FSN

3.6.7.5 Definition

A *definition* is a textual description applied to some SNOMED CT concepts that provides additional information about the intended meaning or usage of the concept. Definitions are not mandated and are considered for addition on a case-by-case basis, and if required, to differentiate a concept from its related concepts.

Adding a definition to a concept provides additional clarity on its context of use. It enhances the definition provided by the modeled relationships whereby a term can be sufficiently defined logically, but the words, which is how many look for and interpret meaning, may imply more or less specificity.

Definitions should be written as complete sentences beginning with a capital letter, ending with a period and with a case sensitivity of CS for entire term case sensitive; this is default for case sensitivity in DEF status.

For example,

- The definition for the concept 11530004 | Brittle diabetes mellitus (finding)|[143] is:

  Frequent, clinically significant fluctuations in blood glucose levels both above and below levels expected to be achieved by available therapies.

> *The definition should never be contradictory to the modeling.*

143 http://snomed.info/id/11530004

The example, *raised blood pressure*, is a commonly used phrase which in itself is ambiguous. *Raised* can mean higher than a previous measurement, on the high side of normal range, or above reference range. Because of that ambiguity, a full definition created by logical model may be impossible, so a text definition could be used to encourage consistent use of the term.

A text definition should be considered where a concept references the obscure or unusual.

In summary, if a term may be interpreted in multiple ways, but is intended to mean only one way in SNOMED CT, it needs a definition. However, ultimate source of truth for meaning remains with the FSN.

- URLs that point to definition sources are unacceptable.
- External references, such as ISBN and PubMed identifiers, are not allowed in SNOMED CT concept definitions.

3.6.8 Case Significance

Generally, SNOMED CT descriptions begin with an upper case letter; the rest of the words in the description lower case except for abbreviations, proper nouns, i.e. names of people, organizations, taxonomic groups (e.g. species, genus, family), etc.

With regard to organism naming:

- Non-taxonomic groupers, such as “Human herpes simplex virus”, are recorded with a case sensitivity indicator of *Entire term case insensitive* (ci).
- There are cases where the authoritative resources do not have an entry for the official name of an organism. For these concepts, the associated literature is referenced for naming and case sensitivity assignments.
    - For example,
        - “Severe acute respiratory syndrome coronavirus 2” is below species level and does not have an entry in the authoritative resource, *International Committee on Taxonomy of Viruses* (ICTV). Therefore, it is recorded with a case sensitivity indicator of *Entire term case insensitive* (ci), since the majority of references do not capitalize “severe”.

Case Sensitivity			
Case Sensitivity Indicator	Values	Meaning	Examples

Case Sensitivity			
cI	900000000000020002 | Only initial character case insensitive (core metadata concept)|[144]	First character of the description may or may not be capitalized while the case of the rest of the description cannot be changed	• Family history of Prader-Willi syndrome (situation) • Born in Australia (finding) • Neonatal jaundice with Dubin-Johnson syndrome (disorder) • Penicillin resistant Streptococcus pneumoniae (organism)
CS	900000000000017005 | Entire term case sensitive (core metadata concept)|[145]	Cannot change any case in the description Changing case may change the meaning of the term or is not commonly used	• Down syndrome • English as a second language (finding) • pH measurement (procedure) • mm (qualifier value)
ci	900000000000448009 | Entire term case insensitive (core metadata concept)|[146]	Entire description may be lower or upper case Changing case does not change the meaning of the term	• Fracture of tibia (disorder) • Blood compatibility test (procedure) • Bite of fish (event) • Floor mat (physical object)

Special attention is to be paid to the possibility of altering the semantics of those concepts whose FSN uniqueness depends upon case significance.

For example,

The subtypes of 365638007 |Finding of Rh blood group (finding)| vary in meaning depending upon the description's case of the letters c, d, and e.

144 http://snomed.info/id/900000000000020002
145 http://snomed.info/id/900000000000017005
146 http://snomed.info/id/900000000000448009

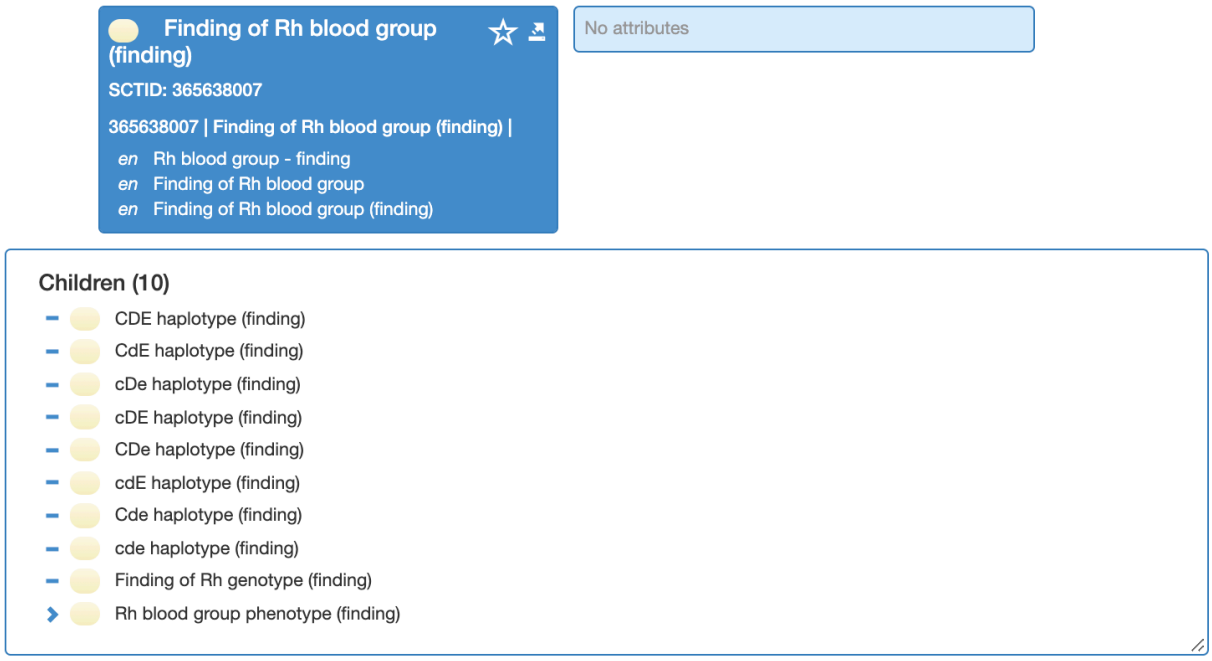


Figure 1: Stated view of 365638007 |Finding of Rh blood group (finding)| and subtypes

Case sensitivity can be changed on an existing description without inactivating the description.

The common name for |Structure of pharyngotympanic tube (body structure)| is eustachian tube. While the term originated eponymously, it is not the name of the person from whom the body structure was named after. Therefore, the case significance is ci for case insensitive.

3.6.8.1 Extensions

SNOMED CT includes three case significance values, "ci", "cI" and "CS". However, this range of values depends on the languages and linguistic norms. For the International Edition, where the first character of descriptions is always capitalized, the value "Only initial character case insensitive" ("cI") is necessary. This value is not required for descriptions in extensions that do not adhere to this convention. When appropriate, it is also acceptable to limit the range to a single case significance value.

3.6.8.2 Numeric values

Numeric values will not display differently if switched between upper and lower case, so numeric values should be treated as case *insensitive* characters in a term.

If a description begins with a numeric value and the word following the number does not begin with a capital letter, the case sensitivity indicator is ci for *Entire term case insensitive*.

For example,

- The concept 33635003 | Serotonin (substance)|[147] has the synonym, 5-hydroxytryptamine. The description is recorded in SNOMED CT in lower case, not 5-Hydroxytryptamine, but the case sensitivity indicator is *ci* for *Entire term case insensitive*.

If a description begins with a numeric value and follows with an abbreviation that contains a capital letter, the case sensitivity indicator is cl for *Initial character case insensitive*.

For example,

- The concept 387407006 | Tioguanine (substance)|[148] has the synonym, 6-TG. Apply the case sensitivity indicator of cl for *Only initial character case insensitive*.

3.6.8.3 Special characters

Special characters such as <, %, >, . , &, ^, will not display differently if switched between upper and lower case, so numeric values should be treated as case *insensitive* characters in a term. The rules for numeric values apply similarly to special characters.

If a description begins with a special character and the word(s) and/or symbol(s) following the special character begins with a capital letter, the case sensitivity indicator is cl for *Initial character case insensitive*.

For example,

- The concept 277976001 | Less than 35 degrees C (qualifier value)|[149] has the synonym, <35 degrees C. The description starts with a special character that is case insensitive but contains an abbreviation "C" for Celsius that is case sensitive, so the case sensitivity indicator applied to the synonym is cl for *Only initial character case insensitive*.

> ⚠ **Greek alphabet characters**
>
> Words derived from the Greek alphabet, for example, alpha, beta, delta, gamma, omega, etc., are case insensitive wherever they are in the description in the substance hierarchy.

3.6.8.4 Assessment scales and Staging systems

SNOMED CT descriptions representing assessment scales and staging systems should be capitalized per the name of the scale or staging system. Legacy concepts may not follow this pattern.

For example,

- Ages and Stages Questionnaires Third Edition (assessment scale)
- Fagerstrom test for nicotine dependence (assessment scale)
- National Cancer Institute histologic grading system (staging scale)
- Clark system for melanoma staging (staging scale)

> ⚠ **Gram staining**
>
> Gram staining is a common laboratory technique used to differentiate bacteria based on their cell wall constituents. Laboratory test results may be *Gram positive* or *Gram negative*. The technique was developed by a Danish physician, Hans Christian Gram. Consequently *Gram*, when referring to the technique, should always begin with an upper case *G*.

147 http://snomed.info/id/33635003
148 http://snomed.info/id/387407006
149 http://snomed.info/id/277976001

3.6.9 Person Naming Conventions

3.6.9.1 Patient vs Subject

Descriptions should use the word *subject*, not *patient*, if required. Subject is broader than patient.

For example,

- 420058008 | Provider of history other than subject (person)|[150]

Subject refers to the subject of record, who may, in some circumstances, not be the patient.

3.6.9.2 Caregiver vs Carer

Descriptions with *caregiver* should be as follows:

- An FSN should use *caregiver* as (one word).
- There should be a synonym using *carer*.

For example,

- 425578005 | Caregiver able to cope (finding)|[151]
- Synonym: Carer able to cope

3.6.10 Plurals

3.6.10.1 Fully specified names (FSNs)

In general, concepts are represented in the singular, rather than the plural.

For example:

- Disorder of lung (disorder), not disorder of lungs
- Acute cholecystitis due to biliary calculus (disorder), not biliary calculi

FSNs should not be plural unless the concept necessarily involves multiples.

3.6.10.2 Unintended plurals

Unintended plurals might be incorrectly interpreted. An unintended plural is the use of a plural when, in fact, there is only one entity.

Correct example,

- *Multiple cranial nerve palsies*; the word *multiple* indicates that there can never be just one, so the plural *palsies* is correct

Incorrect example,

- *Trochlear lesion* versus *trochlear lesions;* users would use this concept to refer to a single trochlear lesion, thus the plural form would be incorrect

150 http://snomed.info/id/420058008
151 http://snomed.info/id/425578005

3.6.10.3 Exceptions

Organizational nodes or grouper concepts may be plural.

For example,

- 234320004 | Procedures for splenic lesions (procedure)|[152]
- 194732001 | Diseases of mitral and aortic valves (disorder)|[153] , has IS A 195002007 | Multiple valve disease (disorder)|[154]

A concept that necessarily involves multiples should have a plural FSN.

For example,

- Bilateral atrophy of testes (disorder)

> ⚠ It is advisable to keep track of these exceptions in a separate subset or using a special term type, so that they can be excluded when the singular/plural distinction is important for mapping.

3.6.11 Punctuation and Symbols

Legacy content may not adhere to current guidelines and will be updated as resources allow.

3.6.11.1 Comma (,)

A comma is allowed in an FSN when required for meaning or to add clarity.

For example,

- Computed tomography of head, neck, abdomen and pelvis (procedure)

A comma is not allowed to change *sort order* for use in the search function.

Unacceptable example,

- Frostbite, acute

3.6.11.2 Apostrophe (')

Eponymous descriptions should not include an apostrophe or final *s*, unless the name normally ends in *s*. With rare exception, a concept with an eponym should have at least one description that follows this rule.

For example,

- Down syndrome, a synonym for Complete trisomy 21 syndrome (disorder)
- Sjogren syndrome (disorder)
- Meigs syndrome (disorder)

When common usage requires it, there should be at least one description that has the apostrophe *s*. For descriptions with a possessive apostrophe where the name normally ends in *s*, the apostrophe should follow the *s*.

For example,

152 http://snomed.info/id/234320004
153 http://snomed.info/id/194732001
154 http://snomed.info/id/195002007

- Alzheimer's disease (disorder)
- Bowen's disease (disorder)
- Meigs' syndrome (disorder)

⚠ Existing eponymous descriptions with the possessive *s*, but no apostrophe, need not be inactivated, but newly added descriptions should either have no *s*, or else include the apostrophe.

3.6.11.3 Prime symbol (')

In protein names, this character (represented by single quote character) is used to indicate the cleavage location on a substrate and to distinguish different subunits with the same notation.

For example, 80222004 |5'-nucleotidase (substance)|

ⓘ The prime symbol and apostrophe may look the same, but each has its own Unicode representation.

3.6.11.4 Hyphen and dash (-)

A *hyphen* is used to join words and to separate syllables. Hyphens may be used in FSNs. There is no space either before or after a hyphen.

✓ Hyphens should follow rules of style for the dialect and language in which the descriptions are used as found in such publications as the *Chicago Manual of Style*, the *American Medical Association's Manual of Style*, a current medical dictionary, etc.

Unless used to prevent ambiguity, punctuation is to be used sparingly.

For example,

- Anti-infective agent (product)
- Zollinger-Ellison syndrome (disorder)
- Zellweger's-like syndrome (disorder)
- Tick-borne hemorrhagic fever (navigational concept)
- Phospho-2-dehydro-3-deoxygluconate aldolase (substance)
- Multidrug-resistant bacteria (organism)
- Pandrug-resistant bacteria (organism)
- Extended spectrum beta-lactamase-producing bacteria (organism)

A *dash* may be used to separate two phrases, to contrast values, or to show a relationship between two things. A dash should not be used in an FSN, with rare exception, because it may obscure the exact meaning of the description. The dash should be replaced with words that clarify the meaning. A dash is also used to separate an acronym from its expanded form when no other terms are included in a description.

For example,

- 273420000 | Disability assessment schedule (assessment scale)|[155] has a synonym of DAS - Disability assessment schedule
- 719977005 | Communication Activities of Daily Living (assessment scale)|[156] has a synonym of CADL - Communication Activities of Daily Living

155 http://snomed.info/id/273420000
156 http://snomed.info/id/719977005

Exceptions

When there is a need to distinguish categories from more specific subtypes with the same name, a dash followed by the word *category*, may be used.

For example,

- 416500007 | Malignant glioma - category (morphologic abnormality)|[157] distinguishes the category of malignant gliomas from those neoplasms that are called 74532006 | Glioma, malignant (morphologic abnormality)|[158] . The neoplasm called malignant glioma is one of several subtypes of 416500007 | Malignant glioma - category (morphologic abnormality)|[159] , and does not have the same meaning as the category itself.

3.6.11.5 Colon (:)

In general, colons should not be used in fully specified names.

Exceptions

Colons are allowed in the FSNs of organisms, substances, or products where the colon is part of the name. They are also allowed in ratios and in tumor stages.

For example,

- Salmonella II 43:g,t:[1,5] (organism)
- Lidocaine hydrochloride 1.5%/epinephrine 1:200,000 injection solution vial (product)
- pT3: tumor invades adventitia (esophagus) (finding)

Colons may be allowed in non-FSN descriptions.

For example, to separate an abbreviation from the rest of a name or a specimen from the finding

- Urine: turbid (finding)

Double Colon (::)

A double colon (::) notation is allowed in the neoplastic morphologic abnormalities (400177003 |Neoplasm and/or hamartoma (morphologic abnormality)| subhierarchy). The notation can be used to represent gene fusions; for example, BCR::ABL1 fusion.

3.6.11.6 Forward slash (/)

The forward slash should not be used in FSNs. When the slash is part of the authoritative name (e.g. representation of heterozygosity in hemoglobinopathies), a hyphen (no space before or after) is used in the FSN. The forward slash, without spaces, may be used in a preferred term or synonym.

For example,

- FSN: Sickle cell-hemoglobin C disease (disorder)
- SYN: Hemoglobin S/C disease
- FSN: Per cubic millimeter (qualifier value)

157 http://snomed.info/id/416500007
158 http://snomed.info/id/74532006
159 http://snomed.info/id/416500007

- SYN: /mm^3

Exceptions

A forward slash may be used to represent units of measure, official enzyme names, and laboratory test results. They may also be used in *and/or* when part of FSNs. There should be no space either before or after the slash.

For example,

- Nitroglycerin 0.3mg/hr disc (product)
- Ibuprofen 5%/Levomenthol 3% gel (product)
- Milligram/deciliter haptoglobin (qualifier value)
- Bone structure of head and/or neck (body structure)

A forward slash may be allowed in non-FSN descriptions in a variety of contexts. Some common examples of use are in acronyms with findings, and as an abbreviation meaning *and/or* concepts.

Protein names may contain the forward slash '/' for separating multiple domains or functions:

For example, 1222712000 |Serine/threonine-protein kinase B-raf (substance)|

Certain neoplastic variants incorporate a slash in their terming (note this slash does not mean 'and' or 'and/or'). Based on pathology input, a dash can be utilized in the FSN and a slash retained in the Preferred Term for clinical usage.

For example,

- FSN: Myelodysplastic-myeloproliferative neoplasm with neutrophilia (disorder)
- PT: Myelodysplastic/myeloproliferative neoplasm with neutrophilia

3.6.11.7 Plus sign (+)

The plus sign is generally discouraged for use in descriptions, and legacy content still contains this symbol. However, some uses are allowed. Plus signs may be found in the product, disposition, and substance hierarchies.

For example,

- |H+/K+-exchanging ATPase inhibitor| is an acceptable synonym for 734582004 | Hydrogen/potassium adenosine triphosphatase enzyme system inhibitor (disposition)|[160] .

3.6.11.8 Caret symbol (^)

A pair of caret symbols is used to enclose character strings that should display as superscript.

> Current guidance for substance and product hierarchies is to not create new instances containing symbols for superscript and subscript.

The single caret is used to represent exponents, i.e. *powers of,* in alignment with the Unified Code for Units of Measure (UCUM) guidance on the use of powers of ten.

For example,

- *10^3* for the third power of ten

160 http://snomed.info/id/734582004

3.6.11.9 Pipe character (|)

A description cannot contain a pipe character, |. Since the | is used to indicate the beginning and end of a description, it may cause confusion.

3.6.11.10 Umlaut (¨)

An umlaut should only be accepted for terms that do not have equivalences in English. Synonyms without umlauts should be added to facilitate searching in English.

For example,

- 83901003 |Sjögren's syndrome (disorder)| and one of its synonyms, Sjogrens syndrome

3.6.11.11 Brackets ([ ])

The use of brackets " [ ] " for descriptions are allowed, including in FSN and PT.

For example,

- 114819005 |Salmonella II 43:g,t:[1,5] (organism)|
- 1222745000 |Succinate dehydrogenase [ubiquinone] iron-sulfur subunit, mitochondrial (substance)|

3.6.11.12 Other Special Characters (<, >, &, %, $, @, #)

Other special characters <, >, &, %, $, @, # are not permitted in FSNs. All instances of FSNs with these characters should be spelled out in full text.

For example,

- *FD&C Yellow #2* should be *FD and C Yellow Number Two*

The characters &, %, and # are permitted in preferred terms or synonyms.

⚠ The characters @ and $ are not used in any descriptions.

3.6.12 Sentence Types

Concepts should be names or short noun phrases. Full statements or sentences are unacceptable.

Procedure concepts should not contain phrases that can be categorized as a sentence function type, i.e. imperative, declarative, interrogative, or exclamatory. A procedure description should be a noun phrase that names the procedure, and should not contain information that it was done, or is to be ordered, carried out, or planned.

For example,

- 11227005 | Excision of ganglion of tendon sheath of hand (procedure)|[161] is a noun phrase giving the proper description for the procedure

Unacceptable example,

161 http://snomed.info/id/11227005

- Hand tendon ganglion excised (situation) indicates the procedure was done, as a past tense declarative statement

  This is a situation with explicit context, not a procedure.

3.6.13 US vs. GB English

All fully specified names (FSN) should be represented in US English. When there is a difference between the US and GB spelling, there should be US and General British (GB) preferred terms (PT) and/or synonyms (SYN).

For example:

- FSN: Benign tumor of endocrine pancreas (disorder)
- PT-US: Benign tumor of endocrine pancreas
- PT-GB: Benign tumour of endocrine pancreas

> **Proper nouns**
>
> Where an FSN represents the name of an organization or trademarked name, a synonym with variant GB or US spelling is not required.

References for Spelling

	References	Notes
US-GB differences	Wikipedia, the free encyclopedia* *Note: Wikipedia may be used as a starting point, or source, for authoritative references, but not as an actual reference	• First point of reference • Provides a summary for authors, addresses many US-GB spelling differences, and provides references
US Medical English	Stedman's Medical Dictionary Merriam-Webster Online Dictionary American Medical Association (AMA) Manual of Style	NA
GB English	Dorland's Medical Dictionary - medical terminology Chambers 21st Century Dictionary - general	NA

⚠ Oxford English Dictionary spelling is different from British English. A summary of the points of difference can be found at http://en.wikipedia.org/wiki/Oxford_spelling_. In those cases where British English and Oxford English Dictionary differ, SNOMED CT follows the British English spelling.
The addition of an Oxford English Dictionary term is allowed but not required. When added, it should be marked as acceptable in the British English dialect. In some cases, it is also accepted or preferred in US English.

3.6.13.1 Principles for selecting preferred spelling variants

SNOMED CT may include (or add) more than one description, each with a different spelling for a given concept. That is, if the above references provide evidence of acceptability in the dialects for which they are being added.

For spelling of preferred terms in a dialect, where the reference sources provide multiple options, a judgment about the most common spelling may be needed. This may be determined by reviewing journal articles containing the word in question.

- Articles should be from highly cited journals, e.g BMJ (for British English) or NEJM or JAMA (for US English).
- For concepts that are not clinical, appropriate scientific journals should be consulted, e.g. Science (US publisher) or Nature (UK publisher).

3.6.13.2 Fetal vs. Foetal

Fetal is the preferred term in both the US and GB language reference sets. *Fetal* is acceptable in GB synonyms. Foetal is not acceptable for US language but acceptable for GB language.

3.6.14 Action Verbs

Action verbs should be written in noun form within SNOMED CT descriptions. This most often means the verb will end with a suffix of –tion, -sion, -ment, -al, -ence, or -ance.

For example,

- *Destruction* instead of destroy
- *Incision* instead of incise
- *Replacement* instead of replace
- *Removal* instead of remove
- *Maintenance* instead of maintain

However, the root form of the verb may be used when it does not make a word when ending in noun suffixes.

For example,

- *Control*
- *Release*
- *Care*

Lastly, the verb with a suffix of –ing may be used when the root form of the verb may cause ambiguity in the meaning, i.e. the root form of the verb could also be a physical object.

For example,

- *Wiring* instead of wire

- *Suturing* instead of suture
- *Splinting* instead of splint
- *Mapping* instead of map
- *Grafting* instead of graft

Exceptions,

Common usage may dictate some exceptions.

For example,

- *Repair* instead of repairment

  Although 'repairment' may be considered a valid word, its use has fallen out of common usage in comparison to 'repair'.

Check for approved and unapproved naming patterns in the Precoordination Naming Pattern Project[162].

3.6.14.1 Past tense

A past tense verbal phrase should not be used to name a procedure, since it indicates that the procedure was done in the past.

Unacceptable example,

- *Hand tendon ganglion excised* indicates the procedure was done, as a past tense declarative statement.

However, the following is an acceptable example using a noun phrase,

- 11227005 | Excision of ganglion of tendon sheath of hand (procedure)|[163]

Situation hierarchy

Existing descriptions containing past tense verbs should be moved to the 243796009 | Situation with explicit context (situation)|[164] hierarchy.

3.6.15 Numbers and Numeric Ranges

3.6.15.1 Roman numerals versus Arabic numbers

Use the most common representation found in literature for the fully specified name. Use the alternative representation as a synonym, if it is also represented in the literature. If neither representation is common, use the Arabic representation.

For example, in the *AMA Manual of Style,* cancer stages are expressed with the use of capital Roman numerals: stage I, stage II, stage III, stage IV. The term, "stage 0", usually indicates carcinoma in situ. Histologic grades are expressed with Arabic numerals, e.g., grade 2.

162 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project
163 http://snomed.info/id/11227005
164 http://snomed.info/id/243796009

3.6.15.2 Numeric ranges

In general, content that depends on numeric ranges should not be used for precoordination.

For example,

- There may be too many possibilities
  - A finding of number of lesions might have ranges of *1*, *2 to 5*, and *greater than 5*; *1 to 2*, *3 to 10*, and *greater than 10*, etc.
- There may be possible changes to reference ranges or systems of units
  - The normal serum sodium concentration is usually defined as 135 to 145 mEq/L. Low serum sodium should not use the phrase *serum sodium less than 135 mEq/L;* it should use a phrase such as *serum sodium concentration below reference range.*
  - A body mass index (BMI) score as an indicator of obesity

Exception: acceptable numeric range

A standard definition with a fixed numeric range may be acceptable, i.e., the range is an explanation or definition of the score.

For example,

- A histologic scoring system with a score of *1* when there are *0 to 5 mitoses per high power field*, and a score of *2* when there are *6 to 10*, etc.
- The Tumor, Node, Metastases (TNM) Classification of Malignant Tumor

3.7 General Modeling

SNOMED CT is arranged as a polyhierarchy. A *hierarchy* is defined as an ordered organization of concept codes linked together through IS A relationships. Concept codes are linked to their more general parent concept codes directly above them in a hierarchy. Concepts with more general meanings are usually located at the top of the hierarchy and then at each level down the hierarchy the meanings become increasingly more specialized.

For general modeling information, use the following links to jump to the following pages:

- Changes to Components(see page 84)
- Conjunction and Disjunction(see page 91)
- General Concept Inclusions - GCIs(see page 93)
- Grouper Concept(see page 97)
- Intermediate Primitive Concept Modeling(see page 99)
- Proximal Primitive Modeling(see page 99)
- Relationship Group(see page 101)
- Sufficiently Defined vs Primitive Concept(see page 113)
- Templates(see page 113)

3.7.1 Changes to Components

Concepts, descriptions, and target values may be changed for a variety of reasons.

- Description Inactivation(see page 85)
- Concept Inactivation(see page 86)

3.7.1.1 Considerations for current concepts when creating new concepts

Concepts that are used as target values in an attribute relationship impact the placement of the source concept of the relationship. Some concepts, for example, those in the Qualifier value hierarchy, are created to support the definition of other concepts. Creation of a new concept that will be used as the target value in an attribute relationship requires an author to determine if there are active concepts in the *domain* hierarchy that should also use the new concept as a target value.

For example,

> The creation of 713295009 | Surgical replacement - action (qualifier value)|[165] would require a review of active concepts that represent *surgical* replacement procedures that were previously modeled with the Method (attribute) of Replacement - action (qualifier value).
>
> A concept that represents a surgical replacement procedure that currently has a Method (attribute) of 282089006 | Replacement - action (qualifier value)|[166] would require inactivation of that relationship and the creation of a new attribute-value relationship of Method (attribute) of 713295009 | Surgical replacement - action (qualifier value)|[167].

3.7.1.2 Description Inactivation

Description inactivation values

Depending upon the combination of the type of component and the reason for inactivation, a specific inactivation reason must be selected.

Inactivation value	Definition	Example
Not semantically equivalent component (foundation metadata concept)	A description does not represent the same meaning as the concept's Fully Specified Name (FSN)	Removal of device (procedure) has a synonym, Replacement of prosthetic device (procedure), which should be inactivated because the synonym has a more specific meaning than the FSN.
Outdated component (foundation metadata concept)	A component is no longer current, useful, appropriate or acceptable	The synonym *Compression facies* was inactivated from the concept's more modern description of *Facial asymmetry*.
Grammatical description error (foundation metadata concept)	A component contains a technical error. The error in the description is grammatical or a spelling mistake, which when corrected does not change the meaning of the concept. Where the meaning *is* changed, the *concept* should be inactivated using *Erroneous component*.	Case significance error: *Alpha* should have a lower case *a* Spelling error: *Asthma* misspelled as *Assthma*

165 http://snomed.info/id/713295009
166 http://snomed.info/id/282089006
167 http://snomed.info/id/713295009

Inactivation value	Definition	Example
Nonconformance to editorial policy component (foundation metadata concept)	A component fails to comply with the current editorial guidance	The concept Urine: turbid (finding) was inactivated and replaced by 167238004 | Turbid urine (finding)|[168]

Order of selection of inactivation values

When there is more than one reason to inactivate a description, the order of preference for the inactivation value is as follows:

1. 723278000 | Not semantically equivalent component (foundation metadata concept)|[169]
2. 900000000000483008 | Outdated component (foundation metadata concept)|[170]
3. 1217318005 | Grammatical description error (foundation metadata concept)|[171]
4. 723277005 | Nonconformance to editorial policy component (foundation metadata concept)|[172]

Corresponding association type

Only the description inactivation value of *Not semantically equivalent component* requires an association type; the association type is *Refers to* and necessitates the reference to at least one active SNOMED CT concept. It is possible that the description is ambiguous and may relate to more than one concept.

The other three description inactivation values (outdated, grammatical error, nonconformance) do not require an associated concept.

See also, *Changes in FSN*, on the Fully Specified Name(see page 62) page.

3.7.1.3 Concept Inactivation

Concept inactivation values

A value from the choices below must be chosen as a reason for inactivating a concept. Inactivation replacement associations are ultimately at the author's discretion. Especially in the instance of an infinite number of possible replacements, clinical relevance and subset inclusion should be considered. Non-synonymous synonyms should also be inactivated and reassigned.

168 http://snomed.info/id/167238004
169 http://snomed.info/id/723278000
170 http://snomed.info/id/900000000000483008
171 http://snomed.info/id/1217318005
172 http://snomed.info/id/723277005

Inactivation reason	Association type	Cardinality	Notes
Ambiguous	*Possibly equivalent to*	1..*	• The inactivated concept is inherently ambiguous. • Every effort should be made to identify **all** of the clinically useful "POSSIBLY_EQUIVALENT_TO" target concepts, which should be semantically as close as possible to the meaning of the inactivated concept. Where appropriate, new concepts should be created if they are clinically valid. • POSSIBLY_EQUIVALENT_TO target may be singular where the second target is a concept that is of little or no clinical usefulness. It is not necessary to represent all of the semantic meaning of the inactivated concept if the concepts needed should not exist in SNOMED CT. • If the FSN is vague, not ambiguous, consider using *Meaning of component unknown.*
Classification-derived component	*Replaced by*	0..1	• Applies to concepts with classification type descriptions - do not have to appear in a classification. • Use with "not otherwise specified", "NOS", "not elsewhere classified", "NEC", "unspecified", "other".
	Partially equivalent to	0..*	• Use Partially *equivalent to* where the intended meaning is disjunction for classification purposes, regardless of whether the terms are explicitly written as "with", "and", "and/or". The replacements must include all of the clinically valid elements of the disjunction, e.g., two or more concept target values. • Every effort should be made to identify **all** of the clinically valid *Partially equivalent to* target concepts which should be semantically as close as possible to the meaning of the inactivated concept. Where applicable and appropriate, new concepts should be created to describe the clinically relevant aspects of the inactivated concept.
Duplicate component	*Same as*	1..1	• The concept has been made inactive because it has the same meaning as another concept.
Erroneous component	*Replaced by*	1..1	• Applies to FSNs which contain an error, that when corrected, potentially changes the semantic meaning of the concept. • Where the error is grammatical or a spelling mistake, which when corrected does not change the meaning, the *description* rather than the *concept* should be inactivated.

Inactivation reason	Association type	Cardinality	Notes
Meaning of component unknown	No association type applied	0..0	• Meaning of the concept cannot be determined. • The FSN is **vague, not ambiguous**.
Non-conformance to editorial policy	No suitable replacement identified	0..0	• A suitable replacement cannot be identified or concept is no longer in scope, e.g. administrative, occupation or country concepts are under discussion. • When jurisdictional control of a concept passes between extensions, eg. international core and the veterinary extension, or relates to specific forms, legal entities, etc.; no replacement is required. • Applies to a concept which does not adhere to editorial guidelines eg. grouper that cannot be defined. • Applies to concept that does not adhere to Precoordination Naming Patterns • *Replaced by:* Where conformance to editorial policy potentially changes the meaning of a concept and it is possible to replace this with a concept that is semantically very close to the inactivated concept. • *Alternative:* Editorial policy results in a change in scope e.g. branded products were considered out of scope for SNOMED CT, an *Alternative* would be the generic product.
	Replaced by	0..1	
	Alternative	0..*	
Outdated component	No suitable replacement identified	0..0	• The inactivated concept is an outdated concept that is no longer considered to be clinically acceptable or semantically interoperable internationally. • In some circumstances, an outdated concept simply falls into disuse without any appropriate replacement. • *Possibly replaced by* is used when two or more potential replacements exist; two or more concepts as targets can be selected. • *Replaced by* is used when a concept exists that is semantically similar to, or more general than, the inactivated concept for the purposes of reconciling historical data analysis.
	Possibly replaced by	0..*	

Inactivation reason	Association type	Cardinality	Notes
	Replaced by	0..1	

Historical relationships

When changes are made to a historical relationship for a concept that was previously inactivated, such as Limited/WAS_A, assign a new historical relationship that facilitates traceability of the concept (duplicate, ambiguous, classification derived, etc.). The *Limited component* inactivation reason (WAS_A association type) is no longer in use for new content inactivations as of the July 2018 release.

Ambiguous

All possible meanings should be represented in the replacement targets when feasible, creating new concepts as replacements when appropriate.

Ambiguous concepts with a single replacement target may be used if one of the two possible meanings of the ambiguous concept is not clinically useful.

Classification-derived

Many, but not all, concepts precoordinated with "with" and "and" are derived from classifications; regardless, this is the acceptable inactivation reason.

For concepts with exclusions, such as NEC, NOS, etc., use the *Replaced by* association with the immediate parent concept as the value, which is the clinical condition without any context. If a parent concept without the exclusion does not exist, it should be created as a new concept.

For concepts with conjunctions such as 'and' and 'with', use the *Partially equivalent to* association with the two separate values as targets. For the purposes of patient care, it is recommended that each disorder is recorded individually.

> The *Partially equivalent to* association signifies that **all** applied targets must be implemented within the clinical notes to ensure the original clinical idea is represented.

Duplicate

Inactivation

- Note that the meaning of the concept is based on the FSN but does not imply that the FSNs are identical. Keep the concept with the more specific FSN. FSN is the source of a concept's meaning; hence, there should be more weight in the meaning of the FSN rather than the underlying modeling. Implementers do not see modeling.
- If appropriate, add the descriptions from the inactivated concept to the remaining active concept while ensuring they are semantically equivalent, clinically useful, and follow current naming conventions.

Consider

- Inactivating the newer concept
- Inactivating the concept with fewer subtypes. This will simplify the process and minimize the amount of rework required.
- Inactivating the concept with least modeling
- Updating the retained concept's FSN and modeling to align with current policy.

Differing hierarchies

The Duplicate component is the inactivation for duplicated concepts:

1. Within the following hierarchies:
    a. Clinical finding and Disorder
    b. Procedure and Regime/Therapy
2. Between the following top-level hierarchies:
    a. Clinical finding and Situation
    b. Procedure and Situation
    c. Observable and Procedure

Any possible duplicates between concepts among other paired hierarchies not listed above should be reconsidered as duplicates and directed to another inactivation reason, likely Erroneous.

⚠ If the change is a request, inform the requestor as to which concept is inactivated.

Erroneous

Where the error gives rise to potential ambiguity, use the inactivation reason of Ambiguous component. Otherwise, the Erroneous component requires a single *Replaced by* value.

Meaning unknown

Meaning of the concept is unknown, and an association type is not given. It will normally be necessary to search the clinical literature to establish that this is truly an unknown concept rather than an outdated clinical concept. This inactivation reason may be used where the meaning of the FSN is considered to be vague.

Nonconformance to editorial policy

Concept which do not adhere to editorial guidance can be inactivated without an association type. Else *Replaced by* and *Alternative* are Association type options.

Policies will often delineate how these two *Association type* options will be used. Changes of this type often include bulk updates and may relate to medicinal products, substances, and devices.

Outdated

When an outdated concept simply falls into disuse without any appropriate replacement, no historical association is applied.

Replaced by is used for a single replacement concept that is semantically similar to or more general than the inactivated concept.

Possibly replaced by is used for multiple replacement concepts.

For example,

A substance or organism originally believed to be a single entity has been reclassified as two or more substances or organisms.

For more information, see the SNOMED CT Editorial Advisory Group Confluence page, Management of Concept Inactivation[173] for details.

3.7.2 Conjunction and Disjunction

In *SNOMED CT*, *and* is used in descriptions to represent the operator for logical conjunction. Concepts with the disjunctives (*or, and/or*) are unacceptable. Instead, there should be separate concepts. There are limited exceptions where *and/or* is used to represent the operator for inclusive disjunction. This helps to avoid confusion with the literal use of *or* in common language, i.e. only one of two operands is true; rarely both operands are true.

Conjunction and Disjunction			
	and	*or*	*and/or*
SNOMED CT	**Conjunction: And** • A set of operands is true, if and, only if all of its operands are true • A and B are true	**Exclusive disjunction: Or** • Either A or B is true but not both	**Inclusive disjunction: And/or** • A set of operands is true, if and, only if one or more of its operands is true • Either A or B is true or • Both A and B are true

3.7.2.1 Disjunctives

Disjunctives are unacceptable with limited exceptions below. Instead of disjunctives, there should be separate concepts when possible.

Concepts with disjunctives (*or, and/or*) in disorders and procedures often involve one or more body structures.

For example,

173 https://confluence.ihtsdotools.org/display/editorialag/Management+of+Concept+Inactivation

- 65966004 | Fracture of forearm (disorder)|[174]

The concept does not specify which bone of forearm is fractured. It is a break in *one or both of the radius and/or ulna* per the ICD definition. It would subsume fracture of radius, fracture of ulna, and fracture of both radius and ulna.

Exclusive disjunction ("or" only) is used when either operands is true but both cannot be true.

For example,

- 417163006 | Traumatic or non-traumatic injury (disorder)|[175]

Concepts representing a clinical finding caused by more than one distinct substance logically represent disjunction, i.e., a clinical finding caused by substance X and/or substance Y. These concepts should be modeled as primitive using GCI. The causative agent for the main axiom should be the most specific shared parent of the substances involved. The causative agent for each GCI should be its own specific substance.

For example,

- 870746005 |Allergy to ergometrine and/or oxytocin (finding)|
- 1149371006 |Sulfamethoxazole and/or trimethoprim overdose (disorder)|

Exceptions

Disjunctives may be used if the:

- The referent is a single thing, but there isn't a name for it.

  For example,
  - 774007 | Structure of head and/or neck (body structure)|[176]
- The concept is an intensional navigational aggregate.

  For example,
  - 707861009 | Structure of skin and/or skin-associated mucous membrane (body structure)|[177]
  - 768845000 | Xanthine and/or xanthine derivative (substance)|[178]
  - 767271006 | Lead and/or lead compound (substance)|[179]
- The concept is based on an authoritative source but not a classification system.

Modeling

The use of *and/or* in a description with disjunction should be lower case.

3.7.2.2 Anatomical structure hierarchy

Conjunction and disjunction are commonly used in the anatomical structure hierarchy. Following the anatomy SEP (Structure/Entire/Part) model, the word "structure" means all or any part of an anatomic entity, which is an inclusive disjunction.

For example,

174 http://snomed.info/id/65966004
175 http://snomed.info/id/417163006
176 http://snomed.info/id/774007
177 http://snomed.info/id/707861009
178 http://snomed.info/id/768845000
179 http://snomed.info/id/767271006

419605007 | Structure of ankle and/or foot (body structure)|[180] represents adjacent regions of ankle and foot by a single concept. It is an inclusive disjunction, because any structures of ankle, foot, or both are true subconcepts. However, "*Entire ankle and foot"* as a conjunction means the ankle and foot as a whole. The concept represents the entirety of this single region, though there is no dedicated name.

"*Structure of ankle and foot"* has the same meaning as "*structure of ankle and/or foot" because of the inclusive disjunction meaning of "structure"*. "*Structure of ankle and foot"* was previously used. These descriptions were changed to *and/or* to explicitly indicate the *inclusive disjunction*. This supports users unfamiliar with the interpretation of "*structure"* in the SEP model.

The *and* represents conjunction in disorders and procedures that can be interpreted as co-occurrent. It can be read as *both* in common usage. It would be *all* if it refers to more than two disorders or procedures.

For example,

- 75857000 | Fracture of radius AND ulna (disorder)|[181] represents the occurrence of a *fracture of radius* and a *fracture of ulna* at the same time or event. In other words, fracture of both radius and ulna. The concept should be modeled using two finding site relationship groups: Bone structure of radius in one and Bone structure of ulna in the other.

3.7.3 General Concept Inclusions - GCIs

3.7.3.1 Draft guidance

See the background, use cases, and examples for general concept inclusion axioms as well as explanation of the definition status at General Concept Inclusion 0.01[182].

3.7.3.2 Authoring Platform User Guide for GCIs

Reference the SNOMED International Authoring Platform User Guide[183] for technical information describing how to add an additional axiom and general concept inclusion.

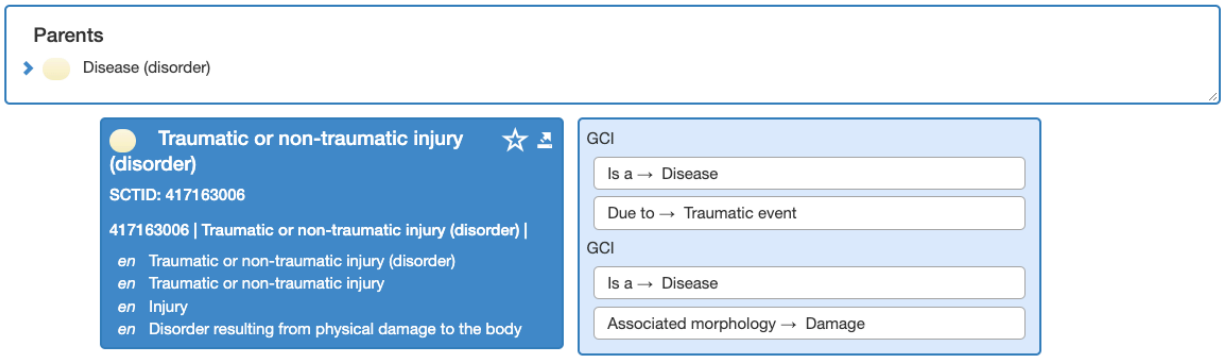
3.7.3.3 GCI display in the browser

A concept with GCIs will display in the browser in the stated view only.

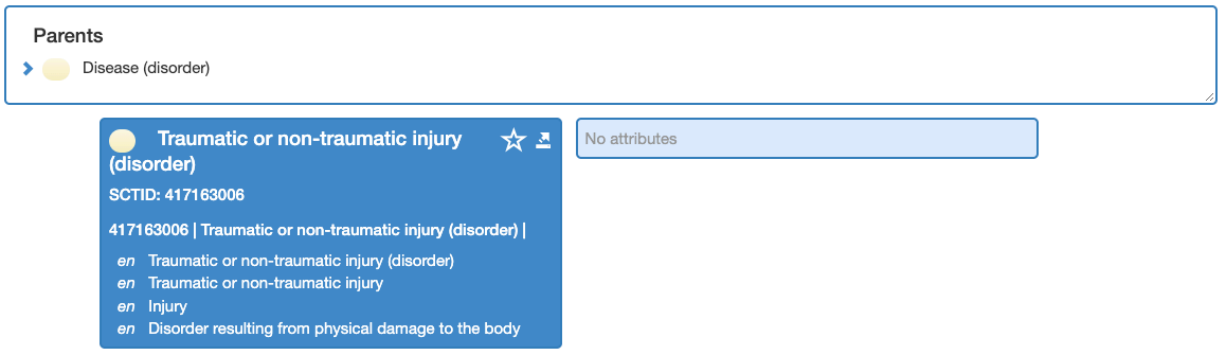
For example,

Below is 417163006 | Traumatic or non-traumatic injury (disorder)|[184] in the *stated* view with the GCIs appearing to the right of the concept:

180 http://snomed.info/id/419605007
181 http://snomed.info/id/75857000
182 https://docs.google.com/document/d/1-Tvswkw5USXydVWpBsT3iORdOFzx3qKAyownS4Enor4/edit
183 https://confluence.ihtsdotools.org/display/SIAPUG/Authoring+-+Description+Logic+%28DL%29+Support+Features
184 http://snomed.info/id/417163006



Here is the same concept in the *inferred* view without the GCIs appearing:



3.7.3.4 Modeling concepts with a GCI-modeled supertype

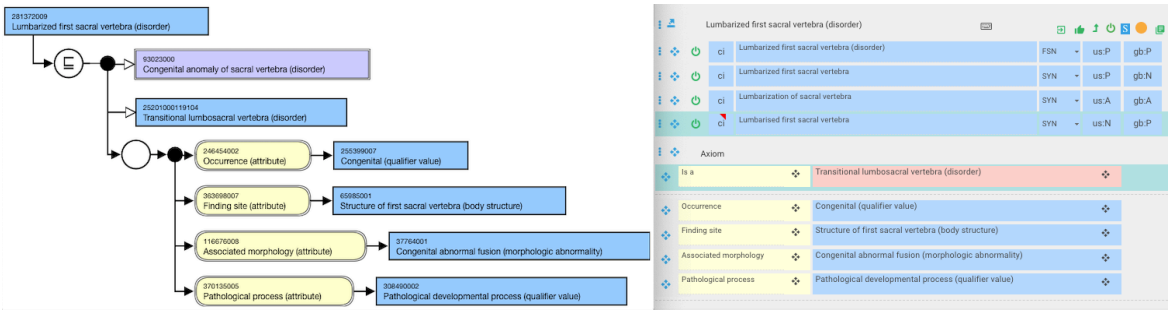
General concept inclusions allow multiple definitions of a concept. A group of subtypes may be defined using GCIs and be considered subtypes of the parent concept without fully defining that parent concept. That parent concept could have multiple definitions, each of which is valid but none of which completely describes the parent concept on its own.

When modeling a concept that will be classified under a GCI-modeled concept, there is no need to add the GCI-modeled concept as a stated parent, even if that GCI concept is primitive, because subsumption still occurs due to the GCI axiom.

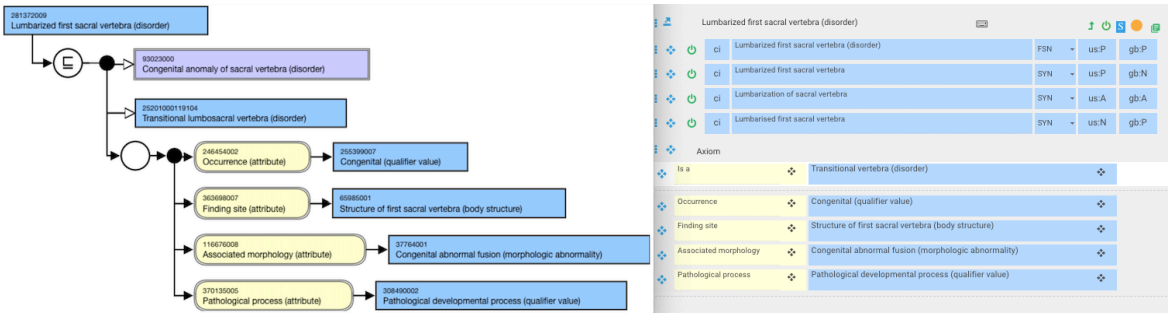
For example,

- 281372009 |Lumbarized first sacral vertebra (disorder)|

  The diagram below shows Lumbarized first sacral vertebra (disorder) incorrectly modeled on the right, with a stated primitive GCI-modeled parent of Transitional lumbosacral vertebra (disorder). Transitional lumbosacral vertebra (disorder) is modeled with a GCI, as notified by the salmon pink color. The left side of the diagram shows the inferred view with two parents.



The GCI-modeled primitive concept, Transitional lumbosacral vertebra (disorder), is unnecessary to state as a parent. The diagram below shows correct modeling of Lumbarized first sacral vertebra (disorder) with the absence of Transitional lumbosacral vertebra (disorder) as a parent, and yet the inferred view diagram on the left is still the same as compared to the incorrectly modeled diagram above.

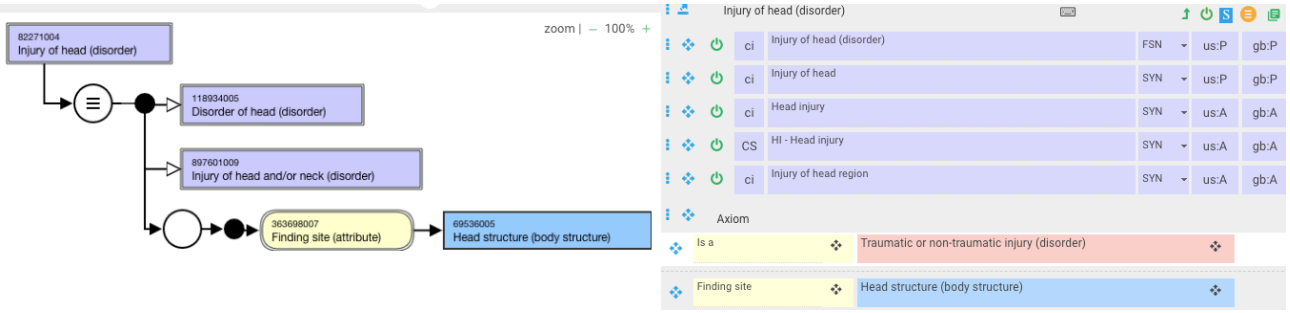


Alternatively, if a GCI-modeled parent will not subsume an appropriate child concept, then the GCI-modeled concept should be stated as a primitive supertype.

For example,

781076008 |Metastatic malignant neoplasm to colon and/or rectum (disorder)| must have the GCI-modeled parent concept of Malignant neoplasm of colon and/or rectum (disorder), also shown in salmon pink, stated as a primitive supertype, or else the concept would not be subsumed by Malignant neoplasm of colon and/or rectum (disorder). Because Metastatic malignant neoplasm to colon and/or rectum (disorder) is a disjunctive, it requires the GCI similar to its parent. However, its subtypes of Metastatic malignant neoplasm to colon (disorder) and Metastatic malignant neoplasm to rectum (disorder) do not require either GCI-modeled concept as a stated parent, because each will be subsumed appropriately with a stated parent of Disease (disorder).

Finally, the example below of 82271004 |Injury of head (disorder)| illustrates a concept with a GCI-modeled supertype of 417163006 |Traumatic or non-traumatic injury (disorder)|. In this case, the concept Injury of head (disorder) is sufficiently defined.



3.7.3.5 Defining GCI-modeled concepts

Though most are primitive, it is possible to define concepts modeled with GCIs. A concept must continue to meet the necessary conditions in order to be considered defined. GCIs can be added to extend the subtypes a defined concept will infer when appropriate.

3.7.3.6 Points to Consider

- GCIs are not restricted to particular hierarchies; they can be used as applicable in any hierarchy that has a concept model.
- The Authoring Platform does not currently have the ability to create templates that include GCIs.
- A concept which has a stated "is a" relationship to a concept with GCIs will need to have GCIs added to it directly if GCIs are required to appropriately represent the concept. GCI axioms are not inherited from supertype to a subtype concept.

3.7.4 Grouper Concept

For hierarchies with a concept model, the usefulness of fully-defined groupers is limited to convenience groupings based on particular use cases. They may be added if they provide demonstrable benefit to organizing and navigating the terminology.

Grouper concepts provide a definition for subtypes that are always and necessarily true. The grouper concept must be sufficiently defined and clinically useful for the purpose of organizing content for an intensional reference set (e.g. *disease of colon and all of its descendants*) or in Expression Constraint Language (ECL), << 128524007 | Disorder of colon (disorder) |[185] .

> **Anatomy concepts**
>
> Anatomy concepts have separate rules.

3.7.4.1 Navigational concepts

Grouper concepts should not be confused with *navigational concepts*. Navigational concepts were created to group other concepts without explicit regard for defining attributes (since there were none). Their purpose was to provide top level groupers for subsets and reference sets used in implementations. Because the Reference Set mechanism is now available, there is no longer a need for navigational concepts in the International Release; however, they can be added at the national or lower level.

185 http://snomed.info/id/128524007

In the past, there was an indiscriminate move of concepts in and out of the navigational concept hierarchy based arbitrarily on use cases by those users organizing concepts based on a particular classification that was wanted. The navigational concept hierarchy was useful to group things into a particular domain. The problem is that many of these are domain-specific and cannot be generalized. For example, mosquito-borne diseases will vary depending on the location of the user. It is difficult to classify the complete instance of these as well. Potential children would have to be manually assigned.

Because this is a primitive hierarchy and subtypes will not auto classify, much work would be required to reorganize hierarchies and maintain the use of navigational concepts. Inactivating concepts may be met with requests to create intermediate primitives. The Content Managers Advisory Group [CMAG] at Use of navigational concepts[186] is being consulted regarding current use of navigational concepts.

As 363743006 | Navigational concept (navigational concept)|[187] is within the 370115009 | Special concept (special concept)|[188] subhierarchy, please see that section of the Editorial Guide at Special Concept(see page 499).

3.7.4.2 Intermediate Primitive Groupers

Intermediate primitive groupers add a substantial management burden, thus, are discouraged. They may however be added on a case-by-case basis with approval from the Head of Terminology when, for example:

- The concept model is not robust enough to support the full definition of a subset of terms, e.g. genomics (i.e. genetic diseases for which we cannot state, *the majority of cases of this disease present with X)*.
- There are variances in the clinical manifestations.

If an **existing** intermediate primitive concept cannot be sufficiently defined **and** has only one subtype, is not used to model another concept nor demonstrably clinically useful, it should be inactivated.

3.7.4.3 Rules for grouper concepts

A grouper concept that is added to SNOMED CT must adhere to the following rules:

- The concept must not be created with the hierarchical tag, (navigational concept).
- The concept must use the semantic tag for the relevant hierarchy e.g. (finding), (procedure).
- The concept must not have stated subtypes. All subtypes must be inferred by the classifier.
- The grouper concept will ONLY be added if it can be sufficiently defined.

Where grouper concepts already exist, the following criteria apply:

- If it can be sufficiently defined, remodel it, and reassign existing stated subtypes to a new proximal primitive parent.
- Identify primitive concepts that cannot be sufficiently defined for additional review.

Modeling

If the addition of a grouper concept duplicates a concept in the 363743006 | Navigational concept (navigational concept)|[189] hierarchy, the navigational concept should be inactivated.

186 https://confluence.ihtsdotools.org/display/cmag/Use+of+navigational+concepts
187 http://snomed.info/id/363743006
188 http://snomed.info/id/370115009
189 http://snomed.info/id/363743006

3.7.5 Intermediate Primitive Concept Modeling

Concepts that cannot be sufficiently defined by necessary conditions are called *primitive concepts*.

Primitive concepts cannot have subtypes automatically assigned by the classifier, unless a sufficient condition for that concept exists. Relevant concepts that are subtypes of a primitive concept in the taxonomy must be manually assigned an IS A relationship to that concept.

When a primitive concept is a child of one or more concepts and a parent of one or more concepts, it is known as an *intermediate primitive*.

For example,

- 41969006 | Idiopathic disease (disorder)|[190]

Without a stated IS_A relationship to the proximal primitive concept Idiopathic disease (disorder), a concept will not classify as a subtype of Idiopathic disease (disorder).

Identifying all subtypes is important when creating a subset or when Identifying relevant content during data retrieval. Therefore, when adding new concepts, potential *primitive parents* need to be identified and the IS_A relationship stated.

Consistent assignment of subtypes to intermediate primitive concepts is challenging. To find a possible intermediate primitive parent, it may be necessary to view the authoring form of several concepts that should be siblings of the new concept. Authors should also check for a possible intermediate primitive supertype among the descendants of the most proximate defined parent(s) under which the new concept would be expected to classify as an inferred subtype.

Given the manual burden that intermediate primitives impose, the creation of new intermediate primitive concepts in the international edition is prohibited unless:

- There is no other option and the concept is clinically necessary.
- The impact of adding the concept has been fully explored and understood.
- The impact is manageable and there is a management plan, including an extensional definition for the direct sub-concepts.

For the International Release, such requests are assessed case-by-case.

3.7.6 Proximal Primitive Modeling

See glossary for definition here: proximal primitive (PP)[191]

- For some, but not all concepts, it is a top level concept e.g. Procedure.
- The proximal primitive supertype may also be an intermediate primitive concept located between the top level concept and the concept in question.
- There may be more than one proximal primitive supertype for a concept.

The approved modelling approach is to use:

- Proximal primitive supertypes
- Attribute-value pairs sufficient to define the meaning
    - An attribute-value pair is explicitly stated for the concept, even if it is already present for a supertype concept.
    - Attribute-value pairs are grouped as required.

190 http://snomed.info/id/41969006
191 https://confluence.ihtsdotools.org/display/DOCGLOSS/proximal+primitive+parent

The classifier infers all appropriate proximal supertypes. With sufficiently defined concepts the subtypes are also inferred.

For example,

- The *stated* view of 702499000 | Computed tomography of humerus (procedure)|[192] . The PP supertype for this concept is 71388002 | Procedure (procedure)|[193] . It has been modeled with one stated supertype and two attribute value pairs in a relationship group.

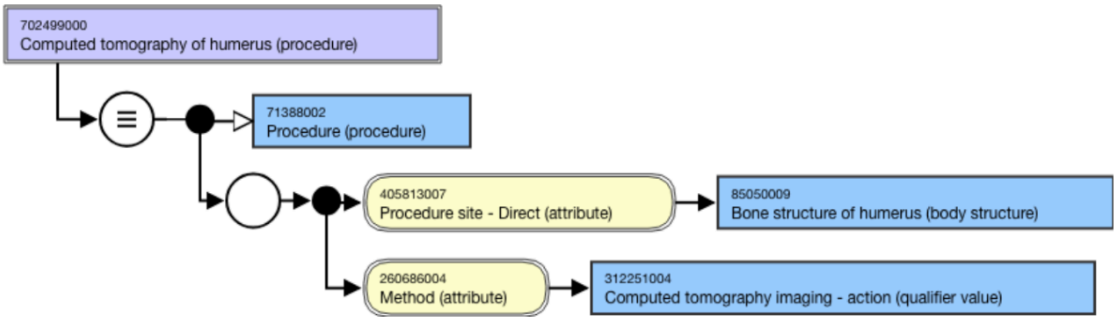


Figure 1: Stated view

The *inferred* view shows the logical definition of the concept. By using the stated relationships (for this concept and other concepts currently in the terminology), the classifier infers three defined proximal supertypes:

- Radiography of humerus (procedure)
- Computed tomography of upper arm (procedure)
- Computed tomography of bone (procedure)

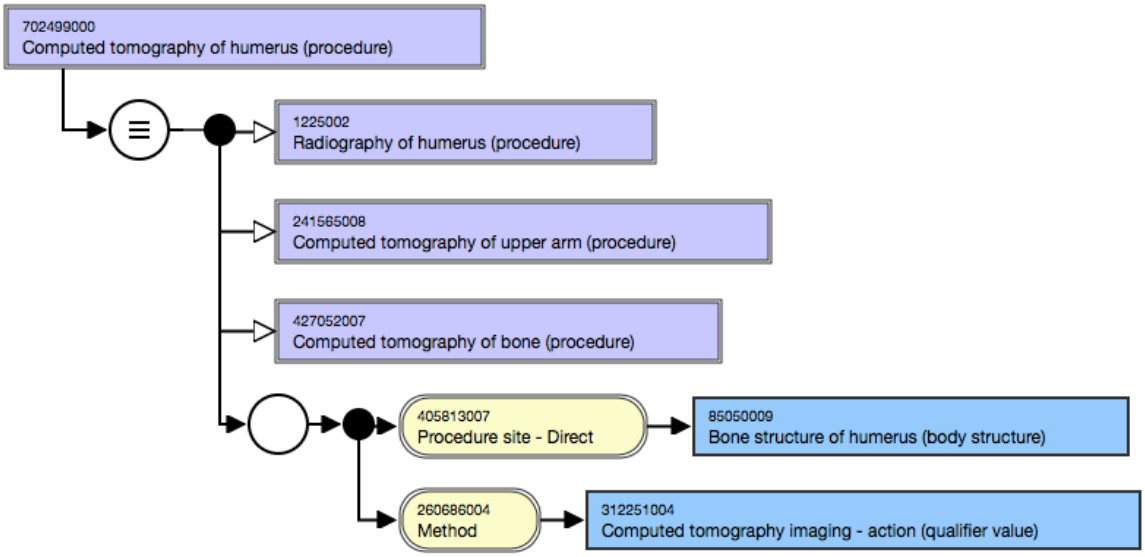


Figure 2: Inferred view

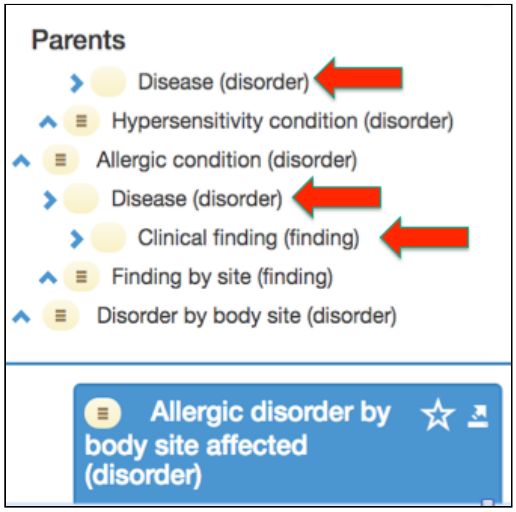
192 http://snomed.info/id/702499000
193 http://snomed.info/id/71388002

3.7.6.1 Multiple potential primitive supertype concepts

Where more than one potential primitive supertype is identified for a concept, authors should check the primitive supertypes for subsumption of one or more other primitive supertypes. Any subsuming concept is not a PP supertype.

For example,

- There is more than one potential primitive supertype for 421095001 | Allergic disorder by body site affected (disorder)|[194] . However, 64572001 | Disease (disorder)|[195] is subsumed by 404684003 | Clinical finding (finding)|[196] , therefore 64572001 | Disease (disorder)|[197] is the proximal primitive supertype concept.



3.7.6.2 GCI-Modeled primitive supertypes

For information on the effect of GCIs on modeling primitive supertypes, see General Concept Inclusions (GCIs), GCI-Modeled Primitive Ancestor(see page 93).

3.7.7 Relationship Group

This page describes the grouping of attributes.

A *relationship group* combines an attribute-value pair[198] with none, one, or multiple attribute-value pairs in order to refine the meaning of a concept.

For example,

194 http://snomed.info/id/421095001
195 http://snomed.info/id/64572001
196 http://snomed.info/id/404684003
197 http://snomed.info/id/64572001
198 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute+value+pair

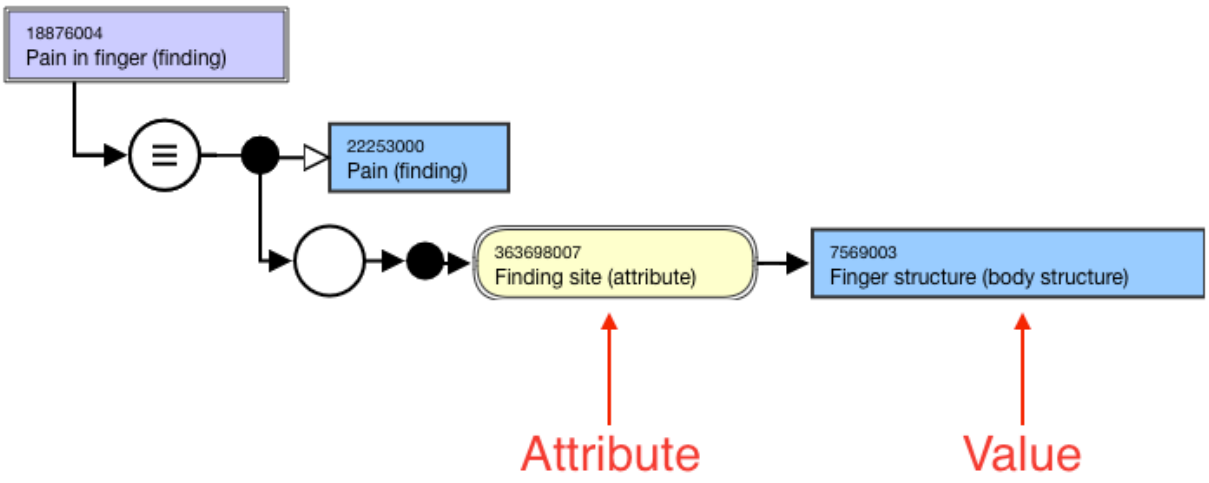


Figure 1: Stated view of 18876004 |Pain in finger (finding)| with the Finding site (attribute) and its value of Finger structure (body structure)

An attribute must be populated with a target value to model a concept.

Relationship groups are needed when modelling:

- Clinical finding concepts that require multiple Associated morphology attributes and multiple Finding site attributes
- Procedure concepts that require multiple Method attributes and multiple Procedure site attributes.

- A single relationship group containing only one attribute can exist.
  - When an attribute is restricted to a single group with no other attributes, the attribute is described as being "self-grouped".
- Multiple attributes may be grouped together in relationship groups, and multiple relationship groups may be created to sufficiently define concepts.
- When creating new concepts or revising existing ones, each attribute type included in a relationship group may only be present once, e.g. two Associated morphology attributes cannot be in the same relationship group.
- Relationship groups are not limited to Clinical finding and Procedure concepts.
- There is no limit to the number of relationship groups that may be added to a concept.

Modeling

As with all authoring activities, grouping of attributes is performed in the stated view.

Ungrouped attributes

An attribute that is not in a relationship group is considered to be in a group on its own. When attributes are not grouped, their meanings are interpreted separately. For example, in the following diagram, the *Associated morphology* is Hemorrhage, and the *Finding site* is Uterine structure. However, it cannot be interpreted that the site of the Hemorrhage is the Uterine structure because the two attributes are not grouped.

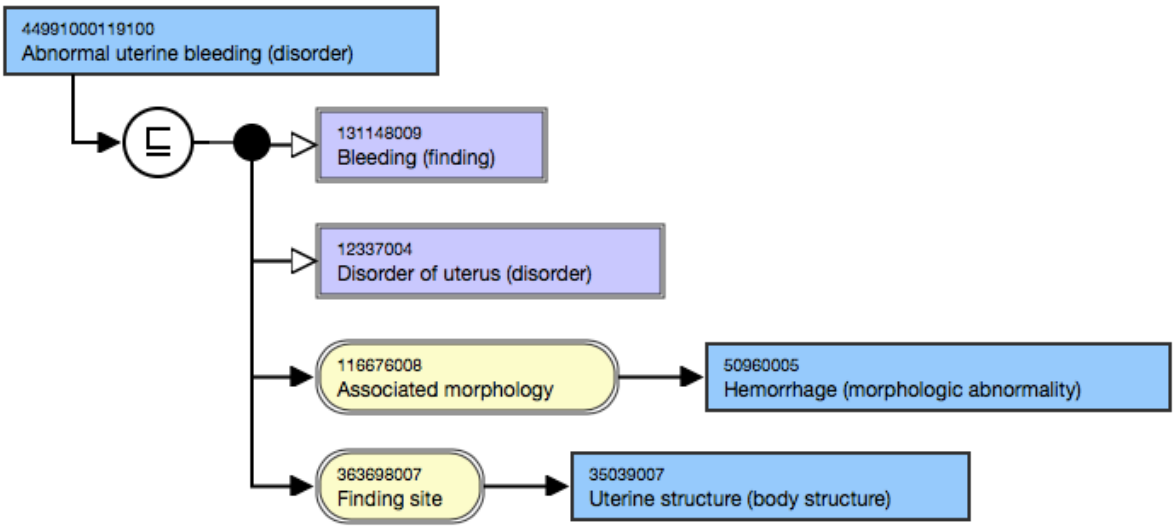


Figure 2: Inferred view of self-grouped attributes values of Hemorrhage (morphologic abnormality) and Uterine structure (body structure)

When the attributes are grouped, the relationships imply meaning towards each other. To continue the example above for 44991000119100 | Abnormal uterine bleeding (disorder)|[199] , the following diagram shows the *Associated morphology* of Hemorrhage and the *Finding site* of Uterine structure in a relationship group together. The grouping can be interpreted that the finding site of the hemorrhage is the uterine structure.

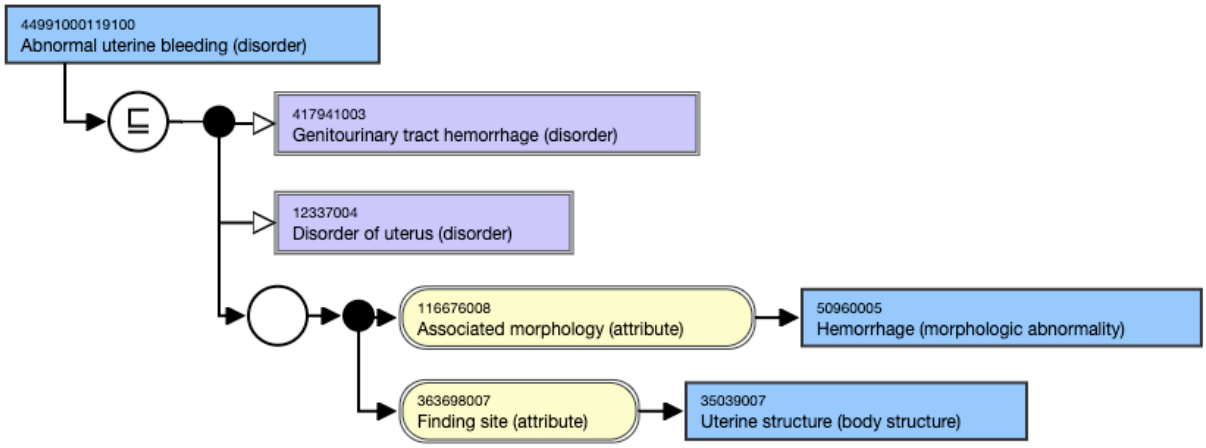


Figure 3: Inferred view of grouped attribute values of Hemorrhage (morphologic abnormality) and Uterine structure (body structure)

Note the difference in the inferred parents between the self-grouped versus grouped attributes. This is explained in more detail below.

199 http://snomed.info/id/44991000119100

3.7.7.1 Impact of relationship grouping on inheritance

Relationship groups refine inheritance, i.e. a grouped set of attributes is more specific than the same attributes that are not grouped. This is important when considering subsumption. The following diagrams demonstrate the impact of grouping or failing to group consistently using the concepts 50434004 | Excision of lesion of aorta (procedure)|[200] and one of its supertypes, 63296004 | Excision of aorta (procedure)|[201] .

The meaning of the supertype concept, 63296004 | Excision of aorta (procedure)|[202] (where the relationships are grouped) is interpreted as a procedure with an excision on the aortic structure. This is because 405813007 | Procedure site - Direct (attribute)|[203] and 260686004 | Method (attribute)|[204] are grouped.

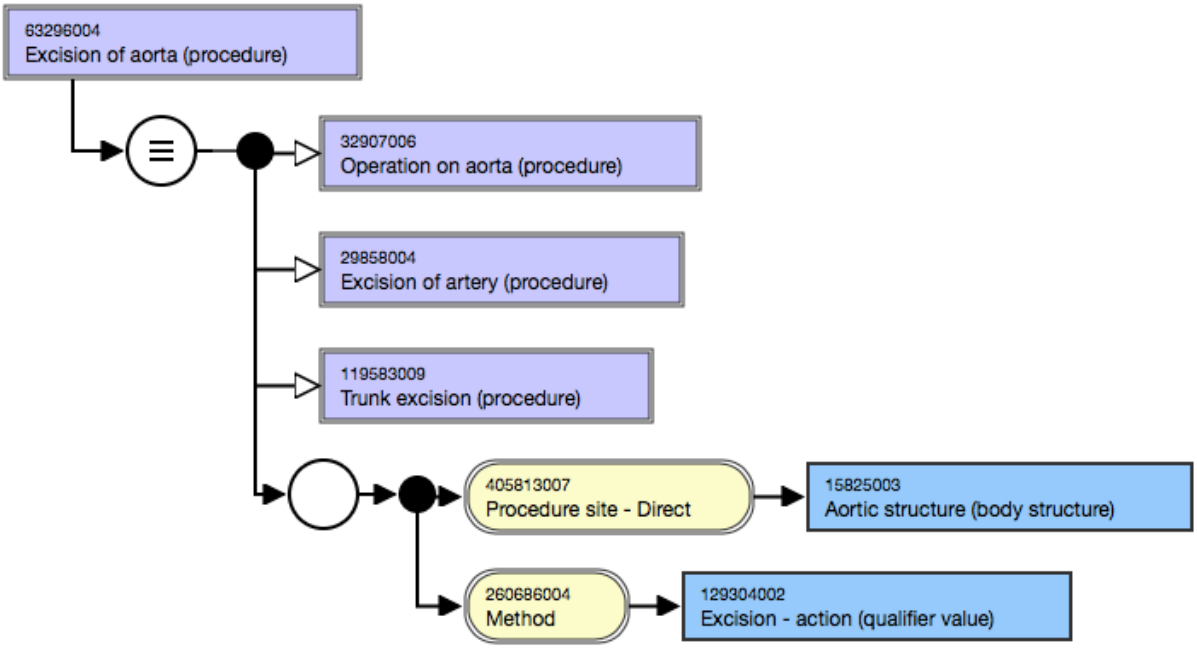


Figure 4: Inferred view of Excision of aorta (procedure) with grouping of attributes

In the following diagram, the more general supertype concepts, 65801008 | Excision (procedure)|[205] and 118809006 | Procedure on aorta (procedure)|[206] are the proximal supertype concepts.

50434004 | Excision of lesion of aorta (procedure)|[207] is a logical subtype of 63296004 | Excision of aorta (procedure)|[208] . However, the attributes of the concept 50434004 | Excision of lesion of aorta (procedure)|[209] are not grouped.

200 http://snomed.info/id/50434004
201 http://snomed.info/id/63296004
202 http://snomed.info/id/63296004
203 http://snomed.info/id/405813007
204 http://snomed.info/id/260686004
205 http://snomed.info/id/65801008
206 http://snomed.info/id/118809006
207 http://snomed.info/id/50434004
208 http://snomed.info/id/63296004
209 http://snomed.info/id/50434004

Thus, the classifier interprets the definitions as non-related and 50434004 | Excision of lesion of aorta (procedure)| [210] is not inferred as a subtype of 63296004 | Excision of aorta (procedure)| [211] . This is because the attributes in the subtype concept are not grouped, i.e are not explicitly stated. From a machine-processing perspective, each attribute is considered a group on its own; i.e. there is an excision, but nothing else is known about the excision. This results in the concept, 63296004 | Excision of aorta (procedure)| [212] , being interpreted more broadly.

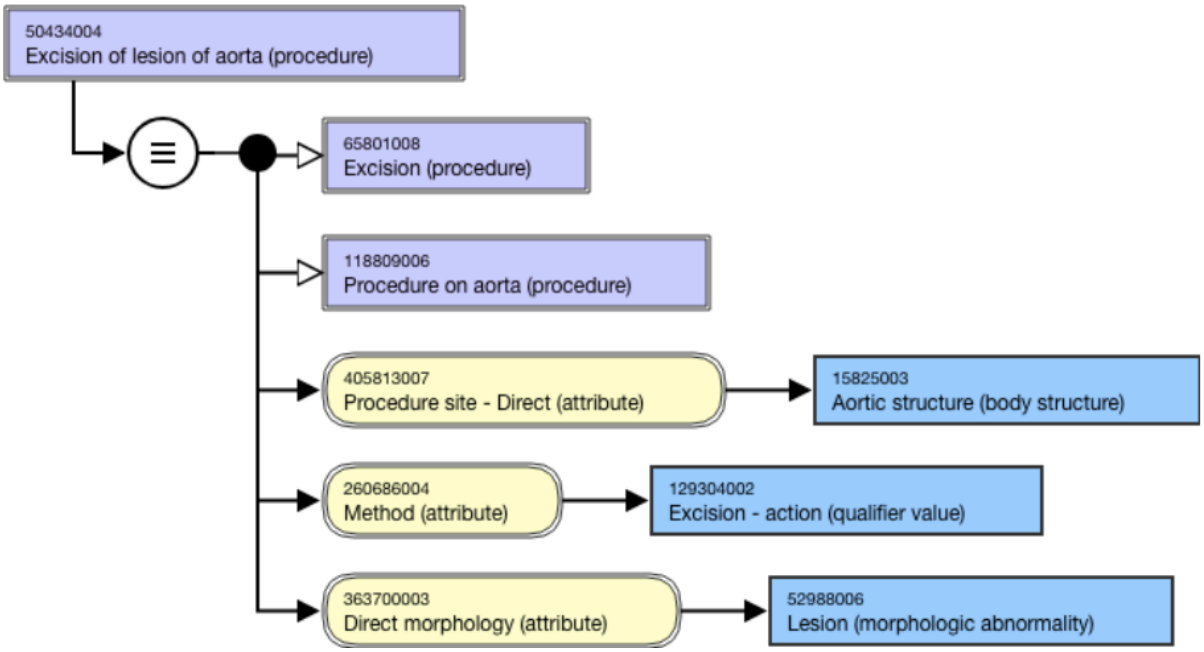


Figure 5: Inferred view of Excision of lesion of aorta (procedure) without grouping of attributes

In the following diagram the attributes of the concept 50434004 | Excision of lesion of aorta (procedure)| [213] are grouped. An author that explicitly states that the excision is of a lesion found in the aortic structure, by grouping the attribute-value pairs, provides the necessary information for the classifier. This enables 50434004 | Excision of lesion of aorta (procedure)| [214] to be inferred as a subtype of 63296004 | Excision of aorta (procedure)| [215] .

210 http://snomed.info/id/50434004
211 http://snomed.info/id/63296004
212 http://snomed.info/id/63296004
213 http://snomed.info/id/50434004
214 http://snomed.info/id/50434004
215 http://snomed.info/id/63296004

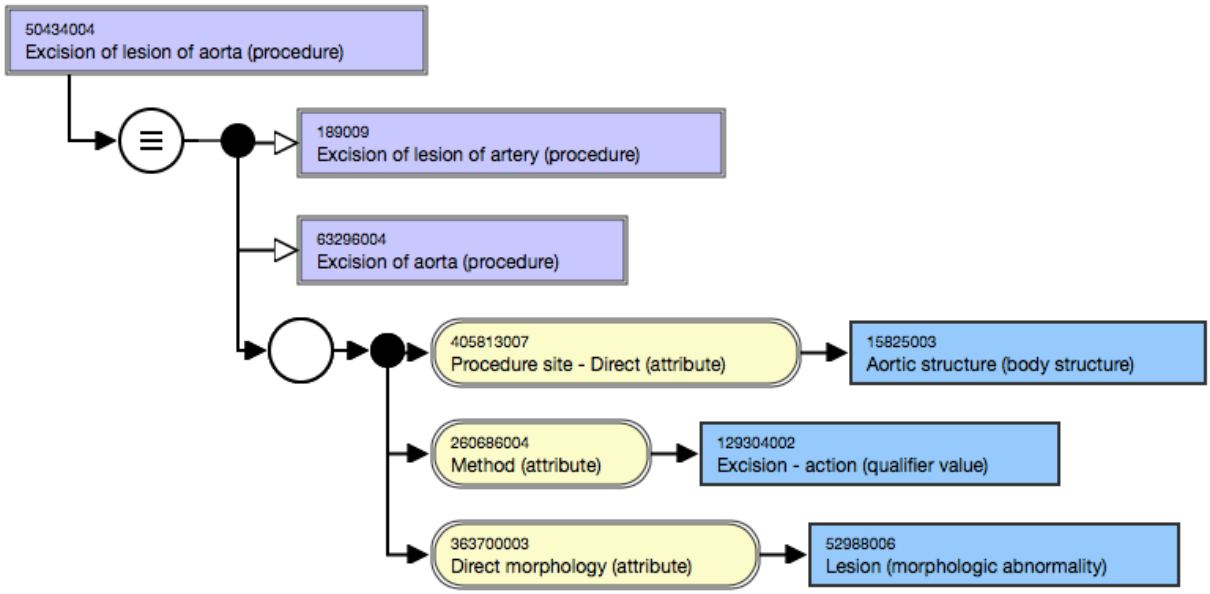


Figure 6: Inferred view of Excision of lesion of aorta (procedure) with grouping of attributes

3.7.7.2 Same attributes in separate relationship groups

Each relationship group should only contain one instance of an attribute. This is because two of the same attributes in a relationship group is not the same as one attribute with one target value that captures the combined meaning of the target values, as illustrated in the following diagram.

Two Finding site attributes are required to support the location of 53627009 | Closed fracture of radius AND ulna (disorder)|[216] . Each 363698007 | Finding site (attribute)|[217] and its respective target value are placed in a relationship group with the attribute 116676008 | Associated morphology (attribute)|[218] with its target value of 20946005 | Fracture, closed (morphologic abnormality)|[219] .

216 http://snomed.info/id/53627009
217 http://snomed.info/id/363698007
218 http://snomed.info/id/116676008
219 http://snomed.info/id/20946005

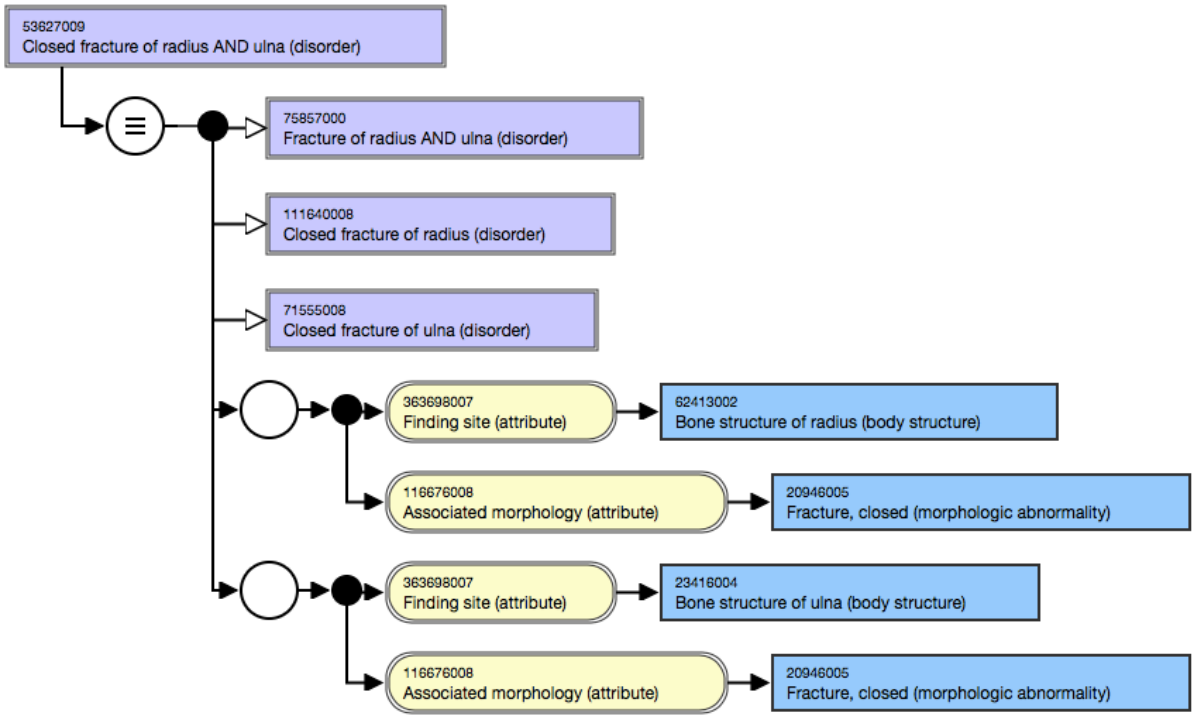


Figure 7: Inferred view of Associated morphology (attribute) with its value of Fracture, closed (morphologic abnormality) in two separate relationship groups

3.7.7.3 Procedure hierarchy

In the 71388002 | Procedure (procedure) |[220] hierarchy, a relationship group is usually a way of combining attributes about a particular method.

In the concept 302619004 | Cholecystectomy and exploration of bile duct (procedure) |[221] within the following diagram, the relationship groups clarify that there is exploration of the bile duct and excision of the gallbladder. Without the relationship groups, the appropriate relationships between the attributes would be unclear; i.e. the exploration of the bile duct versus gallbladder and the excision of the bile duct versus the gallbladder.

220 http://snomed.info/id/71388002
221 http://snomed.info/id/302619004

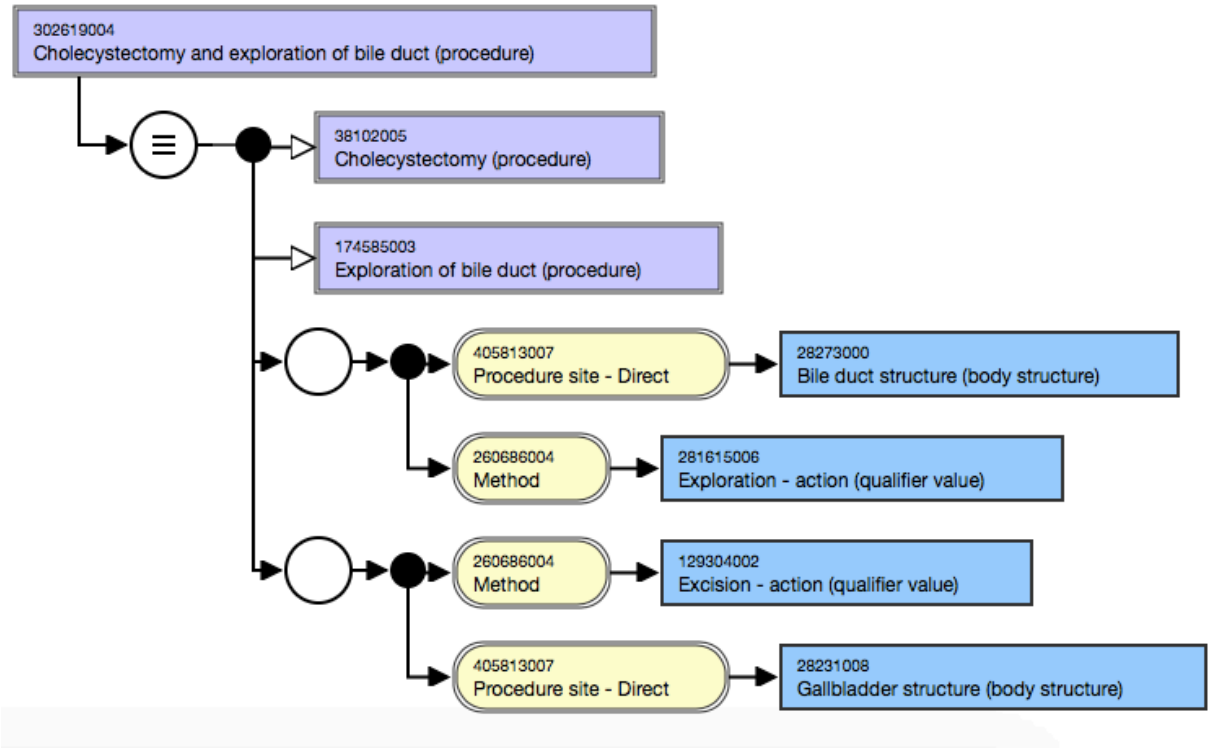


Figure 8: Inferred view of a Procedure hierarchy relationship group: combining attributes around Method (attribute)

Modeling

When there is no *Method* stated, the 363704007 | Procedure site (attribute)|[222] (or its subtype either *Procedure site-direct* or *Procedure site-indirect*) is always grouped with 405816004 | Procedure morphology (attribute)|[223] (or its subtype either *Direct morphology* or *Indirect morphology*) for that site.

Self-grouped Procedure attributes

- 260870009 | Priority (attribute)|[224] is to be grouped on its own, or "self-grouped", as the priority of a procedure applies to the entire procedure and not the specific elements of the procedure.
- 363702006 |Has focus (attribute)| is also self-grouped.

3.7.7.4 Clinical Finding/Disorder hierarchy

In the Clinical finding/Disorder hierarchy:

222 http://snomed.info/id/363704007
223 http://snomed.info/id/405816004
224 http://snomed.info/id/260870009

- The Finding site (attribute) and Associated morphology (attribute) are always grouped when both are present and related.
    - When there is more than one Finding site (attribute) or Associated morphology (attribute), then more than one relationship group is required.
    - When the attributes *Occurrence* and/or *Causative agent* are stated and related to the *Finding site* and *Associated morphology* attributes, include them within that relationship group.
        - As in the following diagram, when the Causative agent (attribute) is an organism, the Pathological process (attribute) is also included in that relationship group, with the target value of either 441862004 | Infectious process (qualifier value)[225] or 442614005 | Parasitic process (qualifier value)[226].

- If a concept has values for a Causative agent (attribute) and Finding site (attribute), but does not have a value for an Associated morphology (attribute) or Pathological process (attribute), combine the Causative agent (attribute) and Finding site (attribute) as usual. Concepts that only have Causative agent (attribute) and Finding site (attribute) in a role group are higher in the hierarchy and subsume those concepts that have a role group of Causative agent (attribute), Finding site (attribute), Associated morphology (attribute) and Pathological process (attribute).

- The *Interprets* and *Has interpretation* attributes are always grouped together where both are present and related to each other. These two attributes and their values are often used in defining a Clinical finding concept by delineating the observation results or describing the analysis used to determine the observation. *Interprets* and *Has interpretation* attributes are not grouped with any other attributes.

- The *Finding method* and *Finding informer* attributes are also grouped together where both are present and related to each other.

Relationship group clarification

A relationship group that uses the attributes ***Associated with, Before, During, After, Due to, Clinical course, or Temporally related to*** are not grouped with another attribute-value pair; these attributes are "self-grouped". This means, authors place these attributes in a relationship group individually with no other attributes.

225 http://snomed.info/id/441862004
226 http://snomed.info/id/442614005

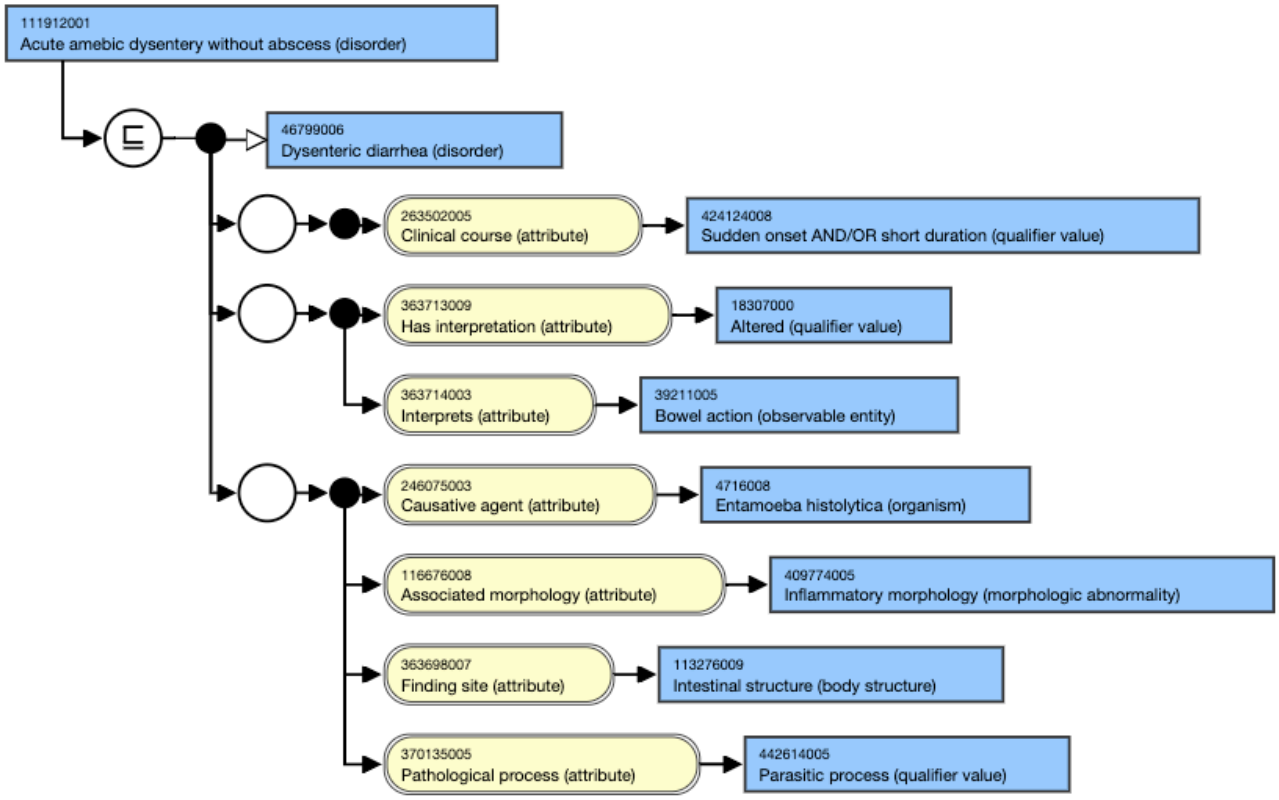
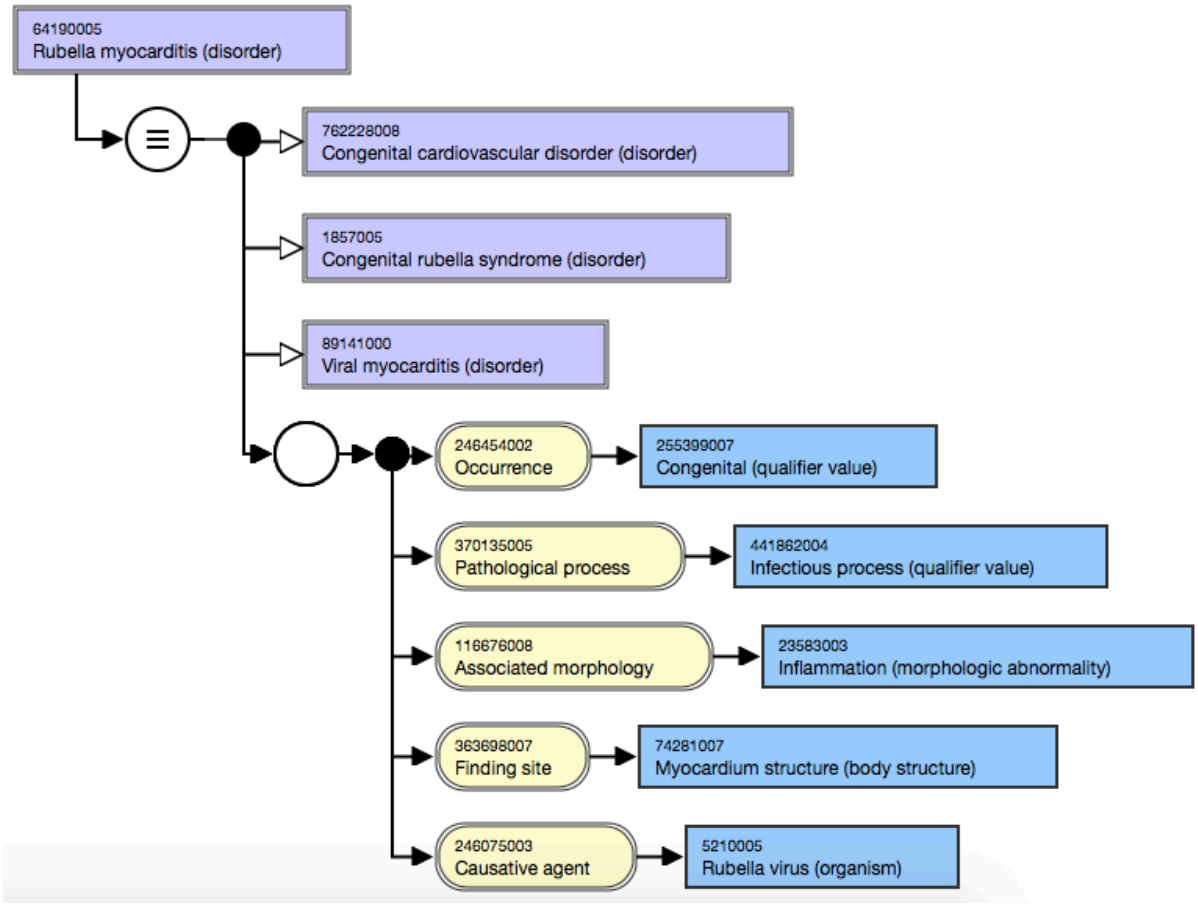


Figure 9: Stated view of a disorder hierarchy concept with Causative agent and Pathological process attributes in the same relationship group



3.7.7.5 Situation with Explicit Context hierarchy

For 413350009 | Finding with explicit context (situation)|[227] concepts, the following four attributes are grouped:

- 408729009 | Finding context (attribute)|[228]
- 246090004 | Associated finding (attribute)|[229]
- 408731000 | Temporal context (attribute)|[230]
- 408732007 | Subject relationship context (attribute)|[231]

For example, 704008007 | No family history of asthma (situation)|[232] *IS A* 243796009 | Situation with explicit context (situation)|[233] ,

- 408729009 | Finding context (attribute)|[234] , 410516002 | Known absent (qualifier value)|[235]
- 246090004 | Associated finding (attribute)|[236] , 195967001 | Asthma (disorder)|[237]

227 http://snomed.info/id/413350009
228 http://snomed.info/id/408729009
229 http://snomed.info/id/246090004
230 http://snomed.info/id/408731000
231 http://snomed.info/id/408732007
232 http://snomed.info/id/704008007
233 http://snomed.info/id/243796009
234 http://snomed.info/id/408729009
235 http://snomed.info/id/410516002
236 http://snomed.info/id/246090004
237 http://snomed.info/id/195967001

- 408731000 | Temporal context (attribute)|[238] , 410511007 | Current or past (actual) (qualifier value)|[239]
- 408732007 | Subject relationship context (attribute)|[240] , 444148008 | Person in family of subject (person)|[241]

For 129125009 | Procedure with explicit context (situation)|[242] concepts the following four attributes are grouped:

- 408730004 | Procedure context (attribute)|[243]
- 363589002 | Associated procedure (attribute)|[244]
- 408731000 | Temporal context (attribute)|[245]
- 408732007 | Subject relationship context (attribute)|[246]

For example, 704503005 | Advice given about pelvic floor exercise (situation)|[247] *IS A* 129125009 | Procedure with explicit context (situation)|[248]

- 408730004 | Procedure context (attribute)|[249] , 385658003 | Done (qualifier value)|[250]
- 363589002 | Associated procedure (attribute)|[251] , 420227002 | Recommendation to (procedure)|[252]
- 408731000 | Temporal context (attribute)|[253] , 410512000 | Current or specified time (qualifier value)|[254]
- 408732007 | Subject relationship context (attribute)|[255] , 125676002 | Person (person)|[256]

3.7.7.6 Observable Entity hierarchy

When defining 363787002 | Observable entity (observable entity)|[257] concepts, attributes are self-grouped. Each observable entity represents only one property being observed.

For example, 400975005 | Standing diastolic blood pressure (observable entity)|[258] is represented using multiple attributes with each in its own relationship group.

238 http://snomed.info/id/408731000
239 http://snomed.info/id/410511007
240 http://snomed.info/id/408732007
241 http://snomed.info/id/444148008
242 http://snomed.info/id/129125009
243 http://snomed.info/id/408730004
244 http://snomed.info/id/363589002
245 http://snomed.info/id/408731000
246 http://snomed.info/id/408732007
247 http://snomed.info/id/704503005
248 http://snomed.info/id/129125009
249 http://snomed.info/id/408730004
250 http://snomed.info/id/385658003
251 http://snomed.info/id/363589002
252 http://snomed.info/id/420227002
253 http://snomed.info/id/408731000
254 http://snomed.info/id/410512000
255 http://snomed.info/id/408732007
256 http://snomed.info/id/125676002
257 http://snomed.info/id/363787002
258 http://snomed.info/id/400975005

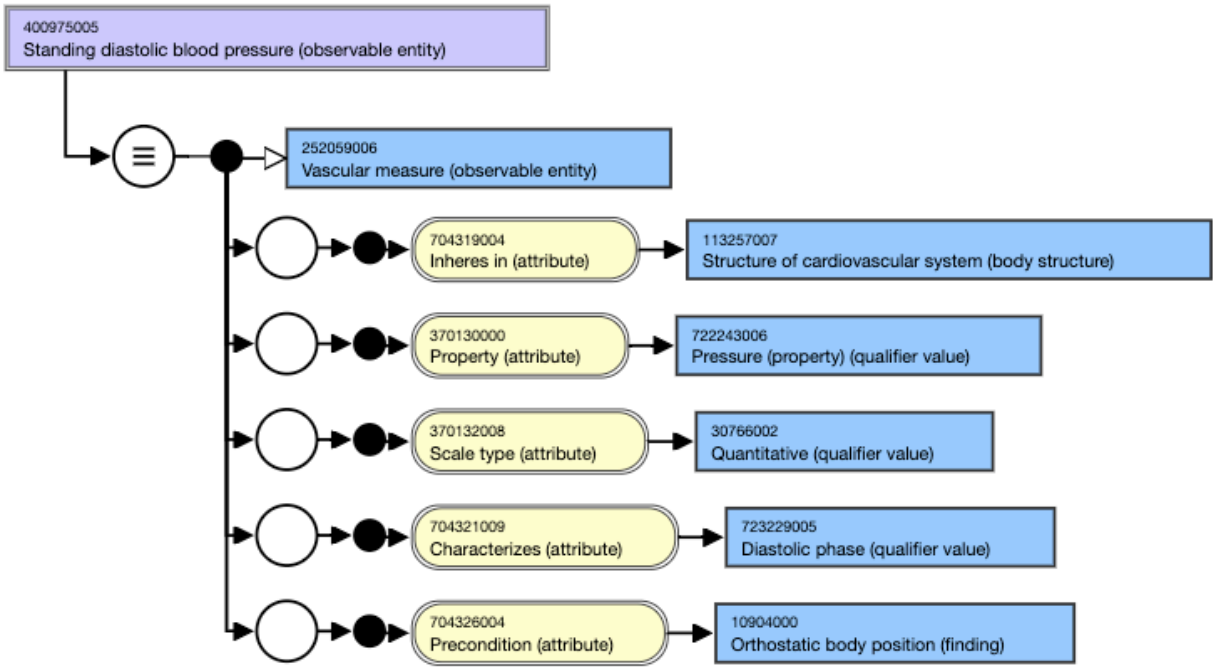


Figure 10: Stated view of a concept from the Observable entity hierarchy with self-grouped attributes

3.7.8 Sufficiently Defined vs Primitive Concept

3.7.8.1 Sufficiently defined

A concept is sufficiently defined[259] if its defining characteristics are adequate to define it relative to its immediate supertypes. A sufficiently defined concept is defined in the context of its hierarchy. See main glossary entry for sufficient definition[260].

3.7.8.2 Primitive

A concept which is not sufficiently defined is *primitive.* A primitive concept[261] is a formal logic definition that is inadequate to distinguish it from similar concepts. A primitive concept does not have enough defining relationships to computably distinguish it from more general concepts (supertypes).

3.7.9 Templates

In addition to the guidance found here in the Editorial Guide, please see information on the use of templates at SNOMED CT Modeling Templates and Description Patterns[262].

259 https://confluence.ihtsdotools.org/display/DOCGLOSS/sufficiently+defined+concept
260 https://confluence.ihtsdotools.org/display/DOCGLOSS/sufficient+definition
261 https://confluence.ihtsdotools.org/display/DOCGLOSS/primitive+concept
262 https://confluence.ihtsdotools.org/display/SCTEMPLATES/SCT+Modeling+Templates+and+description+patterns

Templates are created by authors in an attempt to standardize the modeling, naming, case significance, etc. of certain subhierarchies of the terminology, though it is recognized that not every concept may conform to a prescribed pattern. The modeling approach may be difficult to apply in all cases, but domain-specific templates are being developed to ensure modeling consistency and accuracy.

When to create a template

No template is necessary if less than 50 concepts are affected. In cases of small numbers, check if existing templates can be generalized and/or look to add elements as optional rather than mandatory.

3.8 Domain Specific Modeling

SNOMED CT is arranged as a polyhierarchy. A *hierarchy* is defined as an ordered organization of concept codes linked together through IS A relationships. Concept codes are linked to their more general parent concept codes directly above them in a hierarchy. Concepts with more general meanings are usually located at the top of the hierarchy and then at each level down the hierarchy the meanings become increasingly more specialized.

Selected SNOMED CT attributes have a hierarchical relationship to one another known as *attribute hierarchies*. In an attribute hierarchy, one general attribute is the parent of one or more specific subtypes of that attribute. Concepts defined using the more general attribute can inherit concepts modeled with the more specialized subtypes of that attribute.

Domains

The following are the 19 domains arranged in alphabetical order.

- Body Structure(see page 116)
- Clinical Finding and Disorder(see page 162)
- Environment and Geographical Location(see page 245)
- Event(see page 246)
- Observable Entity(see page 249)
- Organism(see page 271)
- Pharmaceutical and Biologic Product(see page 284)
- Physical Force(see page 403)
- Physical Object(see page 404)
- Procedure(see page 416)
- Qualifier Value(see page 479)
- Record Artifact(see page 482)
- Situation with Explicit Context(see page 483)
- SNOMED CT Model Component(see page 495)
- Social Context(see page 499)
- Special Concept(see page 499)
- Specimen(see page 500)
- Staging and Scales(see page 504)
- Substance(see page 505)

The following subhierarchies do not have concept models:

- Environment or geographical location (environment / location)
- Organism (organism)
- Physical force (physical force)
- Qualifier value (qualifier value)

- Record artifact (record artifact)
- SNOMED CT Model Component (metadata)
- Social context (social concept)
- Special concept (special concept)
- Staging and scales (staging scale)

3.8.1 HRCM Attribute Tables

The pages that follow contain tables that are generated by the Human Readable Concept Model (HRCM). The tables contain Attribute Summaries for those domains with attributes, information on *Group(ed)*, *Cardinality*, and *In-group cardinality*, and Range constraints. The HRCM tables in this guide only reflect the ranges for pre-coordinated concepts; there may be post-coordination values that are not reflected in the tables. All MRCM values for concepts can be viewed via the public MRCM browser at https://browser.ihtsdotools.org/mrcm.

SNOMED International creates precoordinated content in accordance with the MRCM. For postcoordinated content, extensions should review the MRCM. If the MRCM does not specify that a particular value is allowed for a given content type (e.g. using an observable entity value for |Component| in a postcoordinated expression), then it must not be used in that content type (e.g. postcoordinated expressions). The MRCM rules for postcoordination must be strictly followed. This is important for interoperability, being able to query the resulting content consistently, etc. However, the MRCM does provide the option for extensions to extend or adapt the rules in a controlled way if required (see the last section of 6. Considerations[263]). This includes expanding the ranges and/or adding new attributes where required. This needs to be done carefully to ensure consistency and data integrity between editions.

There are special cases in the MRCM where an attribute may have two rows. This situation is caused by a new cardinality rule: a row for *existing/legacy* SNOMED CT content and a row for *newly created* content. The row that is applicable to *new* content will be marked by a "[New]" notation.

See MRCM Maintenance Process[264].

Modeling: precoordination patterns

SNOMED CT relies on the rules for *usefulness* to avoid excessive precoordination (see *Scope* section of Editorial Guide).
Approved precoordination patterns have been created and are available at: Pre-coordination Naming Patterns Project[265]. For additional information about the fields used in precoordination, see: What the fields in the Pre-coordination Naming Patterns JIRA Project mean[266].

263 https://confluence.ihtsdotools.org/display/DOCMRCM/6.+Considerations
264 https://confluence.ihtsdotools.org/display/IAP/Process+for+the+maintenance+of+MRCM+rules#ProcessforthemaintenanceofMRCMrules-JIRA
265 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project
266 https://confluence.ihtsdotools.org/display/IHTSDO1/What+the+fields+in+the+Pre-coordination+Pattern+JIRA+Project+mean

3.8.2 Body Structure

Definition	Examples
Includes Anatomical structures and Morphologic abnormalities (subtype of body structure)	Body structure • 38033009 | Amputation stump (body structure)|[267] • 91134007 | Mitral valve structure (body structure)|[268] Morphologic abnormality • 189955008 | Biopsy wound (morphologic abnormality)|[269] • 31470003 | Adenosarcoma (morphologic abnormality)|[270] Cell • 250293008 | Agranular white blood cell (cell)|[271] • 57184004 | T lymphocyte (cell)|[272] Cell structure • 4897009 | Cell membrane, prokaryotic (cell structure)|[273] • 362293000 | Entire axon (cell structure)|[274]

The body structure domain includes anatomical structures, as well as morphologic abnormalities, as follows:

- Body structure (body structure)
  - Anatomical or acquired body structure (body structure)
  - Anatomical organizational pattern (body structure)
  - Anatomical site notations for tumor staging (body structure)
  - Body structure, altered from its original anatomical structure (morphologic abnormality)
  - Nonspecific site (body structure)
  - Normal anatomy (body structure)
  - Topography not assigned (body structure)
  - Topography unknown (body structure)

Tumor staging

Concepts under 258331007 | Anatomical site notations for tumor staging (body structure)|[275] require review and reallocation.

3.8.2.1 Body Structure Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

267 http://snomed.info/id/38033009
268 http://snomed.info/id/91134007
269 http://snomed.info/id/189955008
270 http://snomed.info/id/31470003
271 http://snomed.info/id/250293008
272 http://snomed.info/id/57184004
273 http://snomed.info/id/4897009
274 http://snomed.info/id/362293000
275 http://snomed.info/id/258331007

HRCM 2023-12-01

Domain Information for 123037004 | Body structure (body structure)|[276]	
Domain Constraint[277]	<< 123037004 |Body structure (body structure)|[278]
Parent Domain	-
Proximal Primitive Constraint	<< 123037004 |Body structure (body structure)|[279]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 123037004 | Body structure (body structure)|[280]

Attribute[281]	Grouped[282]	Cardinality[283]	In Group Cardinality[284]	Range Constraint[285]
733928003 |All or part of (attribute)|[286]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[287]
733931002 |Constitutional part of (attribute)|[288]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[289]

276 http://snomed.info/id/123037004
277 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
278 http://snomed.info/id/123037004
279 http://snomed.info/id/123037004
280 http://snomed.info/id/123037004
281 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
282 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
283 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
284 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
285 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
286 http://snomed.info/id/733928003
287 http://snomed.info/id/123037004
288 http://snomed.info/id/733931002
289 http://snomed.info/id/123037004

1230370004 |Is vasculature of (attribute)|[290]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[291]
733933004 |Lateral half of (attribute)|[292]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[293]
774081006 |Proper part of (attribute)|[294]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[295]
733930001 |Regional part of (attribute)|[296]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[297]
733932009 |Systemic part of (attribute)|[298]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[299]

HRCM 2023-12-01

Domain Information for 91723000 | Anatomical structure (body structure)|[300]	
Domain Constraint[301]	<< 91723000 |Anatomical structure (body structure)|[302]
Parent Domain	123037004 |Body structure (body structure)|[303]
Proximal Primitive Constraint	<< 91723000 |Anatomical structure (body structure)|[304]
Proximal Primitive Refinement	-

HRCM 2023-12-01

290 http://snomed.info/id/1230370004
291 http://snomed.info/id/123037004
292 http://snomed.info/id/733933004
293 http://snomed.info/id/123037004
294 http://snomed.info/id/774081006
295 http://snomed.info/id/123037004
296 http://snomed.info/id/733930001
297 http://snomed.info/id/123037004
298 http://snomed.info/id/733932009
299 http://snomed.info/id/123037004
300 http://snomed.info/id/91723000
301 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
302 http://snomed.info/id/91723000
303 http://snomed.info/id/123037004
304 http://snomed.info/id/91723000

Author View of Attributes and Ranges for 91723000 | Anatomical structure (body structure)|[305]				
Attribute[306]	Grouped[307]	Cardinality[308]	In Group Cardinality[309]	Range Constraint[310]
272741003 |Laterality (attribute)|[311]	0	0..1	0..0	<< 182353008 |Side (qualifier value)|[312]

Modeling: Laterality

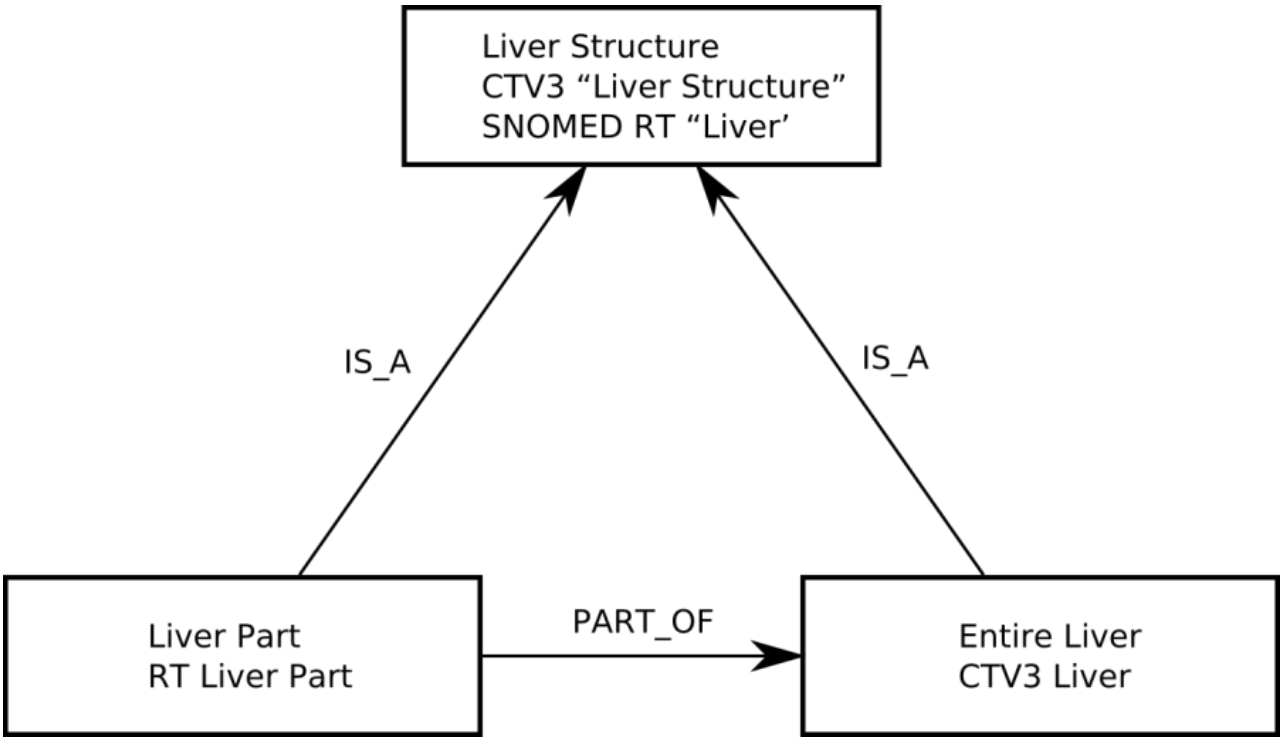
For all Anatomical structure (body structure) concepts, *Laterality* is an approved attribute which can be populated with the range of qualifier values including *Side (qualifier value)* or its subtypes.

3.8.2.2 Anatomical Concept Model

The Structure-Entire-Part (SEP) model

SNOMED CT uses a structure-entire-part triple, known as the *SEP triple*, to represent anatomical structures. The following Relationships provided a way for the anatomy in CTV3 to be mapped to RT:

305 http://snomed.info/id/91723000
306 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
307 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
308 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
309 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
310 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
311 http://snomed.info/id/272741003
312 http://snomed.info/id/182353008



The SNOMED CT anatomy hierarchy differentiates classes of entire anatomical entities from classes of *parts of* entire anatomical entities.

Entire *concept*: Denotes a class that is instantiated by entire anatomical entities of some kind: entire heart is instantiated by all individual hearts.

Entity **P**art *concept:* Denotes a class that is instantiated by all anatomical entities that are a proper part of some entity of a given kind: heart part is instantiated by all entities that are a proper part of some heart, e.g. my mitral valve, your right ventricle, Joe's sinus node. Heart part is not instantiated by any heart.

Entity **S**tructure *concept*: Subsumes both the related Entire and Part *concepts*. Consequently, it denotes a class which is instantiated by anything that instantiates either the Entire or the Part. For instance, Heart structure is instantiated by my heart, my mitral valve, your heart, your right ventricle, Joe's sinus node, Joe's heart, etc.

The code named Liver structure in *CTV3* is equivalent to Liver structure in the diagram above. Both the *CTV3* code for Liver structure and the SNOMED RT code for Liver are interpreted to mean Some or all of the liver. *Site* attributes (PROCEDURE SITE, FINDING SITE) will usually take the value liver structure rather than entire liver , since typically the site of a *liver disorder* or *procedure on the liver* is not necessarily the entire liver.

Purpose of the Structure concept

Adding the Entity Structure codes is a convenience to assist with the logic-based aggregation of references to the entity or its parts. The implication of this view is that the E of the SEP triple is the code that should be regarded as the one that represents the real anatomical entity that is named.

> For example, the code for entire liver is the one that should correspond to the code for liver in the Foundational Model of Anatomy (FMA). The subtype hierarchy for entire liver fits much better with the FMA hierarchies, and indeed it might be possible to completely reconcile SNOMED's non-Structure components with FMA anatomy.

A database has been developed that categorizes codes in the physical anatomical entity hierarchy according to their status as S structure, P Part or E Entire, and provides the corresponding S and P code for each E code. This should provide some value to implementers. It can help with navigation, coordination with formal ontologies of anatomy, and selection of codes for *postcoordination*.

Conventions for merging concepts from SNOMED RT and Clinical Terms v.3

Where there were two concepts with the same name, the SNOMED RT code was to become the *S* code, and the CTV3 code was to become the *E* code. There are still instances of unrecognized pairing of the RT-CTV3 *S-E* pair, where neither codes FSN has been changed according to the naming conventions in this document. When these unmatched pairs are identified, it is our practice to change the FSNs accordingly, and to make the *E* code have a subtype IS-A link to the *S* code.

S concepts without a corresponding *E* concept

Some *S* codes do not currently have a corresponding *E* code subtype, and there was no policy that required that such *E* codes be created during the merger of SNOMED RT and CTV3. However, it is likely that such a policy will be enforced in the future.

S Structure codes can subsume entities other than E or P

The SEP triple may give the impression that all *S* codes have exactly two children, one *E* and one *P*, with all of the remaining descendants placed under *P*. Again, in the past this degree of modeling consistency was not always followed. Some codes were purposely made subtypes of the *S* that are not strictly part of the corresponding *E*.

> For example, perirenal tissue is a kidney structure but not a part of the kidney. It is used to define perirenal abscess so that it is subsumed by renal abscess. While a perirenal abscess is not strictly within the substance of the kidney, it is still considered a kind of renal abscess, and the *S* anatomy hierarchy is used to support this inference.

This policy has introduced undesirable variation and arbitrariness into the terminology, and future revisions will seek to eliminate these variations. Where a code is needed for a site that is really meant to extend to entities that are not part of any kidney, this will be made clear in the name, e.g. Structure of kidney and perirenal tissue.

Countable vs non-countable *E* entities

The *E* code needs to be interpreted with care when the *x* name refers to entities that do not have the property of identity, meaning that they are not countable wholes, or could be interpreted as non-countable. In this circumstance, the interpretation of *E* means some portion of the thing being named.

> For example, tissue and types of tissue such as fascia, muscle, tendon, bone tissue, connective tissue, skin, mucosa/mucous membrane, nerve tissue, etc. Muscle, tendon, bone and skin can identify a type of tissue as well as an individual organ of that type. Bone tissue has no identity, but a particular bone does have identity.

To use skin as the archetypal example, the *E* code for *skin of finger* means a portion of the skin of a finger, so all of its subtypes must also be portions of skin. The *S* code for *skin of finger* then has a subtype *P* which would mean proper part of a portion of skin of finger. This admits subtypes that are not kinds of skin, but may be parts of skin, including layers, e.g. epidermis of finger (meaning a portion of epidermis of finger) could be a proper part of a portion of skin of finger.

Tissues, layers, membranes: portions

We regard the *E* code for x tissue, x layer to have the meaning *portion of X tissue*, and therefore regional subdivisions of tissue types are direct subtypes.

> For example, transitional epithelium of urinary tract, as an *E* kind of code, should be a supertype of transitional epithelium of urinary bladder. The reason is that (portion of) transitional epithelium of urinary bladder is a kind of (portion of) transitional epithelium of urinary tract.

We also deal with layers the same way.

> For example, we regard serosal layer and serosa tissue as meaning the same thing, since all serosal tissue is conifigured as a layer, and it can't be a serosa without being a layer; and their *E* codes mean portion of serosal layer or portion of serosal tissue.
>
> As another example, layer of retina would be a supertype of nerve fiber layer of retina, and also a supertype of retinal epithelium, where retinal epithelium represents a portion of the epithelium of the retina and is therefore a kind of (portion of) a layer.

Groups

The identity/countability issue extends to a problem differentiating groups of entities from one of the group.

> For example, consider x = *lymph node group*, y = *lymph node*. In this case, the group should be linked to the member via an appropriate *Relationship* (not yet in SNOMED CT), such as has-member. In those cases where y is always necessarily a member of group x, it could be linked via a member-of *Relationship* (also not yet in SNOMED CT).

What does part of mean?

There are several possible ways of interpreting *part of*. In SNOMED CT, *A part of B* means that in normal anatomy, the entire structure A is structurally included in B. Another way of saying it is that A is part of B if there is no part of A that is not also part of B.

> For example, the humerus is not part of the shoulder region, because the distal humerus is part of the humerus, and the distal humerus is not part of the shoulder region.

We do *not* use part of for non-anatomical meanings, such as grouping tests together in batteries, nor do we use it to indicate *Relationships* that are not strict anatomical inclusion.

Some recent work has begun to differentiate between part of that is reflexive (that is, an entity is in some sense a *part of itself*, much the same that a set can be viewed as a subset of itself), versus *proper part of*, where an entity cannot be a proper part of itself. For now, we regard part of *Relationships* as implying strict partonomy.

There is sometimes confusion about parthood as opposed to location.

> For example, an embryo is not part of a mother's body, but a kidney is. The anatomy section is composed mainly of canonical parts; but a few abnormal parts are included to permit them to be used as the location of tumors or injuries.
>
> For example, a Meckels diverticulum is a body structure that is part of the small intestine, and it is also a morphological abnormality. Likewise some stomas and other post-surgical structures are considered part of the body. A transplanted liver or kidney would be considered part of the body, as a post-surgical structure, even though the transplanted organ is not genetically identical. Likewise transplanted bone marrow is part of the body.

Non-living implants and devices, and foreign bodies, on the other hand, are considered to be located in the body, but not part of the body.

Part of relationships

For more information on part of relationships in the anatomy concept model, please see Part of relationships (under development)[313].

Can the SNOMED CT relationships table be used to construct a part of hierarchy?

The currently distributed *part of* Relationships need to be much more extensively modeled and quality assured. At present they are not *defining*, that is, their Characteristic Type in the relationship file is *additional*, and, therefore, they do not affect the classifier behavior. A substantial amount of effort has gone into a draft of the updated *part of* Relationships; these will require review and approval before incorporation into the release. This will eventually result in the SEP triplet structures and *part of* relations being strictly paralleled. It is a matter of time to implement and quality assure the changes.

Why are part of relationships not defining?

The SEP structure, combined with the inference mechanism that is used with SNOMED CT, allows us to take advantage of anatomical Relationships to infer subsumption, IS_A Relationships between disorders, procedures, and other entities without reference to *part of* Relationships. The SEP structure also permits us to sufficiently define anatomical structures without reference to *part of* Relationships (making them *necessarily true*, but not among the *necessary and sufficient* conditions).

> For example, the *Structure of left hand* can be sufficiently defined as a hand structure with laterality = *left.* This definition is sufficient. Converting the *part of* Relationships to have Characteristic Status = *defining* will require significant changes to the current model.

Entities with mass versus purely spatial massless entities

Points, lines, and surfaces can be considered to be massless. The FMA calls these *immaterial*. It is important to differentiate the codes/names for these entities from those that are intended to represent entities that have mass. At present, the concepts under anatomical spatial entity represent massless entities. Massless entities are not represented using the SEP model. It is conceivable that users may want to reference parts of a surface, and to enable this we would need to apply the SEP model to anatomical spatial entities, or else adopt defining *part of* Relationships.

Attributes used to define body structure concepts

Laterality

This attribute provides information on whether a body structure is left, right, or bilateral. It is applied only to bilaterally symmetrical body structures which exist on opposite sides of the body.

Unilateral

With the addition of lateralized content in the International Release, the need for unspecified unilateral concepts is removed, as well as potentially dangerous, if used directly in a patient record. Unilateral concepts will not be accepted.

313 https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=35992270

Laterality

Determine if an anatomy structure is lateralizable

The anatomy structures should only be pre-coordinated with laterality if they are lateralizable. All anatomy structures on the midline are not lateralizable. The Lateralizable Body Structure Reference Set has been developed and published as part of SNOMED International release. Please note that the refset requires an ongoing update for new additions.

In this guide, the lateralizable anatomy structures are divided into three types:

1. X
    - The type X represents any anatomy structure that is lateral to mid-sagittal plane.
2. Lateral half of Y
    - Y represents any anatomy structure that is symmetrical on the body's middle-line which cannot be lateralized. However, the lateral half of Y can have laterality, e.g. right half of head.
3. {Part} of X or Y
    - {Part} represents any constitutional or regional part of anatomical structure of X or lateral half of Y.

Creation of lateralized anatomy structure

Both Left and Right structures must be added when adding the new pre-coordinated concepts for anatomy structure with laterality. Lateralization should not be routinely applied to Entire and Part of anatomy concepts unless the concept model requires such lateralized anatomy structure.

Bilateral X anatomical structure (body structure) must not be added. The concepts under 422525002 |Structure of bilateral paired structures (body structure)| are no longer in use in the international edition of SNOMED CT because bilateral concepts are defined by two role groups. However, these concepts may still be in use by extensions, in post-coordinations, or as values in information models. We would recommend users to review their usage and provide feedback to us. Users will be consulted before these concepts are ultimately inactivated.

Term patterns for laterality

Following are the most common term patterns for the representation of laterality for anatomy structures. Preferred terms should have the same description without a semantic tag. In descriptions in hierarchies such as clinical finding/disorder, procedure, observable entity, and situation with explicit context, 'structure of' can be omitted when body site is not a concept of Entire anatomy entity.

1. Structure of + left/right + X or Structure of + left/right + half of Y
    Structure of left hand (body structure)
    Structure of right lung (body structure)
    Structure of left ring finger (body structure)
    Structure of left renal artery (body structure)
    Bone structure of left tibia (body structure)
    Structure of right half of head (body structure)
    Structure of right cerebral hemisphere (body structure)

2. Structure of + {part} + left/right + X or Structure of + {part} + left/right + half of Y
    Bone structure of left hand (body structure) - bone structure is constitutional part of hand
    Bone structure of phalanx of left ring finger (body structure)
    Skin structure of right foot (body structure) - skin structure is constitutional part of foot
    Skin structure of left index finger (body structure)
    Bone structure of proximal right humerus (body structure) - proximal is regional part of humerus

Bone structure of shaft of left femur (body structure) - shaft is regional part of femur

3. Special cases that are different from the above two common term patterns
    a. Finger/toe is not sufficient - Laterality should be placed before hand/foot when finger/toe or any part of a finger/toe is not further specified to individual digit, e.g. ring finger, index finger, great toe. For example,
        Structure of finger of left hand (body structure) - correct
        Structure of left finger (body structure) - incorrect

        Bone structure of phalanx of finger of left hand (body structure) - correct
        Bone structure of phalanx of left finger (body structure) - incorrect

        Structure of nail of toe of right foot (body structure) - neither 'right nail' nor 'right toe' is correct
    Note, hand/foot is redundant when an individually named finger, e.g. index finger, or the great toe has been specified in a description. For example,
        Bone structure of phalanx of left index finger (body structure) - correct
        Bone structure of phalanx of index finger of left hand (body structure) - it is not wrong, but 'hand' is redundant
        Bone structure of phalanx of left index finger of hand (body structure) - it is not wrong, but 'hand' is redundant

    b. Structure of + {non lateralizable part} + left/right lung Parts of symmetric structures should be symmetric. However, some body parts are exceptions. The laterality value in modeling is inherited from its lateralizable parent concept, e.g. left/right lung structure. Therefore, descriptions must clearly indicate such inheritances to avoid potential confusion. It is not accurate for a term such as "right middle lobe" because there is no "left middle lobe". The following are examples for correct description pattern. Note: existing content has not been following the term pattern.
        Structure of middle lobe of right lung (body structure)
        Structure of apical segmental bronchus of right lung (body structure)

    c. Structure of + {part} + left/right half of Y Leave the new concept as primitive if concept 'Structure of half of Y lateral to mid-sagittal plane (body structure)' does not exist. The new concept for 'Structure of half of Y lateral to midsagittal plane' should not be added until the policy is developed.
        Skin structure of left half of face (body structure) - 'skin of left face' is not accurate because it missed the word *half*.

> See also the policy for a preferred term in relationship to Structure vs. Entire at Naming Convention for SEP Model[314].

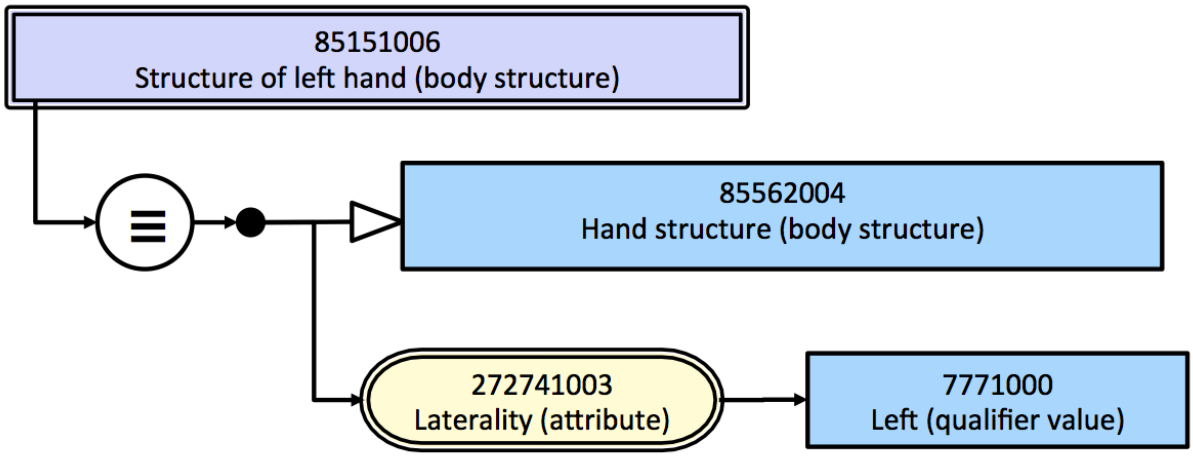
Concept modeling for laterality

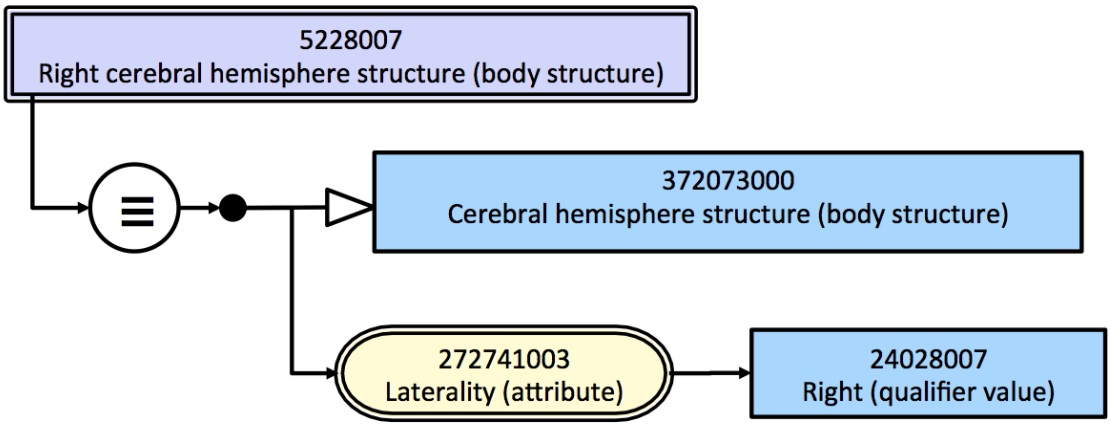
The 'part of' relationship should not be used for concept modeling in anatomy. The laterality attribute should be the only attribute for the representation of laterality. The new concept model for anatomy has not been implemented, and the proximal primitive modeling style should not be applied.

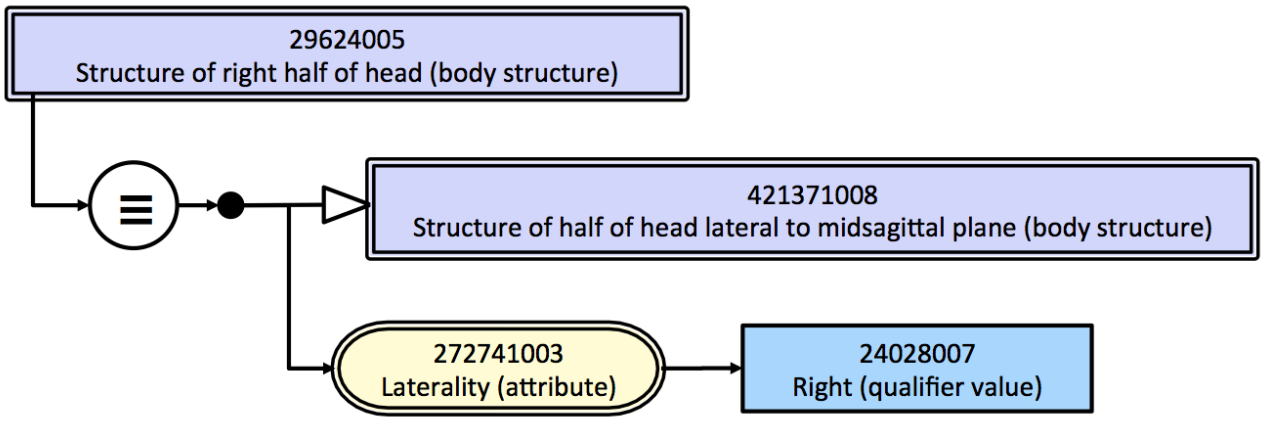
For term pattern 1, the concept X or lateral half of Y should be used to fully define a concept with laterality.

For example,

314 https://confluence.ihtsdotools.org/display/WIPEG/Naming+Convention+for+SEP+Model

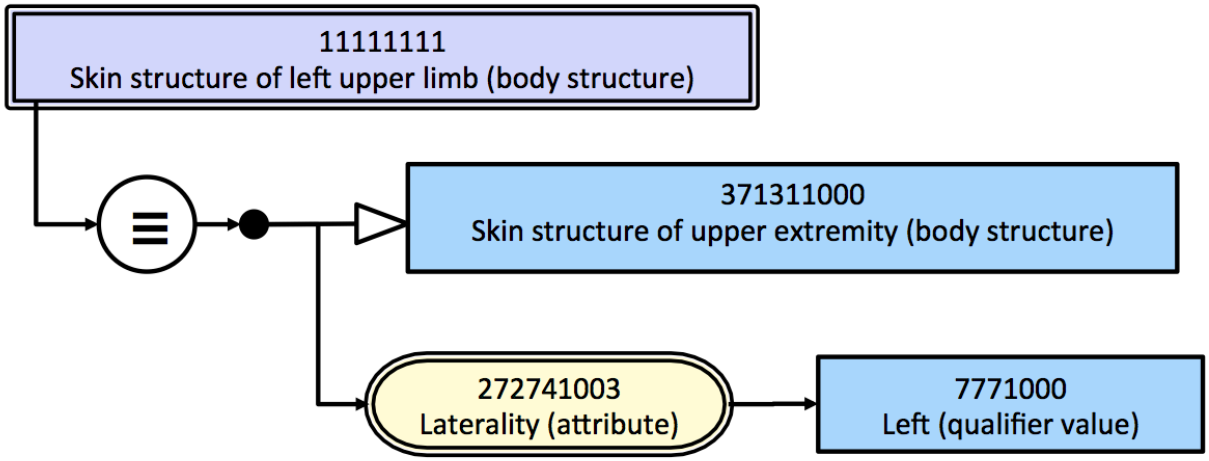

85151006
Structure of left hand (body structure)
≡
85562004
Hand structure (body structure)
272741003
Laterality (attribute)
7771000
Left (qualifier value)


5228007
Right cerebral hemisphere structure (body structure)
≡
372073000
Cerebral hemisphere structure (body structure)
272741003
Laterality (attribute)
24028007
Right (qualifier value)


29624005
Structure of right half of head (body structure)
≡
421371008
Structure of half of head lateral to midsagittal plane (body structure)
272741003
Laterality (attribute)
24028007
Right (qualifier value)

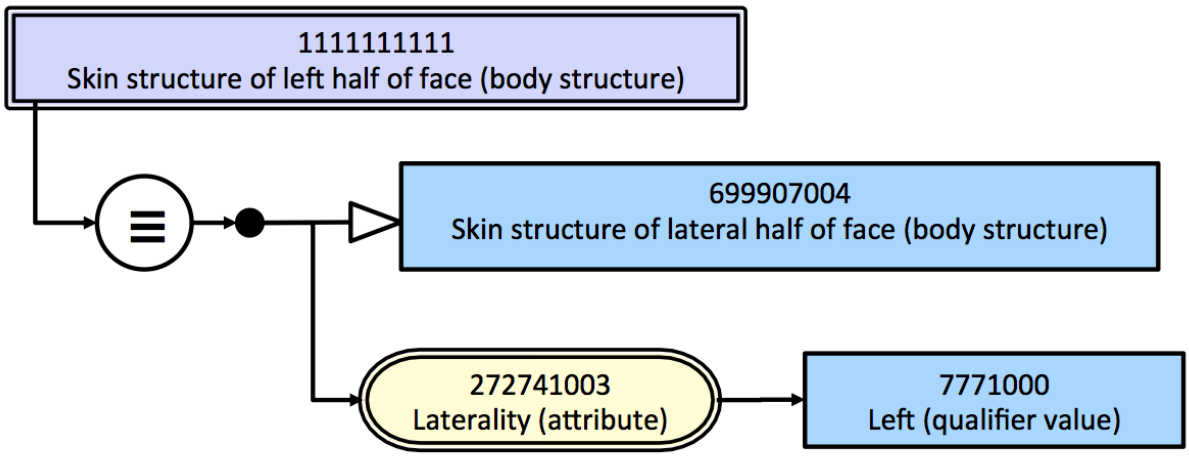
For term pattern 2, the pre-coordinated concept {part} of X should be used to fully define the concept with laterality. Note: Concepts for which an identifier has not been assigned have been shown with an identifier of '1111111111'.

For example,



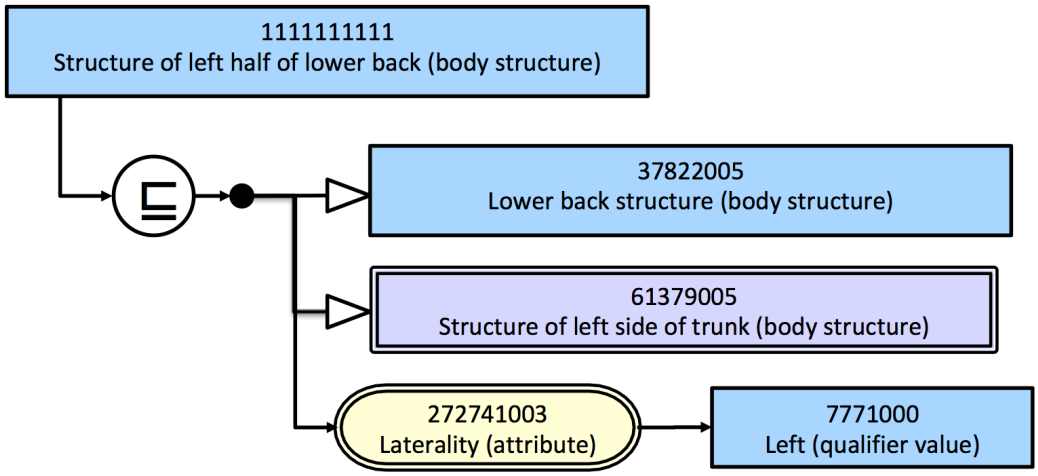
Please note that the concept modeling and utility of pre-coordinated concepts of 'structure of {part} of lateral half of Y' and 'structure of half of Y lateral to mid-sagittal plane' are still under investigation. Similar new anatomy concepts should not be added. The concept model should only use existing pre-coordinated concept {part} of lateral half of Y.

For example,



If pre-coordinated concept does not exist for '{part} of structure of half of Y' or 'structure of half of Y lateral to mid-sagittal plane', the concept can be defined by {part} of Y and the definition status should be primitive.

For example, concept |Structure of lateral half of lower back| does not exist, the concept 'Structure of left half of lower back' should be defined as a primitive concept. Two parent concepts are expected: 61379005 |Structure of left side of trunk (body structure)| and 37822005 |Lower back structure (body structure)|. The additional parent |Structure of left side of trunk (body structure)| is to ensure that any lateralized concept must be a subconcept of a lateralizable structure.



3.8.2.3 Anatomical Structure Naming Conventions

- Naming Convention for SEP Model(see page 128)
- Naming Convention for Digits of Hand and Foot(see page 129)

Naming Convention for SEP Model

1. FSN must include the word 'structure', 'entire' or 'part' for concepts that are following the SEP model.

For example,

- Liver **structure** (body structure)
- **Entire** liver (body structure)
- Liver **part** (body structure)

2. All descriptions for Entire concept must contain the word 'Entire'.

For example,

FSN	PT	SYN
Entire liver (body structure)	Entire liver	
Entire thumb (body structure)	Entire thumb	Entire first digit of hand

3. The word 'structure' can be omitted for synonyms.

For example,

FSN	PT	SYN	SYN
Liver structure (body structure)	Liver structure	Liver	
Thumb structure (body structure)	Thumb structure	First digit of hand	Thumb

S concepts are usually named x structure (body structure) or structure of x (body structure). *E* concepts are usually named entire x (body structure) or x entire (body structure). *P* concepts are usually named x part (body structure) or part of x (body structure).

Plurals

Outside the anatomy section of SNOMED CT, plurals were primarily used as headers, while the individual concept names were singular. In the anatomy section, we have taken plurals to represent meaningful differences from their singular counterparts.

For example, *Skin structure of all fingers* in the FSN would mean more than one finger, while *Skin of finger* would not imply more than one.

Naming Convention for Digits of Hand and Foot

Fully specified names and preferred names should use proper names of digits of hand and foot. The names by order of digits can be added as optional synonyms. The order of fingers is different from the order of digits of hand because the thumb is not a finger in SNOMED CT. Therefore, the order of the finger should not be used to avoid potential confusion.

Naming convention for the structure of digits of hand

FSN	PT	SYN	SYN
Index finger structure (body structure)	Index finger structure	Second digit of hand	Index finger
Little finger structure (body structure)	Little finger structure	Fifth digit of hand	Little finger
Middle finger structure (body structure)	Middle finger structure	Third digit of hand	Middle finger
Ring finger structure (body structure)	Ring finger structure	Fourth digit of hand	Ring finger
Thumb structure (body structure)	Thumb structure	First digit of hand	Thumb

Naming convention for the structure of digits of foot

FSN	PT	SYN	SYN
Great toe structure (body structure)	Great toe structure	First digit of foot	First toe

FSN	PT	SYN	SYN
Second toe structure (body structure)	Second toe structure	Second digit of foot	Second toe
Third toe structure (body structure)	Third toe structure	Third digit of foot	Third toe
Fourth toe structure (body structure)	Fourth toe structure	Fourth digit of foot	Fourth toe
Little toe structure (body structure)	Little toe structure	Fifth digit of foot	Fifth toe

3.8.2.4 Anatomical Structure Modeling

Many terms that refer to body systems or tracts are used imprecisely in clinical practice and in medical publications. Ambiguities frequently arise with many of these terms. We have made the following definitions and distinctions in order to achieve internal consistency of the terminology. We recognize that it may not be possible to get universal consensus for the names for each of these concepts. The goal is to be consistent and clear in defining the meaning of each concept and to allow users and system designers to present the terms that best reflect these meanings in their own implementations.

- Body parts and regions(see page 131)
- Cardiovascular System(see page 133)
- Digestive System(see page 137)
- Ear(see page 139)
- Endocrine System(see page 139)
- Eye(see page 139)
- Genitourinary system(see page 140)
- Integumentary System(see page 141)
- Lymphatic, Immune, Hematologic, Hematopoietic systems(see page 142)
- Musculoskeletal System(see page 144)
- Nervous System(see page 152)
- Respiratory System(see page 153)

Combined site (body structure)

The concepts under 116007004 | Combined site (body structure) |[315] should not be used for concept modeling. They do not provide value for the classification of disorders or procedures. These concepts are ambiguous because their intended meaning is unclear, i.e., a combined site could represent any part of two or more sites or all of the referred sites in the description. The combined site (body structure) concepts will eventually be inactivated.

315 http://snomed.info/id/116007004

Body parts and regions

SNOMED CT uses the Foundation Model of Anatomy (FMA) definition of *body part* and *body part subdivision* for some concepts. For example, the joint regions discussed below are classified as body part subdivisions, since that is what is intended by the diseases and procedures that use these terms in their definitions. They are not body parts because they are defined, not by a set of bones, but rather by a particular joint and its surrounding structures. However, our interpretation of the word *region* is based on common usage and is intended as a three-dimensional structure, *not* the FMA two-dimensional definition of body region. In other words, these regions are not simply surface regions (skin), but also include the three dimensional underlying structures (subcutaneous tissues, bones, muscles, tendons, fascia, vessels and etc.).

Surface regions

Many concepts contain the phrase *surface region.* These could be interpreted as massless (immaterial) mathematical surfaces, but a clinical terminology would have no direct use for such meanings in clinical records. They could be interpreted as having mass (not immaterial), but the depth then is arbitrary. Should it be just skin deep, or should it include deeper layers of the surface? If only skin deep, the meaning of these concepts would overlap with concepts for skin regions. If deeper, the meaning would possibly be the same as the generic structure concepts.

Inactivation

Most surface region concepts will be retired as ambiguous/*possibly equivalent to* their corresponding concepts that are clearly not immaterial, including x structure, entire x, and skin of X. Where the x structure codes do not currently exist, they will be created, without the surface region phrase.

Abdominal regions

The named regions of the abdomen are by tradition divided horizontally by the transpyloric plane and the interspinous plane, and vertically by the midclavicular plane. The lateral regions are therefore bounded above by a plane that is inferior to the ribs. In contrast, the flank is the lateral region of the abdomen bounded above by the ribs. Thus some parts of the hypochondriac regions, which are superior to the transpyloric plane but inferior to the ribs, would be considered also part of the flank. The hypogastric region is also sometimes called the pubic region.

Abdominal cavity, pelvic cavity

The term *abdominal cavity* has two meanings, one including the *pelvic cavity*, the other excluding it. *Abdominal cavity structure* includes both. *Abdominal cavity proper* excludes the pelvic cavity.

Organs, organ system subdivisions

The FMA definition of *body organ* is also used. Organs include individual bones, joints, muscles, arteries, veins, lymph vessels, nerves, and etc. Concepts that include groups of organs are frequently used in SNOMED CT. In most cases, these have been part of the subsumption hierarchy (IS A hierarchy) of the particular organ type, that is, they are *kinds of organs*.

For concepts that refer to the *collection of organs* (rather than organs in a collection), there is another concept that is a, kind of, *organ system subdivision*. Many such collections do not yet have corresponding organ system subdivision concepts. The default is to interpret concepts as denoting organs, rather than organ system subdivisions.

Collections of Organs with/without Organ System Subdivisions	
Organ	Organ system subdivision
Vertebra (bone of vertebral column)	Spine (subdivision of skeletal system)
Cervical vertebra	Cervical spine (subdivision of spine)
Third cervical vertebra	No corresponding organ system subdivision concept
Bone of skull	Skull (subdivision of skeletal system)
Bone of thoracic cage	Thoracic cage (subdivision of skeletal system)
Rib	No corresponding organ system subdivision concept
Third rib	No corresponding organ system subdivision concept
Right third rib	No corresponding organ system subdivision concept
Quadriceps femoris muscle	No corresponding organ system subdivision concept
Quadriceps femoris muscle, left	No corresponding organ system subdivision concept
Vastus medialis muscle	No corresponding organ system subdivision concept

Cell, tissue, organ

In general, organs are made up of tissue, and tissue is made up of cells. However, a cell is not necessarily part of tissue, and tissue is not necessarily part of a named organ.

Tree structured organs

Arteries, veins, nerves, and the bronchi form tree-like structures that distribute across multiple regions. Because of their size and links with other structures, they require slightly different modeling. FMA divides tree structured organs as: *organs with organ cavities* and *organs that are solid.*

Hollow tree organs

Organ with organ cavity has a subtype, *hollow tree organ*. The hollow tree organs are:

- Tracheobronchial
- Biliary
- Vascular
    - Arterial

    - Systemic arterial
    - Pulmonary arterial
- Venous
    - Systemic venous (superior, inferior, and 4 cardiac trees)
    - Pulmonary venous (superior and inferior left and superior and inferior right)
    - Portal venous
- Lymphatic (right lymphatic duct and thoracic duct)

Among the solid organs, there is one category, *neural*, that is tree-structured (see: Nervous system; neural tree).

Laterality of digits

For information on laterality, see Anatomical Structure Naming Conventions section at Naming Convention for Digits of Hand and Foot[316] and Laterality section at Laterality[317]

Unacceptable terms

X disorder at Y level concepts from ICD-11, e.g. *skin laceration of arm at wrist level* (precedent are terms added from ICD-9) will not be added to the SNOMED International Release.

Cardiovascular System

Cardiac valves, normal and malformed

There are a number of concepts in the anatomy hierarchy that represent congenital cardiac malformations. This content was developed in cooperation with IPCCC (International Pediatric and Congenital Cardiac Code).

The following pairs of cardiac valve concepts do not represent the same thing and are siblings, not super- or subtypes, to each other:

- 11124005 |Atrioventricular valve (body structure)|[318] vs. 279316009 |Atrioventricular (non-mitral, non-tricuspid) valve structure (body structure)|[319]
- 91134007 |Mitral valve structure (body structure)|[320] vs. 312523009 |Left (non-mitral) atrioventricular valve structure (body structure)|[321]
- 46030003 |Tricuspid valve structure (body structure)|[322] vs. 244344000 |Entire right (non-tricuspid) atrioventricular valve (body structure)|[323]

Atrioventricular (non-mitral, non-tricuspid) valves represent body structures which were anatomically abnormal from the beginning of their development. They are not called mitral/tricuspid valve although they perform the same function as their normal counterpart would. They are also represented using the term *not morphologically mitral/tricuspid valve*.

For example,

316 https://confluence.ihtsdotools.org/display/WIPEG/Naming+Convention+for+Digits+of+Hand+and+Foot?src=sidebar
317 https://confluence.ihtsdotools.org/display/WIPEG/Laterality?src=sidebar
318 http://snomed.info/id/11124005
319 http://snomed.info/id/279316009
320 http://snomed.info/id/91134007
321 http://snomed.info/id/312523009
322 http://snomed.info/id/46030003
323 http://snomed.info/id/244344000

- 459176007 |Abscess of right atrioventricular (not morphologically tricuspid) valve (disorder)|[324] represents an abscess of the right atrioventricular valve that has been developed abnormally from the beginning vs. 431189009 |Abscess of tricuspid valve (disorder)|[325].

For a normally developed mitral/tricuspid valve, the term *left/right atrioventricular valve* can be used interchangeably. They are true synonyms. However, they cannot be used for abnormally developed valves, i.e. left atrioventricular (non-mitral)/right atrioventricular (non-tricuspid) valves.

Systemic, pulmonary circulation

The *systemic circulatory system* is the combined arterial and venous circulation that begins where blood leaves the left ventricle and ends where blood enters the right atrium. It excludes the coronary circulation. The heart chambers are also considered part of the circulatory system.

The *pulmonary circulation* is the combined arterial and venous circulation that begins where blood leaves the right ventricle and ends where blood enters the left atrium.

Arterial

81040000 |Pulmonary artery structure (body structure)|[326]: Any artery of the pulmonary circulation, i.e. arteries carrying unoxygenated blood from the heart to the lungs. They include the trunk, right and left branches of the pulmonary artery (which are within the mediastinum), and all of their branches (which tend to occur at or past the hilum and are therefore regionally within the lung).

128260003 |Pulmonary artery within lung (body structure)|[327]: Any artery of the pulmonary circulation that is regionally within the lung, the boundary being defined by the hilum.

45341000 |Structure of trunk of pulmonary artery (body structure)|[328]: The main pulmonary artery (one of the *great vessels* that enter the heart) carrying blood from the right ventricle and dividing into right and left main pulmonary arteries (some dictionaries consider this synonymous with pulmonary artery).

Venous

430757002 |Structure of pulmonary vein great vessel (body structure)|[329]: There are four pulmonary veins that enter the left atrium, two on each side. These are what is intended by the name *pulmonary vein* (*great vessels* that enter the heart). In common usage, any vein that is part of the lung may be referred to as a pulmonary vein, but SNOMED CT has a separate concept: 122972007 |Pulmonary venous structure (body structure)|[330]: This means any vein that drains the lung. A synonym is *vein of lung*. *Pulmonary veins* are veins of the lung, but *pulmonary vein* and *vein of lung* are not synonyms.

> **Nonexistent**
>
> There is no concept for *Pulmonary vein within lung*.

Central, peripheral, cerebrovascular systems

The term *central vascular* is not in common use. In fact, the term does not appear in SNOMED CT. However, the term *peripheral vascular* is very common, and therefore it requires a definition that (by default) sets the boundary between central and peripheral vascular systems.

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324 http://snomed.info/id/459176007
325 http://snomed.info/id/431189009
326 http://snomed.info/id/81040000
327 http://snomed.info/id/128260003
328 http://snomed.info/id/45341000
329 http://snomed.info/id/430757002
330 http://snomed.info/id/122972007

The simplest definition of the peripheral vascular system is the vascular system that is not central; and then the central vascular system includes the pulmonary circulation, coronary circulation, cerebrovascular system, thoracic aorta, superior vena cava, inferior vena cava, and mediastinal blood vessels.

Peripheral vascular disease is often distinguished from cerebrovascular disease and coronary artery disease. These are the three major categories of diseases caused by problems in vascular circulation in general, and atherosclerosis, in particular. As a result of this clinical distinction, the cerebrovascular system is excluded from the peripheral vascular system.

Cerebrovascular is commonly defined in two ways: the blood vessels *in* the brain, or the blood vessels that *supply* the brain (including those within the brain). Because cerebrovascular disease includes extra-cranial occlusions of the vertebral and carotid arteries, we define the cerebrovascular system as those vessels involved in the supply and drainage of blood to the brain. Convention does, however, tend to exclude the innominate artery - which gives rise to the right common carotid and the arch of the aorta which gives rise to the left common carotid. Convention also excludes the subclavian arteries which give rise to the vertebral arteries.

Common carotid artery, artery of neck

The common carotid artery has a left and right component. The right common carotid artery has no thoracic portion (it arises from the brachiocephalic trunk behind the right sternoclavicular joint). The left common carotid artery has a thoracic portion (It arises from the arch of the aorta). Thus, the common carotid artery (not specifying laterality) is not exclusively an artery of the neck. This is because of the thoracic portion of the left common carotid artery. Then, artery of neck region includes the cervical part of left common carotid artery and all of the right common carotid artery.

Intracranial, extracranial vascular system

Some vascular trees are located wholly within the cranial cavity, but some (internal carotid; vertebral) cross the boundary between extra- and intra-cranial. Intracranial segments of such vascular trees must be individually identified as such, and the entire vascular tree must not be categorized as either extra- or intra-cranial.

> **Tree-structured organs**
>
> See *Tree-structured organs* elsewhere, re: regional sections of venous and arterial tree organs.

The word *artery*

The word artery has three different meanings. In modeling SNOMED CT concepts that refer to arteries, it is necessary to decide on a case-by-case basis which of these meanings is intended.

Meanings of artery		
Meanings	Notes	Examples

Meanings of artery		
An arterial trunk: a single tube	The most common in clinical use. The meaning of the word *artery* in injuries and operations is clearly a single tube, the trunk of the named artery, or trunk of the named arterial branch.	A puncture wound of the femoral artery affects the femoral arterial trunk. A grafting into the popliteal artery is done into the popliteal arterial trunk. Occlusions of arteries are located by naming the trunk where the occlusion occurs. Occlusions may affect circulation beyond the trunk, however, collateral circulation often mitigates the effects. Thus, it is incorrect to interpret *artery* to mean the entire subtree in any of these usages.
An arterial tree organ	There are only two complete arterial tree organs (the systemic arterial tree arising at the aortic valve, and the pulmonary arterial tree arising at the pulmonary valve) that are readily named as such. They are seldom referred to by disorders or procedures.	NA
An arterial trunk, plus all its branches	When modeling, it is challenging to differentiate when *trunk* vs. *trunk plus branches* is intended.	NA

Artery

This clinical usage of *artery* varies from the definition of the FMA, which defines *artery* as a subdivision of an arterial tree (organ) which consists of branching sets of tubes (arterial trunks) that form a tree; together with other arterial trees (organ parts), it constitutes an arterial tree (organ). The FMA definition corresponds to the third meaning of *artery* above.

The word *vein*

The word vein has three different meanings. In modeling SNOMED CT concepts that refer to veins, it is necessary to decide on a case-by-case basis which of these meanings is intended.

Vein	
Meaning	Notes
A venous trunk	As with the clinical usage of the word *artery*, clinical usage of the word *vein* generally refers to the trunk and not the entire tree

Vein	
A venous tree organ	There are only eleven venous tree organs that are readily named as such.
A venous trunk, plus all its branches	When modeling, it is challenging to differentiate when *trunk* vs. *trunk plus branches* is intended.

Vein

This clinical usage of *vein* varies from the definition of the FMA, which defines *vein* as a subdivision of a venous tree (organ) which consists of branching sets of tubes (venous trunks) that form a tree; together with other venous trees (organ parts), it constitutes a venous tree (organ). The FMA definition corresponds to the third meaning of *vein* above.

Trunk of vein, vein as a tree structure

Because *trunks of veins*, not *venous trees*, have been used to organize the vein hierarchy, there are implications for regional classes.

For example, the internal jugular vein is a vein of the neck, but its entire *venous tree* extends into the head. The internal jugular vein *venous tree* is not strictly part of the neck, even though the internal jugular vein *venous trunk* is strictly part of the neck.

Tributaries are also modeled as direct tributaries of the trunk. A tributary of a named vein is part of the *venous tree* of the named vein, but not part of the *venous trunk* of the named vein. Some veins that are part of the *venous tree*, and therefore might be regarded as indirect tributaries, are not modeled as direct tributaries of the *trunk of the vein*. Direct tributary is the intended meaning of tributary.

Inactivation

All concepts with the name pattern *vein x and its tributaries* were inactivated due to ambiguity about their meanings. They have *MAYBE A* links to *structure of vein x* and *entire vein x.*

Digestive System

Digestive tract is the same as alimentary tract, and includes the entire passage for food through the body, including mouth, oral cavity (both vestibule of mouth and cavitas oris propria), oropharynx, esophagus, stomach, duodenum, jejunum, ileum, colon, rectum, and anal canal.

Digestive system includes the digestive tract, as well as the associated organs of digestion, including tongue, teeth, salivary glands, liver, exocrine pancreas, gallbladder, and biliary tract.

Gastrointestinal tract has two meanings in common usage. One that does and one that does not include the esophagus. The usage that includes the esophagus would more correctly be named esophago-gastrointestinal tract. Endoscopists frequently use this meaning, even though it is contrary to some dictionary definitions and does not follow strict lexical interpretation (which does not include the esophagus).

> ***Upper gastrointestinal (GI) tract.*** When describing upper GI bleeding and upper GI radiographic and endoscopic procedures the upper GI tract includes the esophagus, stomach, and duodenum. The upper GI tract does not include the more restricted *stomach-intestine* entity.

Lower gastrointestinal (GI) tract. When describing lower GI bleeding, lower GI radiographic and endoscopic procedures, and lower GI output from ileostomies and colostomies, the lower GI tract includes the jejunum, ileum, cecum, colon, rectum and anal canal. The ligament of Treitz may be used as the division between upper and lower GI tracts (and the division between the duodenum and jejunum).

Also, since the upper GI tract is said to end at the duodenum-jejunum junction, and there is no concept meaning middle GI tract, the jejunum can be inferred to be in the lower GI tract.

Information

See *J Vasc Interv Radiol 9:747* for an example of inclusion of the jejunum and distal tract as part of the lower GI tract.

Upper aerodigestive tract

The SNOMED CT concepts 119253004 |Upper aerodigestive tract structure (body structure)| and 361922007 |Entire upper aerodigestive tract (body structure)|[331] have the meaning based on the following reference: *Cancers of the upper aerodigestive tract constitute approximately 4% of all malignancies. These include cancer of the lip, tongue, major salivary glands, gums and adjacent oral cavity tissues, floor of the mouth, tonsils, oropharynx, nasopharynx, hypopharynx and other oral regions, nasal cavity, accessory sinuses, middle ear, and larynx* (Upper aerodigestive tract cancers, Cancer 1995 Jan 1;75 (1 Suppl): 147-53). This definition matches the tumors included in the *CAP Cancer Checklist* for upper aerodigestive tumors. The esophagus, or at least the cervical esophagus, may be included, but not in SNOMED CT.

Biliary tract

Biliary tract includes the gallbladder, intrahepatic and extrahepatic bile ducts, and common bile duct. It does not include the liver. SNOMED CT uses *biliary system* as a synonym for *biliary tract.* SNOMED CT has another concept that does include the liver, 732049009 |Entire liver and biliary system (body structure)|[332].

Mouth

Mouth has several different meanings including mouth region, oral region of the face, and rima oris.

Mouth region includes structures surrounding the oral cavity, as well as structures of the oral region of the face.

Modeling

Use *mouth region* for most disorders with a finding site of *mouth*.

Oral region of face includes the skin and subcutaneous tissue of the lips and perioral region, the orbicularis oris muscle, and the vessels and nerves in these structures.

Rima oris is the opening of the mouth.

Tongue

The four regional parts of the tongue are the ventrum (inferior surface), dorsum, root, and body. The *root of the tongue* is the posterior third, the dorsal surface of which forms the anterior wall of the oropharynx. The root of the tongue rests on the floor of the mouth. The nerves and vessels that supply the intrinsic muscles of the tongue traverse the root of the tongue.

331 http://snomed.info/id/361922007
332 http://snomed.info/id/732049009

Colorectum

The terms *colorectal* and *colorectum*, commonly used by pathologists, are included in descriptions for concepts referring to neoplasms modeled with 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)|. 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)| is needed because neoplasms are the same from the cecum to rectum and are considered as a group in cancer synoptic reporting protocols. Note, there is no consensus concerning the definition of *colon* in the literature and between different domains.

Ear

The ear includes the external, middle and inner ear. The external ear has two main parts, the *auricle* (also called the *pinna*) and the 84301002 |External auditory canal structure (body structure)|[333]. The external auditory canal has the synonym *external auditory meatus*. The external auditory meatus is not just the external opening of the canal, but rather the canal extending to the ear drum (42859004 |Tympanic membrane structure (body structure)|[334]). The 61671002 |Structure of internal acoustic meatus of temporal bone (body structure)|[335] (SYN, *internal auditory canal,* is not part of the ear. As described in the FSN, it is an opening in the temporal bone, and is primarily a nerve conduit that anatomically parallel to the external auditory canal.

Endocrine System

The endocrine system is composed of the endocrine pancreas, pineal body, paraganglia, paraaortic bodies, parathyroid glands, endocrine ovaries, endocrine testes, adrenal glands, pituitary gland, thyroid gland, juxtaglomerular apparatus of the kidneys, and some diffuse neuroendocrine structures. Certain parts of the thymus produce endocrine hormones, but the thymus itself is not part of the endocrine system.

Eye

Choroid

Both *subchoroidal* and *suprachoroidal* refer to the same potential anatomic space between the choroid and the sclera. The term *lamina subchoroidea of choroid* is the same as the *lamina suprachoroidea*.

> **Suprachoroidal hemorrhage**
>
> In the literature, the term *massive suprachoroidal hemorrhage* is replacing *expulsive hemorrhage* and *subchoroidal hemorrhage*.

Retinal vein

There is not a vein actually named *retinal vein*. However, *SNOMED CT* has concepts with the phrase.

For example,

- 85003000 |Structure of retinal vein (body structure)|[336] has the synonym *retinal vein*.
- 280927000 |Entire central vein of the retina (body structure)|[337] has the synonym *entire central retinal vein.*

333 http://snomed.info/id/84301002
334 http://snomed.info/id/42859004
335 http://snomed.info/id/61671002
336 http://snomed.info/id/85003000
337 http://snomed.info/id/280927000

Orbital region

371398005 |Eye region structure (body structure)|[338] has a synonym of *orbital region structure* which subsumes *bony orbit*, *entire eye*, and *ocular adnexa*.

Genitourinary system

The genitourinary system includes the entire urinary system, as well as the genital system. The genital system includes internal genital organs and external genitalia.

Urinary system/tract

The urinary system includes the organs that form and excrete urine, the kidneys, ureters, bladder, and urethra. The male urinary system includes the prostatic urethra (since it is a male urinary outflow structure).

In common usage, *urinary system* and *urinary tract* are used interchangeably. However, in SNOMED CT, this is not they case, i.e. they are not synonyms. The two concepts are: 122489005 |Urinary system structure (body structure)|[339] and 431938005 |Structure of urinary tract proper (body structure)|[340].

Urinary tract proper

The urinary tract proper includes the organs involved in the excretion of urine including the renal pelvis (but not the rest of the kidney), ureters, bladder, and urethra. It is used for disorders affecting the flow of urine (as opposed to its formation) or the urothelium, the lining of the urinary tract.

For example,

- 41368006 |Disorder of urinary tract proper (disorder)|[341]
- 249273002 |Finding of urinary tract proper (finding)|[342]
- 7163005 |Urinary tract obstruction (disorder)|[343]
- 255150000 |Carcinoma in situ of urinary tract proper (disorder)|[344]

Upper urinary tract

The upper urinary tract consists of the kidneys and the ureters (to the juncture with the bladder). Since upper urinary tract infections include kidney infection, the upper urinary tract must include the kidney.

Upper urinary tract proper

The upper urinary tract proper is the part of the urinary tract proper. It includes only part of the kidney, the renal pelvis, and the ureters.

For example,

- 25990002 |Renal pelvis structure (body structure)|[345] has a parent, 431491007 |Structure of upper urinary tract proper (body structure)|[346].

338 http://snomed.info/id/371398005
339 http://snomed.info/id/122489005
340 http://snomed.info/id/431938005
341 http://snomed.info/id/41368006
342 http://snomed.info/id/249273002
343 http://snomed.info/id/7163005
344 http://snomed.info/id/255150000
345 http://snomed.info/id/25990002
346 http://snomed.info/id/431491007

Lower urinary tract

The lower urinary tract, 19787009 |Lower urinary tract structure (body structure)|[347], is the urinary system below the junction of the ureter with the bladder. It consists of the bladder and urethra. Lower urinary tract and lower urinary system are the same. The male and female specific components are located under male urinary outflow structure and female urinary outflow structure, respectively.

Obstetric and gravid

Obstetric and gravid body structures should not be added inSNOMED CT. *Obstetric* is a context for a disorder, procedure, or medical specialty that is applied to a body structure during pregnancy, childbirth, or the postpartum period. The context does not change the body structure.

Prostate lobes

The *posterior lobe* of the prostate is described in newborns but does not persist in the adult. 113295002 |Structure of lobe of prostate (body structure)|[348] includes three lobes, left and right lateral, and medial.

Integumentary System

Skin, skin-associated mucosa

This is an example of a body structure that is used to group related terms. The concept 707861009 |Structure of skin and/or skin-associated mucous membrane (body structure)|[349] intentionally employs *disjunction* (inclusive O*r*). It includes structures in the deep layers, but excludes non-skin mucosal epithelium, e.g. bronchial, gastrointestinal, and genitourinary sites of squamous cell neoplasms. The 400199006 |Structure of skin and/or surface epithelium (body structure)|[350] concept is used to represent the sites of these neoplasms.

Skin and/or skin-associated mucosa is intended for use in dermatology. It is not intended to subsume all mucosal structures, which are under Mucous membrane structure (body structure).

> **Diseases of the skin**
>
> For the meaning of *diseases of the skin*, refer to the draft of ICD-11: *Diseases of the skin incorporate conditions affecting the epidermis, its appendages (hair, hair follicle, sebaceous glands, apocrine sweat gland apparatus, eccrine sweat gland apparatus and nails) and associated mucous membranes (conjunctival, oral and genital), the dermis, the cutaneous vasculature and the subcutaneous tissue (subcutis).*

Skin regions, skin of <named body part>

Since the phrase *skin of finger* can mean *some or all of the skin of finger* (if interpreted as a *structure*, rather than *entire* in the *The StructureEntirePart (SEP) model*, we could use *IS-A* to represent the relationship between skin of finger and skin of hand. Thus, skin of finger *IS-A* skin of hand, *IS-A* Skin structure of upper limb, *IS-A skin region*. The word *region* is not used in all of these names, because it may refer to the *entire* region or a *part of* a region.

347 http://snomed.info/id/19787009
348 http://snomed.info/id/113295002
349 http://snomed.info/id/707861009
350 http://snomed.info/id/400199006

Scalp

Formal definitions of scalp include layers beneath the skin. Therefore we make a distinction between 41695006 | Scalp structure (body structure)|[351] and 43067004 |Skin structure of scalp (body structure)|[352].

Soft tissue

There are at least three different use cases and meanings, and thus categories, for the phrase *soft tissue.* They include:

- **Tumors**. *Soft tissue* gives rise to similar types of neoplasms of mesenchymal stem cell origin, generally called *soft tissue neoplasms.* This accounts for the inclusions/exclusions of the category. *Non-neoplastic masses* arising in soft tissue are included in the WHO Classification of Soft Tissue Tumours.
    - For tumors, *soft tissue* is defined as non-epithelial extraskeletal tissue of the body, exclusive of the mononuclear phagocyte system, glia, and supporting tissue of various mesenchymal organs. Other explicit inclusions are: fibrous tissue, fascia, ligaments, tendons, tendon sheaths, synovia, bursae, skeletal muscle, smooth muscle, fatty tissue, adipose tissue, blood vessels, lymph vessels, peripheral nerves, sympathetic and parasympathetic nerves, and ganglia, as well as subcutaneous tissue. Skin, skeletal cartilage, pleura, and the pericardium, peritoneum, central nervous system, endocrine glands, and viscera are excluded.
- **Sites of non-bone disorders and injuries of the limbs, head, neck, and body wall**. Skeletal cartilage, as well as all non-bone structures of the limbs, and subcutaneous tissue and fat are included. Skin and lymph nodes are not included. For the head, neck and torso, mononuclear phagocyte system, central nervous system, endocrine glands, viscera, and supporting tissues are excluded.
- **Structures identified in images**. Soft tissue include everything except for mineralized bone tissue and teeth.

Lymphatic, Immune, Hematologic, Hematopoietic systems

Lymphatic system / 89890002 |Structure of lymphatic system (body structure)|[353]

Set of structures through which lymph flows. It includes 59441001 | Structure of lymph node (body structure) | and 83555006 | Structure of lymphatic vessel (body structure) |. It supports the categorization of findings, disorders and procedures that relate to the flow of lymph.

Lymphoid system / 122490001 |Lymphoid system structure (body structure)|[354]

Set of structures with groups of lymphoid cells, including those in the intestines, marrow, liver, and other locations, and the lymph nodes, spleen, thymus, and tonsils and adenoids; excludes the lymph vessels. It supports categorization of lymphomas.

Immune system / 116003000 |Structure of immune system (body structure)|[355]

All of the lymphoid system, as well as the mononuclear phagocytic system; the immune system also includes cellular and sub-cellular components involved in cellular and humoral immunity.

351 http://snomed.info/id/41695006
352 http://snomed.info/id/43067004
353 http://snomed.info/id/89890002
354 http://snomed.info/id/122490001
355 http://snomed.info/id/116003000

Mononuclear phagocytic system / 127908000 |Mononuclear phagocyte system structure (body structure)|[356]

Collection of true macrophages, distributed widely in the body (splenic and lymphoid sinusoids, liver Kuppfer cells, pulmonary alveolar macrophages, osteoclasts, macrophages in serous membranes, and microgliocytes); also endothelial cells that line hematopoietic tissues.

Dendritic cell system / 127909008 |Dendritic cell system structure (body structure)|[357]

Collection of antigen-presenting cells, including the following: epidermal Langerhans, dendritic reticulum, and interdigitating. Class I histiocytoses (Langerhans cell histiocytosis) are disorders of the dendritic cell system.

Hematologic system / 414387006 |Structure of hematological system (body structure)|[358]

Bone marrow, the lymphoid system, the hematopoietic system, and the terminal cells of all lineages of the hematopoietic system (red cells, white cells, platelets, histiocytes, plasma cells, etc). Disorders of the hematologic system do not necessarily include disorders of the hemostatic system, even though bleeding and thrombosis are usually categorized as *hematologic*.

Hematopoietic system / 57171008 |Hematopoietic system structure (body structure)|[359]

Structures and cells responsible for erythropoiesis, granulocytopoiesis, monocytopoiesis, thrombocytopoiesis, and lymphopoiesis. Refers to the immature cellular elements that eventually form the cellular components of blood. The blood itself cannot be strictly part of the hematopoietic system, since this would cause all components of blood to be part of the hematopoietic system (including components like albumin, clearly not *hematopoietic*). SNOMED CT considers leukocytes, erythrocytes, and platelets *the result* of hematopoiesis, but not blood-forming, otherwise leukocytosis would become a disorder of hematopoiesis, whereas it can arise simply from a demargination of white cells following stress. SNOMED CT has a concept named 419333002 | Cellular component of blood (substance) |; note that platelets are not actually cells, but are *cellular components*.

Modeling

Hematopoietic should be differentiated from *hematologic*, since the terminal cells of each lineage (the erythrocyte, segmented neutrophil, monocyte, histiocyte, platelet, mature T- and B-cells, plasma cells, etc.) are not strictly hematopoietic.

Blood

The blood is not necessarily part of the cardiovascular system, nor is it necessarily part of the hematopoietic system. 87612001 |Blood (substance)|[360] is a body fluid, not strictly part of either the hematopoietic or cardiovascular systems.

Single versus multiple lymph node(s)

|Lymph node structure| could be a single node or multiple nodes. A term in single form does not mean it is a single anatomical entity. For example, | Inguinal lymph node structure | represents the lymph node(s) in the inguinal region. It is a representation of the type of anatomical entity. A 'Lymph node group' concept could have two distinctive concepts, e.g. lymph node of a particular classification group, or a group of nodes, representing the

356 http://snomed.info/id/127908000
357 http://snomed.info/id/127909008
358 http://snomed.info/id/414387006
359 http://snomed.info/id/57171008
360 http://snomed.info/id/87612001

lymph node according to different groups in most cases. If it represents a group of nodes, the description should be in the plural form.

Regional lymph nodes of lungs

SNOMED CT has lymph node concepts per their anatomical locations, e.g. pulmonary, bronchopulmonary, tracheobronchial, tracheal, and esophageal) and concepts for *node groups* used for clinical staging of lung cancer, i.e. lymph nodes categorized into 14 stations.

Professional societies concerned with the clinical staging of lung cancer have developed at least three different nomenclatures for *stations* of lung-related lymph nodes. Even though the numbering of the stations is very similar, the inter-relationships between the various node groups are complex, particularly in stations 4 and 10, near the carina and hilar regions.

SNOMED International considers *American Joint Committee on Cancer (AJCC) Station 10*, *hilar lymph node*, *bronchial lymph node*, and *bronchopulmonary lymph node* as synonyms. The American Thoracic Society (ATS) *Station 10R,* the *right tracheobronchial lymph node* is not a *subtype* of *tracheobronchial lymph node* because its definition includes nodes covered by both *lower paratracheal lymph node,* (AJCC Station 4) and by the hilar lymph node (AJCC Station 10). SNOMED CT uses *tracheobronchial lymph node* as a supertype of both inferior tracheobronchial (subcarinal) and superior tracheobronchial (a subset of lower paratracheal).

Musculoskeletal System

Skeletal system, bony skeleton

The *skeletal system* (*systema skeletal* in *Nomina Anatomica*) includes bones and cartilage. The *bony skeleton* includes bones only. The *vertebral column* is part of the skeletal system, and includes the intervertebral discs (fibrocartilage). Individual vertebrae are part of the bony skeleton.

> **Skeletal system subdivision**
>
> SNOMED CT considers the *skeletal system subdivision* part of the entire bone (system). This may change if there are procedures on cartilaginous skeleton that involve skeletal system subdivisions.

In ordinary usage, *bone* combines the meanings *bone organ* and *bone tissue*.

The 5 anatomical concepts related to *bone* are:

1. 3138006 |Bone (tissue) structure (body structure)|[361]. Tissue type that makes up bones; a quantity of regular connective tissue consisting of osteocytes and related cells, the intercellular matrix of which is ossified; or any part thereof.
2. 90780006 |Entire bone (organ) (body structure)|[362]. Individual bones, e.g. femur, tibia, ulna, scaphoid, lunate. An organ with cavitated parts; consists primarily of compact (cortical) and cancellous bone surrounding bone marrow cavities; also includes periosteum, endosteum (and, according to FMA, articular cartilage).
3. 118966000 |Skeletal system subdivision (body structure)|[363]. Groups of bones, e.g. spine, skull, bony pelvis.
4. 128530007 |Entire bony skeleton (body structure)|[364]. *Pars ossea systematis skeletalis*, *bone part* of the skeletal system.

361 http://snomed.info/id/3138006
362 http://snomed.info/id/90780006
363 http://snomed.info/id/118966000
364 http://snomed.info/id/128530007

5. 113192009 |Skeletal system structure (body structure)|[365]. Entire skeletal system, including bones and cartilage.

Bone (tissue) is part of entire bone (organ); entire bone (organ) is part of skeletal system subdivision (system); skeletal system subdivision (system) is part of entire bony skeleton (body structure); and entire bony skeleton (body structure) is part of skeletal system structure (body structure). We can use Entire bone (system) to define aggregate concepts that involve bones.

Modeling

FSNs for spinal levels should not contain abbreviations.

Correct example,

- Posterior cord syndrome at tenth thoracic spinal cord level, not Posterior cord syndrome of thoracic spinal cord at T10 level

Non-ossified bone

Bone organs are composed primarily of bone tissue, but there are some non-ossified parts. In particular, periosteum is clearly a part of a bone organ, but is not ossified tissue.

Bone marrow, marrow cavity

Bone marrow is contained within the marrow cavity, but it is not part of the bone organ. The (empty) marrow cavity is part of the bone organ. The bone marrow structure (body structure) is not a subtype of Bone structure (body structure).

Clinically, marrow disorders are not usually considered bone disorders, nor are marrow procedures considered bone procedures.

For example,

- Bone marrow disorders are not musculoskeletal disorders, but bone disorders are musculoskeletal disorders. Bone marrow transplants are not considered types of bone transplant.
- 60168000 |Osteomyelitis (disorder)|[366] is not the same as 44462005 |Osteitis (disorder)|[367].

Structure of (named bone), bone structure of (named bone)
To differentiate marrow, vessels, nerves, and periosteum from the actual hard tissue of bones, we differentiate structure of tibia from 12611008 |Bone structure of tibia (body structure)|[368]. The bone marrow and other soft tissues of the tibia can then be categorized separately from the hard tissues. Bone marrow diseases are not considered musculoskeletal diseases, so bone marrow structures should not be placed in the bone (tissue) structure hierarchy.

Long bone, short bone

ICD does not use the standard anatomical definition of *long bone*. For instance, Benign neoplasms of long bones are distinguished from benign neoplasms of short bones; the bones of the hand are considered short bones. The anatomical definition of long bone cites the proportional relationship between length and width (length >> width). It is clear that metacarpals, metatarsals, and phalanges are included in the anatomical definition of long bone.

365 http://snomed.info/id/113192009
366 http://snomed.info/id/60168000
367 http://snomed.info/id/44462005
368 http://snomed.info/id/12611008

Modeling: phalanx (finger)

The index finger is the *first finger* and *second digit*. Do not use *second finger*.

In order to accommodate the differences between anatomical definitions and classifications, SNOMED CT has anatomical groupings that correspond to the ICD groupings. *Scapula*, *humerus*, *radius*, or *ulna* and *long bone of thigh* or *lower leg* are used as the sites for grouper concepts that match ICD definitions and groupings.

Sternum, manubrium, body, xiphoid

The sternum is considered a bone organ. The manubrium, body, and xiphoid are parts of the sternum, classed as zones in the FMA.

Teeth, maxilla, mandible

Even though teeth are supported by the maxillary or mandibular bone, they are not *part of* the 70925003 |Bone structure of maxilla (body structure)|[369] or 91609006 |Bone structure of mandible (body structure)|[370]. Teeth are part of the 4335006 |Upper jaw region structure (body structure)|[371] and 48077000 |Lower jaw region structure (body structure)|[372].

Joints, joint regions

In many diseases and procedures, reference is made to areas of the body that may ambiguously imply either a *joint* or a *region surrounding the joint*. Some common ones are:

Joint vs. Joint Region	
70258002 |Ankle joint structure (body structure)|[373]	344001 |Ankle region structure (body structure)|[374]
74670003 |Wrist joint structure (body structure)|[375]	8205005 |Wrist region structure (body structure)|[376]
85537004 |Glenohumeral joint structure (body structure)|[377]	16982005 |Shoulder region structure (body structure)|[378]

Shoulder girdle

272691005 | Bone structure of shoulder girdle (body structure)|[379] This concept is used to define diseases and procedures affecting bones in the shoulder region, i.e. proximal humerus, scapula, and clavicle. It is not a bone, but a bone structure, and is part of the shoulder region.

369 http://snomed.info/id/70925003
370 http://snomed.info/id/91609006
371 http://snomed.info/id/4335006
372 http://snomed.info/id/48077000
373 http://snomed.info/id/70258002
374 http://snomed.info/id/344001
375 http://snomed.info/id/74670003
376 http://snomed.info/id/8205005
377 http://snomed.info/id/85537004
378 http://snomed.info/id/16982005
379 http://snomed.info/id/272691005

Intertarsal joint structure

27949001 |Intertarsal joint structure (body structure)|[380]; SYN: Tarsal joint: This structure is part of a group of bones forming the tarsus or tarsal joint (ankle). The 27162001 |Talocalcaneonavicular joint structure (body structure)|[381] is the articulation between the talus (one of the seven bones of the ankle joint) and the other bones of the tarsus, and is what is meant by the rarely-used term *talotarsal joint*. The talocalcaneal joint is a synonym for the 127863007 |Subtalar joint structure (body structure)|[382]. Dislocations of the subtalar joint usually involve the 127864001 |Structure of talonavicular joint (body structure)|[383]. The subtalar and talonavicular joints constitute the talocalcaneonavicular joint.

Arm, leg, upper, lower, extremity, limb

The meaning of the words *arm* and *leg* may be misinterpreted.

- *Arm* may refer to the upper limb, but it may also refer to the upper part of the arm.
- *Leg* may refer to the lower limb, but it may also refer to the lower part of the leg.
- In common usage, *leg* is a synonym of *lower extremity,* and *arm* is a synonym of *upper extremity*.

In SNOMED CT,

- 53120007 |Upper limb structure (body structure)| includes the shoulder, upper arm, forearm, wrist, and hand
- Upper arm is a synonym to 40983000 |Structure of upper extremity between shoulder and elbow (body structure)|.
- 61685007 |Lower limb structure (body structure)| includes the hip, thigh, lower leg, ankle and foot.
- Lower leg is a synonym to 30021000 |Structure of lower extremity from knee to ankle (body structure)|. Lower leg does not include the foot. *Stedman's Medical Terminology* defines lower leg as *the segment of the inferior limb between the knee and the ankle*.

The word *limb* appears in the FSN of the body structure, while the word *extremity* appears as a synonym. Therefore, when constructing an FSN for a new clinical finding concept, this precedent should be followed:

> FSN: 61685007 |Lower limb structure (body structure)|[384]
>
> PT: Lower limb structure
>
> Synonym: Lower extremity

Additional descriptions of *leg* and *arm* are permitted for concepts whose FSNs refer to *lower limb* and *upper limb* respectively.

> **External sources**
>
> External sources, such as WHO Classifications, may have conventions for interpreting the meaning of phrases that contain the words *arm* and *leg.* These sources may be referenced to help determine the meanings of *International Classification of Diseases (ICD)* terms when mapping or completing other actions. ICD terms may differ from common usage and will not necessarily match SNOMED CT concepts.

Shoulder and hip regions, upper and lower limbs

The shoulder region is part of the upper limb, and the hip region is part of the lower limb. This follows the general pattern used in the *Foundation Model of Anatomy (FMA)*.

380 http://snomed.info/id/27949001
381 http://snomed.info/id/27162001
382 http://snomed.info/id/127863007
383 http://snomed.info/id/127864001
384 http://snomed.info/id/61685007

The *FMA* defines:

- upper limb as the free upper limb and the pectoral girdle (of which the shoulder region is part). SNOMED CT has the concept 896766000 |Structure of free upper limb (body structure)|.
- lower limb as the free lower limb and pelvic girdle (of which the hip region is part). SNOMED CT has the concept 699617006 |Structure of free lower limb (body structure)|[385], i.e. the lower limb not including the pelvic girdle.

Axilla

The axilla is bound by the upper limb laterally and the thorax medially. It may be viewed as not strictly part of the upper limb or the thorax or it may be views as part of both. 91470000 |Axillary region structure (body structure)|[386] is defined in SNOMED CT as being both an upper limb structure and a thoracic structure.

Tendon

A muscle may be considered an entire functional unit, including attachments to the skeletal system, or merely the contractile part of this unit. In clinical use, muscle is the contractile part only. The FMA definition implies that tendons should be considered part of their corresponding muscles, rather than organs in their own right. SNOMED CT models |Tendon structure| as a subtype of |Skeletal muscle and/or tendon structure (body structure)|. Muscle and tendon are two separate anatomical entities.

For example,

61352006 |Structure of achilles tendon (body structure)|[387] is not a 53451005 |Triceps surae muscle structure (body structure)|[388] (gastrocnemius and/or soleus) muscle structure.

Muscle function

When modeling muscle categories according to their functions, assume they mean the function of the *entire muscle*, unless stated otherwise.

Unacceptable terms

X disorder at Y level concepts from ICD-11, e.g. *skin laceration of arm at wrist level* (precedent are terms added from ICD-9) will not be added to the SNOMED International Release.

Anatomy relating to the spine

The terms 'spine' and 'vertebral column' in descriptions of conditions or procedures are often used loosely in clinical discourse but can relate to three different general anatomical concepts:

421060004 |Structure of **vertebral column** (body structure)| (synonym: Spinal column, 'Backbone', Spine)

- includes the bones of the spine and associated joints and ligaments

289959001 |***Musculoskeletal structure of spine*** (body structure)|

- includes the vertebral column plus muscles and tendons associated with the spine

385 http://snomed.info/id/699617006
386 http://snomed.info/id/91470000
387 http://snomed.info/id/61352006
388 http://snomed.info/id/53451005

1141981001 |Structure of **vertebral column region** (body structure)|

- includes the musculoskeletal structure of spine plus spinal canal, meninges, spinal cord, roots and ganglia and immediate soft tissue including adjacent vascular structures where specified.

The last concept has been allocated the following definition: This volume includes the spinal column, its spaces and contents, notably the spinal canal, spinal meninges and spinal cord. It also includes the muscles associated with the spine within (and including) the anterior and posterior thoracolumbar fascia and its equivalent nuchal fascia in the neck. This region also includes the spinal ventral (anterior) and dorsal (posterior) roots, the dorsal root (spinal) ganglions and the spinal nerve trunks.

To emphasize the different volumes, cross-sections are shown below of (Figure 1) the vertebral column in yellow, and (Figure 2) the larger vertebral column region in amber color.

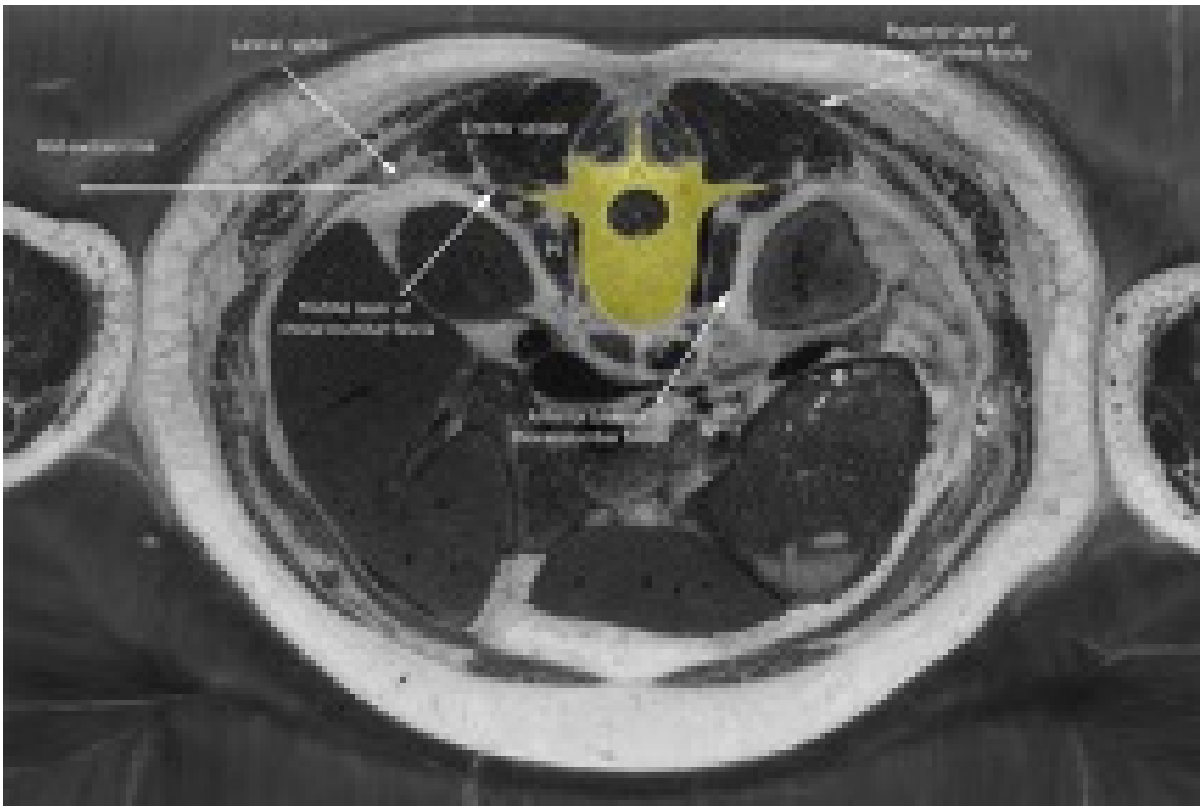


Figure 1, Vertebral column

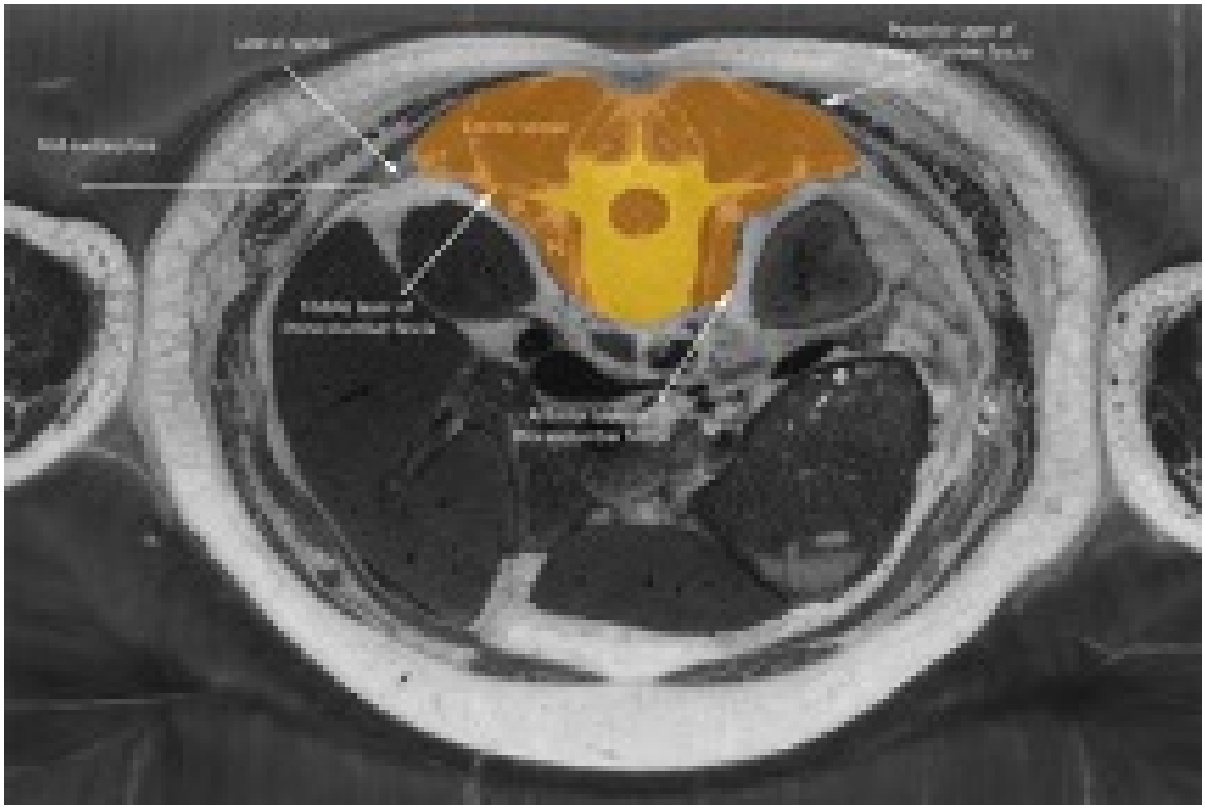


Figure 2, Vertebral column region

From the preceding descriptions, it is clear that *Vertebral column region* is a broader concept for 'spine', and it should be used when a procedure or condition could involve not only the bony component of the vertebral column, but also the spinal cord, nerve root, muscle, bone, or joint of spine.

For example,

- MRI of thoracic spine (procedure) is modeled with 1141986006 |Structure of thoracic vertebral column region (body structure)|.
- Pain in sacrum (finding) is interpreted as being related to the more general notion of 1144746008 |Structure of sacral vertebral column region (body structure)|.

When a procedure or disorder is exclusively related to musculoskeletal structures of the spine, the 'musculoskeletal structure of spine' should be used.

For example,

- Cervical traction (procedure), Manipulation of the cervical spine (procedure), and Rotational deformity of cervical spine (finding) are all modeled with 297166009 |Structure of musculoskeletal system of cervical spine (body structure)|.

Where a procedure or condition only effects the bone, joint, or ligament component (and not the muscles or tendons directly) the ‘vertebral column variant’ is used for modeling.

For example,

- Benign neoplasm of lumbar vertebral column (disorder) and Kyphoplasty of fracture of lumbar spine using fluoroscopic guidance (procedure) are both modeled with 122496007 |Structure of lumbar vertebral column (body structure)|.

Sacrum

The sacrum is considered equivalent to the sacral vertebral column, as it is composed of the bone structure of the sacrum plus the joint structure of sacrococcygeal junction of spine.

Junctional and combined segments of spine
The spine is traditionally divided into the following regions:

- Cervical
- Thoracic
- Lumbar
- Sacral
- Coccyx

The anatomy of these individual segments are structured in accordance with the description above.

The regions and joints between these identified segments are referred to as *cervicothoracic, thoracolumbar, lumbosacral* and *sacrococcygeal*. The meaning of these words are subject in common parlance and some literature to be ambiguous.

For example,

- 'Thoracolumbar' sometimes refers to the thoracic spine *and* lumbar spine, or alternatively, it is used to express the junction *between* the thoracic spine and lumbar spine.

To avoid false assumptions, the junction of spinal segments in SNOMED CT have been made explicit by including the word *junction* in descriptions. This avoids potential misinterpretation as to whether a word such as 'thoracolumbar' relates to both spinal segments or just the adjacent volume.

For example,

- The notion of 1145014005 |Structure of thoracolumbar junction of vertebral column (body structure)| is only used for modeling when it is explicitly stated in the target concept e.g. 281907005 |Fracture dislocation of thoracolumbar junction (disorder)|.

By contrast, in the circumstance where a dependent concept relates to the combination of two segments, e.g. 702487007 |CT of thoracolumbar spine (procedure), (FSN Computed tomography of thoracic and lumbar spine), the concept is modeled with two axioms, namely Structure of lumbar vertebral column region and Structure of thoracic vertebral column region.

The volume or extent of the junctional zones themselves are not defined consistently in the literature but most commonly relate to the junction between two segments and one vertebra above and below. So the convention used in the SNOMED CT anatomy hierarchy follows this guidance.

For example,

1145014005 |Structure of thoracolumbar junction of vertebral column (body structure)| includes the following concepts in its class:

- 66794005 |Bone structure of L1 (body structure)|
- 23215003 |Bone structure of T12 (body structure)|
- 714833001 |Structure of intervertebral syndesmosis of T12 and L1 (body structure)|
- 181879009 |T12/L1 facet joint (body structure)|

In addition, a further convention is required as to where segmental junctional joints belong, i.e. either to the cephalic or caudal segment. For instance, does the T12/L1 facet joint relate to the Thoracic spine joint structure or/ and Lumbar spine joint structure?

> The convention used (based on common criteria of spinal injuries) is that the junctional joints are included with the cephalic segment. So, in the case of the T12/L1 facet joint, it is included in the class of Thoracic spine joint structure (body structure).
>
> Similarly, 8454000 |Lumbar spine joint structure (body structure)| subsumes:

- Intervertebral L5-S1 disc
- Structure of lumbosacral joint
- Structure of facet joint between L5 and S1

Nervous System

The nervous system has two parts, central and peripheral.

- The central nervous system, sometimes also called the *neuraxis*, consists of the brain and spinal cord. The pyramidal system is a subdivision of the central nervous system; the extrapyramidal system is part of the brain.
- The peripheral nervous system includes all neural structures outside the central nervous system.

The nervous system is also divided as: autonomic, somatic, and enteric.

- The autonomic system is further divided as sympathetic and parasympathetic. The autonomic system is not entirely a part of the peripheral nervous system, but the autonomic nerves are peripheral.

Nerve

The word *nerve* has multiple meanings according to the FMA:

- nerve trunk
- neural organ (trunk plus branches, excluding nuclei, ganglia, and roots)
- neural tree organ, including nuclei, ganglia, roots, etc.

A *neural tree organ* is defined in FMA as *a nonparenchymatous organ which has as its parts an aggregate of neurons (nuclei or ganglia) and their axons which are grouped into fasciculi by connective tissue to form elongated, cable-like structures that are arranged into a tree*. A *nerve*, according to FMA, is defined as *a segment of a neural tree organ which has as its parts a nerve trunk and its branches; together with other nerves of the same tree, it constitutes a neural tree.* The neural tree structure includes:

- Cranial nerve
    - Complex cranial nerve-tract
- Spinal nerve
- Spinal accessory nerve (strictly neither cranial or spinal nerves)
- Peripheral nerve
- Autonomic nerve

Nerve, conventionally has two meanings:

- An anatomically distinct nerve trunk (without branches) that is identified in a dissection (e.g. the structure that student identifies when a pin is placed in the trunk of the vagus nerve, for instance located on the arch of the aorta)
- A larger anatomical entity which supports a related set of functions (e.g. all anatomical components of the vagus nerve that are necessary for it to execute its functions (e.g. when a student is asked which nerve is responsible for slowing the heart the answer, *the vagus nerve*, includes the vagal nucleus, as well as the trunk and branches of the vagus).

- Neural tree designates the second concept in order to distingiush it from the first which is only a part (subdivision of) the vagal neural tree.

A third meaning of nerve, defined by the FMA is: *Segment of neural tree organ which has as its parts a nerve trunk and its branches; together with other nerves of the same tree it constitutes a neural tree*.

For example,

- Chorda tympani, digastric branch of facial nerve, greater petrosal nerve, posterior cutaneous branch of posterior ramus of cervical nerve, superior lateral cutaneous nerve of arm.
- If one severs the facial nerve, the meaning refers to the trunk. But if one has facial nerve palsy, the meaning refers to the entire distribution of the nerve and the functions served by it.

Inactivation

There were several concepts with the phrase *x nerve and its branches,* interpreted as meaning *the entire nerve and its branches.* Therefore, *x nerve and its branches* would be a duplicate of *entire x nerve*, when we interpret *entire x nerve* as being a neural tree organ.

For example,

- *Entire facial nerve* is a neural tree organ, so there is no need for an additional concept called *facial nerve and its branches*.
- *Entire cranial nerve* is a neural tree organ and *structure of cranial nerve* is that organ or any part (or branch) thereof. Branches of the cranial and spinal nerves are segments of the neural tree organs from which they branch.

All concepts named *nerve x and its branches* were inactivated due to their ambiguity. There are *MAY BE A* links to *structure of nerve x*, and *entire nerve x*. Specifying *trunk of a nerve* requires a specific concept.

Supratentorial brain

Cerebrum may refer to the *supratentorial brain,* which is everything except the midbrain, medulla, pons, and cerebellum. In this interpretation, the telencephalon and diencephalon are in the cerebrum. On the other hand, cerebrum may only refer to the parts derived embryologically from the telencephalon, the cerebral hemispheres and the intercerebral commissure (corpus callosum and anterior commissure).

Supratentorial brain may be used for categorizing tumors and for designating the location of swelling that can result in herniation. The telencephalon and diencephalon (including thalamus, geniculate bodies, pineal body, habenulae, and hypothalamus) are definitely supratentorial. The upper part of the midbrain (mesencephalon) is also supratentorial. SNOMED CT excludes all midbrain structures from the supratentorial brain.

Respiratory System

Respiratory tract

321667001 |Respiratory tract structure (body structure)|[389]. In SNOMED CT, *respiratory tract* has the same meaning as the *Nomina Anatomica* term *apparatus respiratorius*, which includes the structures through which air passes from the nares to the alveoli. The *oral cavity* is not included. In common usage, *respiratory system* may have the same meaning as *respiratory tract*; but not in SNOMED CT. *Respiratory system* does not mean *the global respiratory system* that might include the CNS components of breathing. *Pleura* are part of the lower respiratory system, but not a part of the lower respiratory tract.

389 http://snomed.info/id/321667001

Upper aerodigestive tract

This phrase has several meanings. The SNOMED CT concepts 119253004 |Upper aerodigestive tract structure (body structure)|[390] and 361922007 |Entire upper aerodigestive tract (body structure)|[391] have the meaning based on the following reference: *Cancers of the upper aerodigestive tract constitute approximately 4% of all malignancies. These include cancer of the lip, tongue, major salivary glands, gums and adjacent oral cavity tissues, floor of the mouth, tonsils, oropharynx, nasopharynx, hypopharynx and other oral regions, nasal cavity, accessory sinuses, middle ear, and larynx* (Upper aerodigestive tract cancers, Cancer 1995 Jan 1;75 (1 Suppl): 147-53). This definition matches the tumors included in the *CAP Cancer Checklist* for upper aerodigestive tumors. The esophagus, or at least the cervical esophagus, may be included, but not in SNOMED CT.

Upper respiratory tract

58675001 |Upper respiratory tract structure (body structure)|[392] includes the nasal cavity, paranasal sinuses, nasopharynx, oropharynx, and larynx

Lower respiratory tract

82094008 |Lower respiratory tract structure (body structure)|[393] includes the tracheobronchial tree (from the trachea through the terminal bronchioles) and the lungs, including the alveolar respiratory tract (which extends from the respiratory bronchioles to the alveoli).

Lower respiratory system

400141005 |Lower respiratory system structure (body structure)|[394] includes the lower respiratory tract and the pleura.

Interarytenoid fold or larynx

The interarytenoid fold forms part of the inlet of the larynx. The fold has two surfaces, one forming part of the wall of the supraglottic larynx, the other forming part of the wall of the hypopharynx (the *food tube* behind the larynx, leading to the esophagus). The 102295003 |Structure of hypopharyngeal aspect of interarytenoid fold (body structure)|[395] may be considered part of the hypopharynx, the larynx, or both. A tumor of this site is categorized as a tumor of the hypopharynx, and not the larynx, but the 105585004 |Interarytenoid fold structure (body structure)|[396] is considered part of the larynx.

SNOMED CT does not give a *Part of* relationship between the hypopharyngeal aspect of the interarytenoid fold and the interarytenoid fold. This emphasizes SNOMED CT modeling based on the relationship of anatomical entities and disorders and procedures and not simply by reading term names.

Nasal turbinates

SNOMED CT differentiates between the bone underlying the nasal turbinates and the actual turbinates:

Bones underlying the turbinates,

390 http://snomed.info/id/119253004
391 http://snomed.info/id/361922007
392 http://snomed.info/id/58675001
393 http://snomed.info/id/82094008
394 http://snomed.info/id/400141005
395 http://snomed.info/id/102295003
396 http://snomed.info/id/105585004

- 118648008 |Inferior nasal turbinate bone structure (body structure)|[397]
- 122491002 |Middle nasal turbinate bone structure (body structure)|[398]
- 122492009 |Superior nasal turbinate bone structure (body structure)|[399]
- 122493004 |Supreme nasal turbinate bone structure (body structure)|[400]

Turbinates, which include bone, overlying mucous membranes, and other tissue,

- 6553002 |Inferior nasal turbinate structure (body structure)|[401]
- 122491002 |Middle nasal turbinate bone structure (body structure)|[402]
- 65289004 |Superior nasal turbinate structure (body structure)|[403]
- 33415007 |Supreme nasal turbinate structure (body structure)|[404]

The 118648008 |Inferior nasal turbinate bone structure (body structure)|[405] is a facial bone and skull bone. And, parts of the ethmoid bone form the middle, superior, and supreme nasal conchae. This means that the bones of the middle, superior, and supreme turbinates are not bone organs.

3.8.2.5 Morphologic Abnormality Modeling

The morphologic abnormality subhierarchy is located two levels below the Body structure hierarchy with siblings *Apoptosis* and *Structure resulting from tissue repair process*:

- SNOMED CT concept
  - Body structure (body structure)
    - Body structure, altered from its original anatomical structure (morphologic abnormality)
      - Apoptosis (morphologic abnormality)
      - Morphologically abnormal structure (morphologic abnormality)
      - Structure resulting from tissue repair process (morphologic abnormality)

The concepts in the morphologic abnormality hierarchy represent abnormal body structures.

Leave Primitive

The subhierarchy of 118956008 |Body structure, altered from its original anatomical structure (morphologic abnormality)| is to remain primitive. Authors are not to define morphologic abnormality concepts.

Content in this space

397 http://snomed.info/id/118648008
398 http://snomed.info/id/122491002
399 http://snomed.info/id/122492009
400 http://snomed.info/id/122493004
401 http://snomed.info/id/6553002
402 http://snomed.info/id/122491002
403 http://snomed.info/id/65289004
404 http://snomed.info/id/33415007
405 http://snomed.info/id/118648008

- Morphologic Abnormalities vs. Findings(see page 160)
- Multiple x morphologic abnormality(see page 160)
- Tumor morphology(see page 161)

Abscess

There are two types of abscesses:

1. septic
2. sterile

Most abscesses are septic, which means that they are the result of an infection.

If a concept's meaning, based on its FSN and text definition, does not specify whether the abscess is sterile or septic, then the concept should not be modeled as septic.

Modeling Abscess in Procedures

The concept's logical definition uses the Indirect morphology (attribute) of 44132006 |Abscess (morphologic abnormality)| and a Direct substance (attribute) of 11311000 |Pus (substance)|.

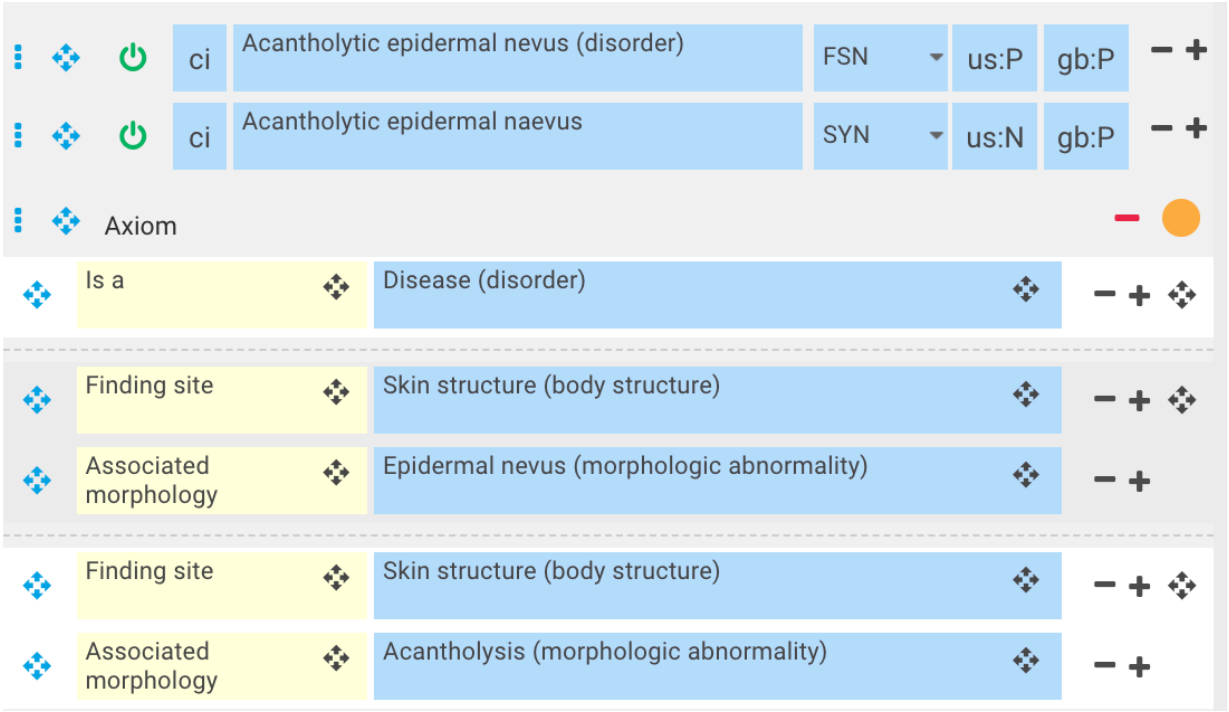
Combining morphologies

When modeling a concept requiring two role groups with the same finding site/body structure but two different morphologies (because a combined morphology does not exist), then those two morphologic abnormalities can be combined to create a new single, combined |(morphologic abnormality)| concept. Keep the newly created morphologic abnormality concept primitive as all morphologic abnormality concepts should be primitive. Limit the combination to two morphological concepts into a single concept; combining more than two morphological concepts into a single combined concept is not permitted.

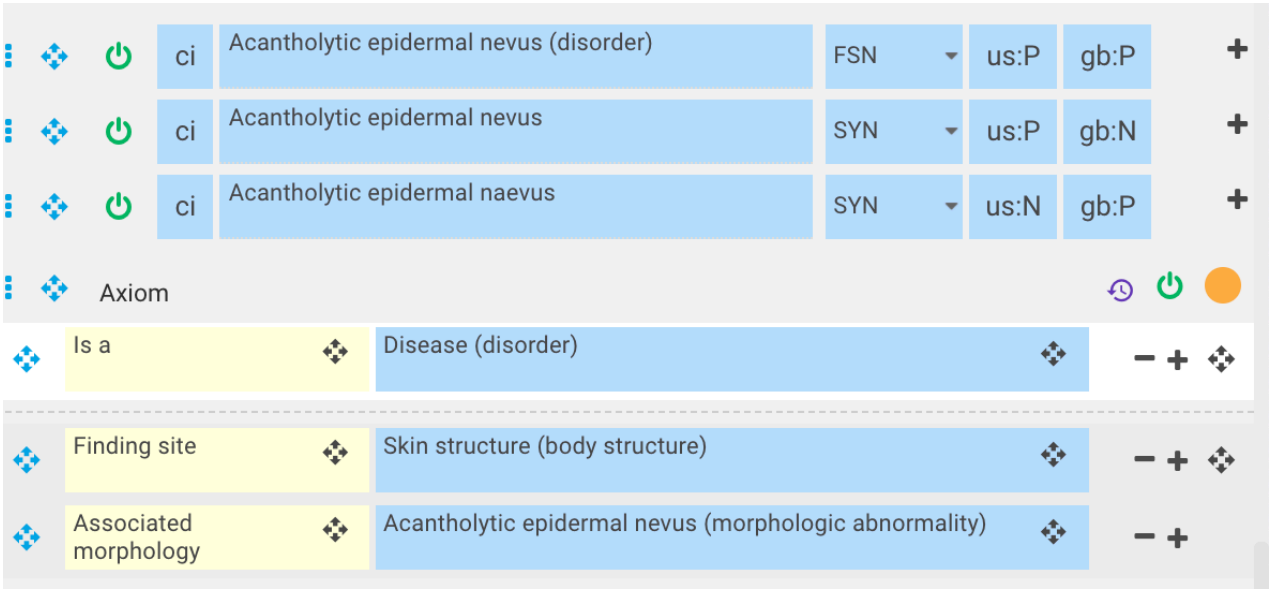
Example,
If 400067002 |Acantholytic epidermal nevus (disorder)|[406] had the same Finding site of |Skin structure (body structure)| with two different morphologic abnormalities of |Epidermal nevus (morphologic abnormality)| and |Acantholysis (morphologic abnormality)|, then those two morphologic abnormality concepts can be combined to create a single, primitive, morphologic abnormality concept of |Acantholytic epidermal nevus (morphologic abnormality)|. This will prevent modeling with two relationship groups.

Instead of modeling as per this diagram in the stated view with two morphologies of the same finding site:

406 http://snomed.info/id/400067002



Model as in the stated view of this diagram with a combined morphology:



Morphologies can be combined to create a single morphologic abnormality concept where doing so creates a specialization of the morphology e.g. 55075001 |Bleeding ulcer (morphologic abnormality)|. Where morphologies are different e.g. abscess and cellulitis, they can not be combined.

> This guidance is not being applied retrospectively so the concept 707496003 |Inflammation and consolidation (morphologic abnormality)| will be an exception to this rule as it already exists as a current concept.

Combining morphologies to create a specialization is done when modeling a concept that requires two role groups with the same body structure and two morphology values. Creating a combined morphology concept enables one role group to be used.

> Older 'like' content may still use the two role groups. This content would also need to use the new combined morphology value to support correct subsumption.

Neoplasm exception

Subtypes of 108369006 |Neoplasm (morphologic abnormality)| are not to be combined. These morphologies represent histological cell types that are recognized internationally by pathologists, classified by WHO, and aligned with the ICD-O classification.

Congenital anomaly

Disorders which involve congenital anomalies are defined with:

- Occurrence (attribute) = Congenital (qualifier value)
- Associated morphology (attribute) = Morphologically abnormal structure (morphologic abnormality)
- Pathological process (attribute) = Pathological development process (qualifier value)

Therefore, *congenital* does not need to be represented as the Associated morphology (attribute) target value. Congenital anomaly morphology concepts usually have non-congenital parents.

Creating new morphologies

When considering the creation of a new morphological abnormality concept, consider the following:

- When the name of a potentially new morphology is the same as the disease, creation of that new morphologic abnormality concept may not be beneficial since it would not be very morphologically descriptive.
- Determine if there is benefit in creating a new morphology for a very small number of rarely used leaf nodes. If the new morphology is needed to differentiate two non-leaf concepts, that would be sufficient to create the new morphology. Otherwise, use the nearest existing morphologic abnormality.
- Including a body site in a morphological abnormality concept is forbidden unless there is a clear modeling and pathological need.

Degeneration and Degenerative abnormality

A distinction should be made between 107669003 |Degenerative abnormality (morphologic abnormality)|[407] and 33359002 |Degeneration (morphologic abnormality)|[408].

- 33359002 |Degeneration (morphologic abnormality)|[409] is a child of 107669003 |Degenerative abnormality (morphologic abnormality)|[410].
- 107669003 |Degenerative abnormality (morphologic abnormality)|[411] is a grouper concept with members usually characterized by retrogressive pathologic structural changes. Diseases that are degenerative do not necessarily have 116676008 |Associated morphology (attribute)|[412] of 33359002 |Degeneration (morphologic abnormality)|[413], since the word *degenerative* sometimes refers to loss of function rather than structural degeneration.

Examples include degeneration proper, as well as lysis, vascular sclerosis, necrosis, infarct, deposition, dystrophy, pigmentation, atrophy, and depletion.

- Morphologies under degeneration also have retrogressive structural changes, but they are not necessarily any of the above, nor are they necessarily resorption, malacia, obliteration, opacity, plaque, or postmortem change (this seems to be definition by exclusion).
- Necrosis is a degenerative abnormality, but not a degeneration. Necrosis can follow degeneration.
- Atrophy is a degenerative abnormality, but only *atrophic degeneration* is also a degeneration.

Modeling

33359002 |Degeneration (morphologic abnormality)|[414] and 107669003 |Degenerative abnormality (morphologic abnormality)|[415] should rarely, if ever, be used as the value of Associated morphology of a particular disorder; rather, a more specific subtype should be used.

Exception

It might be used as the value of Associated morphology for a broad category of degenerative disorders when the degeneration is always and necessarily structural. It is then inherited by all the subtypes, unless specialized by assigning a subtype of degeneration as the value for Associated morphology.

Fracture

Fractures should be agnostic as to whether they are pathologic or not, unless specified in the FSN or could only be caused by trauma (e.g. open fractures). Although most fractures are traumatic, there are some pathological

407 http://snomed.info/id/107669003
408 http://snomed.info/id/33359002
409 http://snomed.info/id/33359002
410 http://snomed.info/id/107669003
411 http://snomed.info/id/107669003
412 http://snomed.info/id/116676008
413 http://snomed.info/id/33359002
414 http://snomed.info/id/33359002
415 http://snomed.info/id/107669003

fractures. Based on its FSN and text definition, if the word *pathological* is present, use Pathologic fracture (morphologic abnormality).

Example: Modeling Traumatic vs. Pathological Fractures		
Concept	Finding Site	Associated Morphology
21351003 |Fracture of phalanx of foot (disorder)|[416]	Bone structure of phalanx of foot	Fracture (morphologic abnormality)
704168008 |Pathological fracture of phalanx of foot (disorder)|[417]	Bone structure of phalanx of foot	Pathologic fracture (morphologic abnormality)

Morphologic Abnormalities vs. Findings

Concepts from the Morphologic Abnormality hierarchy should not be used in place of concepts from the Clinical Findings hierarchy, even though they appear to refer to similar *clinical situations*.

For example,

- 4147007 \| Mass (morphologic abnormality)\|[418] is not a finding, but 300848003 \| Mass of body structure (finding)\|[419] is a finding

Morphologies are used as the values of the defining attributes of findings and procedures. Findings are used to represent the combination of a morphology and a location.

For example,

- 300923002 \| Cyst of scalp (disorder)\|[420] represents cystic type of morphology that has the location, scalp

Many morphologies have names that could be misinterpreted as implying a process rather than a structure.

- Inflammation might mean the *structural-morphologic* features of inflammation, such as inflammatory cell infiltrates; or it might mean the *process* that causes the structural changes. Within the morphologic abnormality hierarchy, the *structural* interpretation is intended, not the *process* interpretation.

Multiple x morphologic abnormality

Multiple x morphologies, such as 125291005 |Multiple cysts (morphologic abnormality)|, are currently subtypes of the "X" morphology. The "X" morphology concept represents a class rather than a singular instance, and this arrangement follows the open world assumption of the description logic in SNOMED CT.

For example,

> *Cyst of upper eyelid* does not mean a single cyst on a single upper eyelid. It represents a class of cyst condition that at least appeared in an upper eyelid. This class would also include a cyst condition involving both upper and lower eyelids.

416 http://snomed.info/id/21351003
417 http://snomed.info/id/704168008
418 http://snomed.info/id/4147007
419 http://snomed.info/id/300848003
420 http://snomed.info/id/300923002

A similar example is how |Retinitis of bilateral eyes (disorder)| is a subconcept of |Retinitis of left eye (disorder)| and |Retinitis of right eye (disorder)|.

Having the *Multiple X* morphologic abnormality concept as a subtype of the "X" morphology concept allows the disorder concepts defined by these "multiple X" morphologies to be sufficiently defined. One drawback of the current format is that classification results are not complete.

For example,

Multiple cysts of eyelid would not subsume *cysts of upper and lower eyelids* in the current concept model.

⚠ In the future, these disorder concepts may be updated with a more robust representation utilizing cardinality as part of the logical definition. However, this functionality is not available in the reasoner profile of SNOMED CT at this time.

Tumor morphology

SNOMED CT accepts tumor concepts, as long as they are included in the International Classification of Diseases for Oncology (ICD-O). ICD-O has two coding systems for coding the site (topography) and the histology (morphology) of the neoplasm:

- Topographical - Anatomical site of origin or the organ system
- Morphological - Tumor cell type or histology and behavior, i.e. malignant versus benign

The *topography* code describes the site of origin of the neoplasms. The *morphology* code describes the cell type of the tumor and its biologic activity, in other words, the characteristics of the tumor itself. The morphology code, combined with the appropriate topography, expresses the complete morphological assessment as stated by the pathologist.

Although the behavior of a neoplastic morphological type is implicit knowledge in the pathology community, the behavior (benign, in situ, uncertain behavior, or malignant) must be included in the description in SNOMED CT to aid users, terminology authors, and mappers; and because over time, the behavior of a certain neoplastic cell type may change depending upon the latest scientific understanding, so clarity is important.

SCT intends to avoid adding concepts that conflate the localization of a specific tumor type in a topographic location as opposed to a neoplastic cell type that is derived from a specialized cell in an organ, e.g. adenocarcinoma vs. renal clear cell carcinoma. One is general; the other is specific to a cell type.

The naming pattern utilized for gene-derived neoplastic morphology terms will align with the WHO Classification of Tumours (IARC 'Blue Books'). Gene acronyms are not required to be expanded. This policy is an exception to SNOMED CT's requirement for expansion of acronyms.

For example,

1186933006 |SMARCA4-deficient undifferentiated tumor (morphologic abnormality)|

The gene SMARCA4 is not required to be named with the expanded form of *SWI/SNF Related, Matrix Associated, Actin Dependent Regulator Of Chromatin, Subfamily A, Member 4*.

⚠ **For more information**

Visit ICD-O at http://www.iacr.com.fr[421]

421 http://www.iacr.com.fr/index.php?option=com_content&view=category&layout=blog&id=100&Itemid=577

3.8.3 Clinical Finding and Disorder

Definition	Examples
• Clinical finding: normal/abnormal observations, judgments, or assessments of patients • Disorder: always and necessarily an abnormal clinical state	Clinical finding • 167222005 | Abnormal urinalysis (finding)|[422] Disorder • 39579001 | Anaphylaxis (disorder)|[423]

Clinical findings or observations are the active acquisition of subjective or objective information from a primary source. This includes information acquired from human observers, through recording of data via the use of scientific instruments, or indirectly from samples taken from the source, and evaluated separately.

Observations

The term *observations* should not be confused with *Observable entity.* Observable entity is the name of something that can be observed and represents a question or assessment (e.g. |systolic blood pressure|, |color of iris|, |gender|) which can produce an answer or result.

Context

The default context for a *Clinical finding* concept is:

- Present (vs. being absent)
- Subject of the record (the patient)
- Current, if not specifically stated or specified to a time in the past by an entity linked to the concept

The *Clinical finding* hierarchy contains the subhierarchy of *Disorder*. Concepts that are descendants of *Disease (disorder)* are always and necessarily abnormal clinical states. The Disease subtype allows diseases to be subtypes of other disorders, as well as subtypes of findings.

Concepts with a semantic tag of *disorder*, must have a parent of Disease (disorder) or subtype of Disease (disorder).

For example,

- 95617006 | Neonatal cyanosis (disorder)|[424] has the parent, Disease (disorder); it is also a subtype of 3415004 | Cyanosis (finding)|[425].

The distinction between a disorder and a finding may be difficult to define. There are, however, distinct characteristics of each.

Disorder vs Finding	
	Characteristics

422 http://snomed.info/id/167222005
423 http://snomed.info/id/39579001
424 http://snomed.info/id/95617006
425 http://snomed.info/id/3415004

Disorder vs Finding	
Disorder	• Always and necessarily abnormal • Necessarily have an underlying pathological process • Have temporal persistence (may be under treatment, in remission, or inactive, even though they are still present) • May be present as a propensity for certain abnormal states to occur, even when treatment mitigates or resolves those abnormal states
Finding	• May be normal (but not necessarily) • May exist only at a single point in time (e.g. a serum sodium level) • Cannot be temporally separate from the observation (one cannot observe them and say they are absent, nor can they be present when they cannot be observed) • Cannot be defined only in terms of an underlying pathological process that is present, when the observation itself is not present

In some cases the disease process is irrefutable, e.g. meningococcal meningitis. In others an underlying disease process is assumed based on the temporal and causal association of the disorder and its manifestation, e.g. nystagmus (disorder) is different from nystagmus present (finding). Nystagmus present (finding) may be a normal physiological response to head rotation. A person who spins around and has nystagmus present (finding), does not have nystagmus (disorder). Alternatively, a person may have nystagmus (disorder), but not nystagmus present (finding), i.e. they do not currently manifest nystagmus. Similarly, hearing loss (disorder) is different from perception of hearing loss (finding), which can be due to a number of temporary causes, such as excessive ear wax.

- Clinical Finding Attributes Summary(see page 163)
- Clinical Finding Defining Attributes(see page 167)
- Clinical Finding and Disorder Naming Conventions(see page 177)
- Clinical finding and Disorder Modeling(see page 186)

3.8.3.1 Clinical Finding Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 404684003 | Clinical finding (finding)|[426]	
Domain Constraint[427]	<< 404684003 |Clinical finding (finding)|[428]
Parent Domain	-
Proximal Primitive Constraint	<< 404684003 |Clinical finding (finding)|[429]

426 http://snomed.info/id/404684003
427 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
428 http://snomed.info/id/404684003
429 http://snomed.info/id/404684003

Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 404684003 | Clinical finding (finding)|[430]

Attribute[431]	Grouped[432]	Cardinality[433]	In Group Cardinality[434]	Range Constraint[435]
255234002 |After (attribute)|[436]	1	0..*	0..1	<< 272379006 |Event (event)|[437] OR << 404684003 |Clinical finding (finding)|[438] OR << 71388002 |Procedure (procedure)|[439]
116676008 |Associated morphology (attribute)|[440]	1	0..*	0..1	<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[441]
47429007 |Associated with (attribute)|[442]	1	0..*	0..*	<< 105590001 |Substance (substance)|[443] OR << 260787004 |Physical object (physical object)|[444] OR << 272379006 |Event (event)|[445] OR << 404684003 |Clinical finding (finding)|[446] OR << 410607006 |Organism (organism)|[447] OR << 71388002 |Procedure (procedure)|[448] OR << 78621006 |Physical force (physical force)|[449]

430 http://snomed.info/id/404684003
431 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
432 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
433 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
434 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
435 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
436 http://snomed.info/id/255234002
437 http://snomed.info/id/272379006
438 http://snomed.info/id/404684003
439 http://snomed.info/id/71388002
440 http://snomed.info/id/116676008
441 http://snomed.info/id/49755003
442 http://snomed.info/id/47429007
443 http://snomed.info/id/105590001
444 http://snomed.info/id/260787004
445 http://snomed.info/id/272379006
446 http://snomed.info/id/404684003
447 http://snomed.info/id/410607006
448 http://snomed.info/id/71388002
449 http://snomed.info/id/78621006

288556008 |Before (attribute)|[450]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[451]
246075003 |Causative agent (attribute)|[452]	1	0..*	0..1	<< 105590001 |Substance (substance)|[453] OR << 260787004 |Physical object (physical object)|[454] OR << 373873005 |Pharmaceutical / biologic product (product)|[455] OR << 410607006 |Organism (organism)|[456] OR << 78621006 |Physical force (physical force)|[457]
263502005 |Clinical course (attribute)|[458]	1	0..*	0..1	<< 288524001 |Courses (qualifier value)|[459]
42752001 |Due to (attribute)|[460]	1	0..*	0..1	<< 272379006 |Event (event)|[461] OR << 404684003 |Clinical finding (finding)|[462] OR << 71388002 |Procedure (procedure)|[463]
371881003 |During (attribute)|[464]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[465]
246456000 |Episodicity (attribute)|[466]	1	0..*	0..1	<< 288526004 |Episodicities (qualifier value)|[467]
419066007 |Finding informer (attribute)|[468]	1	0..*	0..1	<< 419358007 |Subject of record or other provider of history (person)|[469] OR << 420158005 |Performer of method (person)|[470] OR << 444018008 |Person with characteristic related to subject of record (person)|[471]

450 http://snomed.info/id/288556008
451 http://snomed.info/id/71388002
452 http://snomed.info/id/246075003
453 http://snomed.info/id/105590001
454 http://snomed.info/id/260787004
455 http://snomed.info/id/373873005
456 http://snomed.info/id/410607006
457 http://snomed.info/id/78621006
458 http://snomed.info/id/263502005
459 http://snomed.info/id/288524001
460 http://snomed.info/id/42752001
461 http://snomed.info/id/272379006
462 http://snomed.info/id/404684003
463 http://snomed.info/id/71388002
464 http://snomed.info/id/371881003
465 http://snomed.info/id/71388002
466 http://snomed.info/id/246456000
467 http://snomed.info/id/288526004
468 http://snomed.info/id/419066007
469 http://snomed.info/id/419358007
470 http://snomed.info/id/420158005
471 http://snomed.info/id/444018008

418775008 |Finding method (attribute)|[472]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[473]
363698007 |Finding site (attribute)|[474]	1	0..*	0..1	<< 442083009 |Anatomical or acquired body structure (body structure)|[475]
363713009 |Has interpretation (attribute)|[476]	1	0..*	0..1	<< 260245000 |Finding value (qualifier value)|[477] OR << 263714004 |Colors (qualifier value)|[478] OR << 308916002 |Environment or geographical location (environment / location)|[479]
719722006 |Has realization (attribute)|[480]	1	0..*	0..1	<< 272379006 |Event (event)|[481] OR << 404684003 |Clinical finding (finding)|[482] OR << 71388002 |Procedure (procedure)|[483] OR << 719982003 |Process (qualifier value)|[484]
363714003 |Interprets (attribute)|[485]	1	0..*	0..1	<< 108252007 |Laboratory procedure (procedure)|[486] OR << 363787002 |Observable entity (observable entity)|[487] OR << 386053000 |Evaluation procedure (procedure)|[488]
246454002 |Occurrence (attribute)|[489]	1	0..*	0..1	<< 282032007 |Periods of life (qualifier value)|[490]

472 http://snomed.info/id/418775008
473 http://snomed.info/id/71388002
474 http://snomed.info/id/363698007
475 http://snomed.info/id/442083009
476 http://snomed.info/id/363713009
477 http://snomed.info/id/260245000
478 http://snomed.info/id/263714004
479 http://snomed.info/id/308916002
480 http://snomed.info/id/719722006
481 http://snomed.info/id/272379006
482 http://snomed.info/id/404684003
483 http://snomed.info/id/71388002
484 http://snomed.info/id/719982003
485 http://snomed.info/id/363714003
486 http://snomed.info/id/108252007
487 http://snomed.info/id/363787002
488 http://snomed.info/id/386053000
489 http://snomed.info/id/246454002
490 http://snomed.info/id/282032007

370135005 |Pathological process (attribute)|[491]	1	0..*	0..1	<< 1495041000004108 |Proliferation of neoplasm (qualifier value)|[492] OR << 308490002 |Pathological developmental process (qualifier value)|[493] OR << 441862004 |Infectious process (qualifier value)|[494] OR << 472963003 |Hypersensitivity process (qualifier value)|[495] OR << 769247005 |Abnormal immune process (qualifier value)|[496]
246112005 |Severity (attribute)|[497]	1	0..*	0..1	<< 272141005 |Severities (qualifier value)|[498]
726633004 |Temporally related to (attribute)|[499]	1	0..*	0..*	<< 404684003 |Clinical finding (finding)|[500] OR << 71388002 |Procedure (procedure)|[501]

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3.8.3.2 Clinical Finding Defining Attributes

Self-grouped Attributes

Generally, the attributes *before*, *during*, *after*, *due to*, *clinical course*, or *temporally related to* are self-grouped, meaning they must not be placed in a relationship group with other attributes; each attribute must be the only attribute in a relationship group. Any rare exceptions will be documented within the individual attribute section below.
The Human Readable Concept Model (HRCM) *grouped* column (see the Clinical Finding Attributes Summary[502] table on the previous page) correctly indicates that these attributes are put into a relationship group during classification because they are self-grouped.

The following defining attributes correspond to the *Clinical Finding/Disorder Attributes Summary* table.

After

This attribute is used to model concepts in which a clinical finding occurs after another clinical finding, procedure or event. Neither asserting nor excluding a causal relationship, it instead emphasizes a sequence of events. This attribute is self-grouped.

For example,

491 http://snomed.info/id/370135005
492 http://snomed.info/id/1495041000004108
493 http://snomed.info/id/308490002
494 http://snomed.info/id/441862004
495 http://snomed.info/id/472963003
496 http://snomed.info/id/769247005
497 http://snomed.info/id/246112005
498 http://snomed.info/id/272141005
499 http://snomed.info/id/726633004
500 http://snomed.info/id/404684003
501 http://snomed.info/id/71388002
502 https://confluence.ihtsdotools.org/display/WIPEG/Clinical+Finding+Attributes+Summary

- 123948009 | Post-viral disorder (disorder)|[503] occurs | After (attribute)|[504] 34014006 | Viral disease (disorder)|[505]

A clinical finding may start either: after a variable period of time; immediately following the resolution of its antecedent; or during the course of its antecedent but continue after the antecedent has resolved. These sequences correspond to Allen's interval algebra relations of:

- X takes place before Y
- X meets Y
- X overlaps with Y

Associated morphology

This attribute specifies the morphologic changes seen at the tissue or cellular level that are characteristic of a disease.

(Please see *Morphologic Abnormalities vs. Findings* for details).

For example,

- 75694006 | Pancreatitis (disorder)|[506] has an Associated morphology (attribute) of 409774005 | Inflammatory morphology (morphologic abnormality)|[507]

When selecting a value for this attribute, in general, the concept should not represent a body structure combined with the morphology. There are, however, exceptions, i.e. where a morphology implies the finding site:

For example,

- Thymoma (morphologic abnormality)
- External hyperostosis (morphologic abnormality)
- Odontoma (morphologic abnormality)

Body structure should be captured in the value selected for the Finding site attribute. There are, however, exceptions.

For example,

- 70529004 | Lymphoid hyperplasia of appendix (disorder)|[508] has | Associated morphology (attribute)|[509] of 43961000 | Lymphoid hyperplasia (morphologic abnormality)|[510] and a | Finding site (attribute)|[511] of 45679000 | Appendiceal lymphoid nodule (body structure)|[512]

503 http://snomed.info/id/123948009
504 http://snomed.org/fictid#
505 http://snomed.info/id/34014006
506 http://snomed.info/id/75694006
507 http://snomed.info/id/409774005
508 http://snomed.info/id/70529004
509 http://snomed.org/fictid#
510 http://snomed.info/id/43961000
511 http://snomed.org/fictid#
512 http://snomed.info/id/45679000

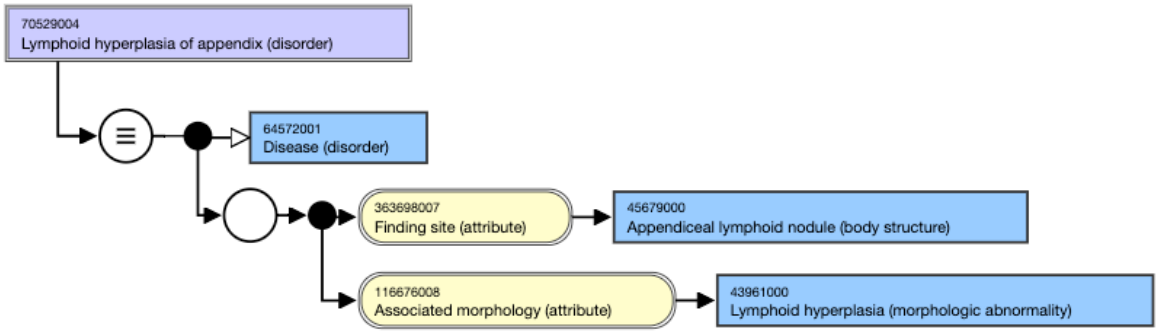


Figure 1: Stated view of Lymphoid hyperplasia of appendix (disorder)

Associated with

47429007 | Associated with (attribute)|[513] represents a clinically relevant association between concepts without either asserting or excluding a causal or sequential relationship between the two. In general, avoid using the 47429007 | Associated with (attribute)|[514] as it may be ambiguous and difficult to apply consistently.

This attribute is self-grouped.

Areas of content that use this attribute:

- Devices
- Intolerance to substances
- Concepts that group specific associations

  For example,

  6211002 | Polyarthritis associated with another disorder (disorder)|[515]

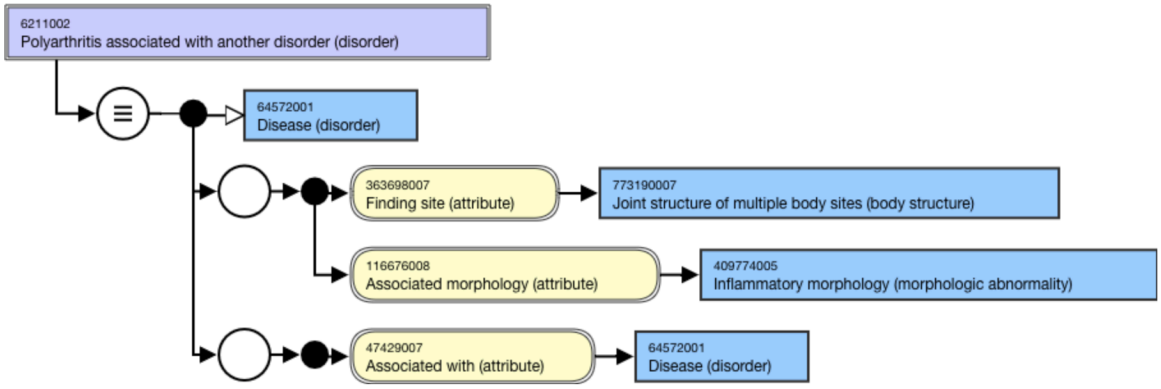


Figure 2: Stated view of 6211002 |Polyarthritis associated with another disorder (disorder)| using the |Associated with (attribute)|

513 http://snomed.info/id/47429007
514 http://snomed.info/id/47429007
515 http://snomed.info/id/6211002

Before

This attribute is used to model pre-procedure complications (e.g, preoperative complication). It represents temporal associations between procedures and related disorders. This attribute is self-grouped.

Causative agent

This attribute identifies an organism, substance, physical object, physical force, and/or pharmaceutical/biological product as the direct cause of a condition. It does not include vectors, for example, a mosquito that transmits malaria.

For example,

- 4989003 | Electrical burn of skin (disorder)|[516] has the 246075003 | Causative agent (attribute)|[517] of 18213006 | Electricity (physical force)|[518]

Although Pharmaceutical / biologic product (product) and its descendants are considered valid values for Causative agent (attribute) by the MRCM, they are not currently used as values for this attribute in the International Release. The only exception is 787859002 |Vaccine product (medicinal product)| and its descendants, which *can* be used as valid values for this attribute.

The following guidelines should be considered where the causative agent is a substance:

Concepts representing a clinical finding caused by a base substance (e.g., 836284001 |Pentamethonium (substance)|), a substance structure grouper (e.g. 1149501006 |Substance with ether structure (substance)|), or a substance disposition grouper (e.g. 404642006 |Substance with opioid receptor agonist mechanism of action (substance)|) should be modeled using a causative agent that is a descendant of 105590001 |Substance (substance)|. Classification results are expected to be consistent with the modeling in the Substance hierarchy:

For example,

- 93419003 |Contact dermatitis caused by nickel (disorder)|
- 13503000 |Poisoning caused by naloxone (disorder)|
- 767116002 |Allergy to substance with ether structure (finding)|
- 870376001 |Adverse reaction to dopamine receptor agonist (disorder)|

Concepts representing a clinical finding caused by a substance role grouper (e.g., 372688009 |Antineoplastic agent (substance)|) currently follow the same guidelines noted above. However, role groupers will be transitioned from the Substance hierarchy to the 763158003 |Medicinal product (product)| hierarchy in a future release.

For example,

- 295597003 |Antineoplastic overdose (disorder)|

Concepts representing a clinical finding caused by a substance modification (e.g., 82485006 |Pentamethonium bromide (substance)|) are generally not allowed. Exceptions may be included if the condition caused by the substance modification is significantly different from the one caused by the base substance. Exceptions may include Liposome or lipid complex substances, Pegylated substances, or salt forms:

For example,

- 293908005 |Allergy to chloral hydrate (finding)|
- 296213007 |Fluphenazine decanoate overdose (disorder)|

516 http://snomed.info/id/4989003
517 http://snomed.info/id/246075003
518 http://snomed.info/id/18213006

Clinical course

This attribute is used to represent both the course and onset of a disease or condition. This attribute is self-grouped.

For example,

- 74973004 | Chronic fibrosing pancreatitis (disorder)|[519] has a 263502005 | Clinical course (attribute)|[520] of 90734009 | Chronic (qualifier value)|[521]

The clinical course value is added when appropriate to the condition and thus specified in the FSN. The distinction is often necessary in those conditions that can have either an acute or a chronic course, such as bronchitis. For those conditions that have only one clinical course, i.e. diabetes is a chronic disease, a wider discussion is necessary before a decision can be made whether to assign a clinical course. Decisions on these concepts are currently made on a case-by-case basis.

Many conditions with acute (sudden) onsets also have acute (short-term) courses. Few conditions with chronic (long-term) durations require rapid versus gradual onset subtyping. Thus, there is no clear need for separating the rapidity of onset from the duration of a disease. The clinical course attribute, which combines onset and course, has been more reproducible and useful than two attributes that attempt to separate the meanings.

The word acute

The word acute has more than one meaning, and the meanings are often overlapping or unclear. It may imply rapid onset, short duration, or high severity; in some circumstances it might be used to mean all of these. For morphological concepts, acute may also imply the kind of morphology associated with the speed of onset.

For example,

- 4532008 | Acute inflammation (morphologic abnormality)|[522] does not necessarily have a clinical course of sudden onset and/or short duration, but rather implies polymorphonuclear infiltration (84499006 | Chronic inflammation (morphologic abnormality)|[523] implies mononuclear cell infiltration, not necessarily a chronic course, although inflammation with a chronic course is highly correlated with a lymphocytic infiltration)

2704003 |Acute disease (disorder)| is modeled with a Clinical course (attribute) of Sudden onset AND/OR short duration (qualifier value). For clinical conditions that necessitate further specificity, the more appropriate subtypes are available. *Acute onset* and *sudden onset* are synonymous; clinical conditions specifying *acute onset* should be modeled with a Clinical course (attribute) of Sudden onset (qualifier value).

Due to

This attribute is used to identify a clinical finding/disorder, event, or procedure concept as the direct cause of another Clinical finding or Disorder concept. If the clinical finding merely predisposes to another disorder, rather than causing it directly, the more general | Associated with (attribute)|[524] is used instead.

This attribute is self-grouped.

519 http://snomed.info/id/74973004
520 http://snomed.info/id/263502005
521 http://snomed.info/id/90734009
522 http://snomed.info/id/4532008
523 http://snomed.info/id/84499006
524 http://snomed.org/fictid#

For example,

- 43959009 | Cataract of eye due to diabetes mellitus (disorder)|[525]

During

This attribute is used to model concepts in which a clinical finding occurs during a procedure. Neither asserting nor excluding a causal relationship, it instead emphasizes a sequence of events. This attribute is self-grouped.

For example,

- 10901000087102 | Hypotension during surgery (disorder)|[526] has the value Surgical procedure (procedure) for During (attribute)

Episodicity

This attribute is used to represent episodes of care provided by a physician or other healthcare provider, not episodes of disease experienced by the patient.

For example,

- Asthma with 246456000 | Episodicity (attribute)|[527] of 255217005 | First episode (qualifier value)|[528] represents the first time the patient presents to their healthcare provider with asthma.

Modeling

Episodicity is not used to model any concepts precoordinated in the International Release, but it can be used as a qualifier in postcoordination.

Finding informer

This attribute specifies the person or other entity from which the clinical finding information was obtained. It is not about the particular individual but about the category or type of informer. It is used to differentiate patient-reported symptoms from provider-determined signs. This attribute is frequently used in conjunction with 418775008 | Finding method (attribute)|[529] .

Finding method

This attribute specifies the means by which a clinical finding was determined. It includes findings that were determined by examination of the patient. Finding method is frequently used with Finding informer.

For example,

- 713071004 | Alcohol misuser in household (finding)|[530] has the 418775008 | Finding method (attribute)|[531] of 84100007 | History taking (procedure)|[532]

525 http://snomed.info/id/43959009
526 http://snomed.info/id/10901000087102
527 http://snomed.info/id/246456000
528 http://snomed.info/id/255217005
529 http://snomed.info/id/418775008
530 http://snomed.info/id/713071004
531 http://snomed.info/id/418775008
532 http://snomed.info/id/84100007

Finding site

This attribute specifies the body site affected by a condition.

For example,

- 90708001 | Kidney disease (disorder)|[533] has 363698007 | Finding site (attribute)|[534] of 64033007 | Kidney structure (body structure)|[535]

Has interpretation

This attribute refers to and designates the judgment aspect being evaluated or interpreted (e.g. presence, absence, degree, normality, abnormality, etc.). Subtypes of Environment or geographical location (environment / location) can also be used as the value in cases such as specifying a location of an incident to be reported to death and injury registries.

Interprets and Has Interpretation are grouped together in a relationship group without any other attributes.

For example,

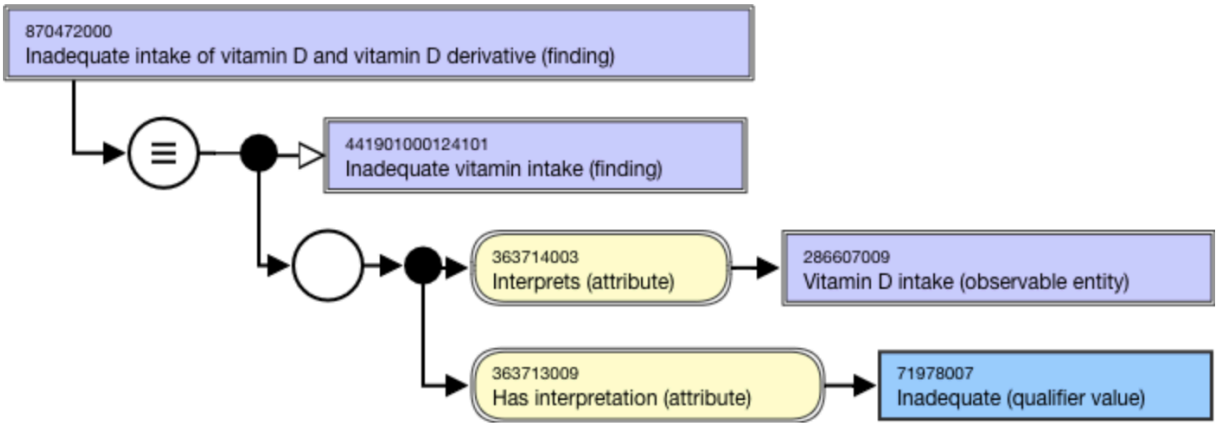


Figure 3: Inferred view of Inadequate intake of vitamin D and vitamin D derivative (finding)

Qualifier values of |Below reference range| and |Above reference range| are preferred over values such as high/low, increased/decreased, etc. to describe Measurement finding (finding) concepts.

Interprets

This attribute refers to the entity being evaluated or interpreted, when an evaluation, interpretation, or judgment is intrinsic to the meaning of a concept.

Interprets and Has Interpretation are grouped together in a relationship group without any other attributes. Interprets may be used in a relationship group by itself without any other attributes if the value of the observable is not defined.

For example,

533 http://snomed.info/id/90708001
534 http://snomed.info/id/363698007
535 http://snomed.info/id/64033007

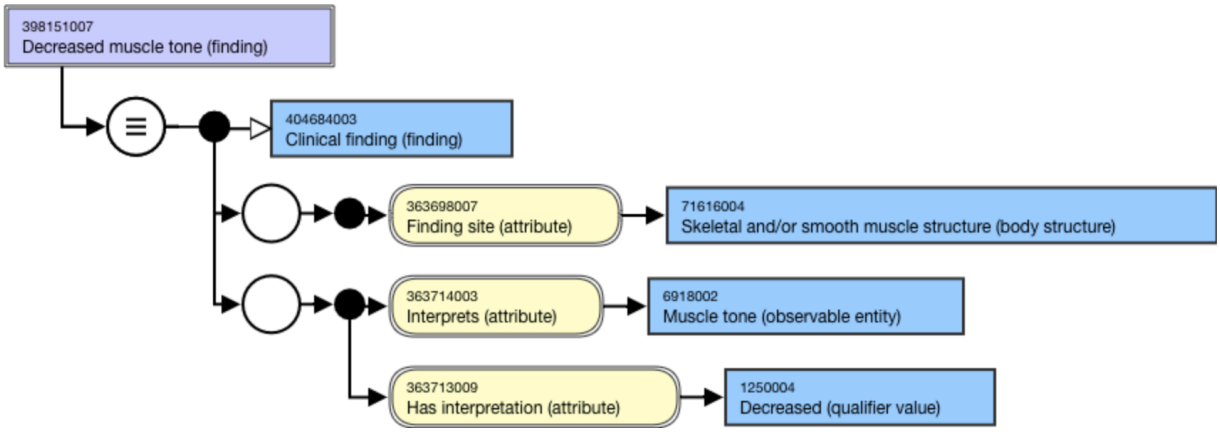


Figure 4: Stated view of |Decreased muscle tone (finding)|

In general, the value for the |Interprets| attribute should be from the |Observable entity| hierarchy rather than the |Procedure| hierarchy.

|Observable entity| concepts that are modeled with a |Scale type (attribute)| relationship should not be used as a value for a Clinical finding's |Interprets| relationship. The existing *vital sign* |Observable entity| concepts, e.g. |Arterial blood pressure (observable entity)| are exceptions to this guideline; they are permitted for use.

> In the guidance on the use of the |Scale type (attribute)[536]|, it has been noted that going forward, international |Observable entity| concepts will not be modeled with the |[537]Scale type (attribute)|[538]. Extension concepts are permitted to add specific subtypes of observable entities that include the |[539]Scale type (attribute)|[540], if desired.

Be aware that SNOMED CT currently contains some concepts in the |Evaluation Procedure| hierarchy which logically belong in the |Observable entity| hierarchy. Reconciliation of the overlap between these two hierarchies will be undertaken at a future date. Discussions about the final solution for the |Observable entity| and |Evaluation Procedure| issue are ongoing. See Observable Entity vs. Evaluation procedure(see page 249).

When working with the Interprets attribute, consider the values used by the supertypes and possible subtypes of your concept for this attribute. This is because the |Interprets| values must be drawn from the same hierarchy, e.g. |Observable entity| hierarchy or |Procedure| hierarchy as supertypes and subtypes, to support modeling and correct subsumption.

> **Measurement finding**
>
> For concepts in the 118245000 |Measurement finding (finding)| subhierarchy, the value for 363714003 |Interprets (attribute)| can be an Evaluation procedure, Laboratory procedure, or an Observable entity concept. In the future, the range of values may change when discussion of the relationship between evaluation procedures and observable entities concludes.

536 https://confluence.ihtsdotools.org/display/EDUEG/Observable+Entity+Defining+Attributes
537 http://snomed.org/fictid
538 http://snomed.org/fictid
539 http://snomed.org/fictid
540 http://snomed.org/fictid

Has realization

This attribute is used to specify the process or activity that is the consequence of realization of the function.

Modeling Allergy to X

Allergy to X is modeled with 719722006 | Has realization (attribute)|[541] of 472964009 | Allergic process (qualifier value)|[542] and 246075003 | Causative agent (attribute)|[543] of 105590001 | Substance (substance)|[544]. Find the allergy template at the Clinical finding and disorder templates[545] page for more information including exceptions.

Occurrence

This attribute refers to the specific period of life during which a condition first presents. However, conditions may persist beyond the period of life when they first present.

For example,

- 192611004 | Childhood phobic anxiety disorder (disorder)|[546] has the 246454002 | Occurrence (attribute)|[547] of 255398004 | Childhood (qualifier value)|[548]

Modeling

Multiple values of 246454002 | Occurrence (attribute)|[549] for a single concept are not desirable. They will be addressed in a future release.

Pathological process

This attribute provides information about the underlying pathological process of a disorder, i.e. it describes the process that results in the structural or morphologic change.

441862004 | Infectious process (qualifier value)|[550] and its subtype 442614005 | Parasitic process (qualifier value)|[551] are included in the range for 370135005 | Pathological process (attribute)|[552]. These are used in modeling the 40733004 | Infectious disease (disorder)|[553] subhierarchy.

For example,

- 17322007 | Disease caused by parasite (disorder)|[554] has the 370135005 | Pathological process (attribute)|[555] of 442614005 | Parasitic process (qualifier value)|[556]

541 http://snomed.info/id/719722006
542 http://snomed.info/id/472964009
543 http://snomed.info/id/246075003
544 http://snomed.info/id/105590001
545 https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=64260419
546 http://snomed.info/id/192611004
547 http://snomed.info/id/246454002
548 http://snomed.info/id/255398004
549 http://snomed.info/id/246454002
550 http://snomed.info/id/441862004
551 http://snomed.info/id/442614005
552 http://snomed.info/id/370135005
553 http://snomed.info/id/40733004
554 http://snomed.info/id/17322007
555 http://snomed.info/id/370135005
556 http://snomed.info/id/442614005

370135005 | Pathological process (attribute)|[557] must not be used for values that could overlap with 116676008 | Associated morphology (attribute)|[558] .

For example,

- Inflammatory processes result in inflammation (by definition), but these disorders should be defined by their morphology, i.e. 708039003 | Inflammatory lesion (morphologic abnormality)|[559]

Disorders which involve congenital anomalies are defined with the following grouped attribute-value pairs:

- Occurrence (attribute) = congenital (qualifier value)
- Associated morphology (attribute) = << 49755003 |Morphologically abnormal structure (morphologic abnormality)|
- Pathological process (attribute) = pathological development process (qualifier value)
- Finding site = X (body structure)

Modeling

Congenital X morphology concepts should not be used. They may be used only if there is not a non-congenital supertype.

Severity

This attribute is used to subclass a Clinical finding concept according to its severity. However, this use is *relative*, i.e. it is incorrect to assume that the disease intensity or hazard is the same for all clinical findings to which this attribute is applied.

The severity attribute may be applied to subtypes of Clinical finding (excluding << Symptom severity (finding)) to represent the severity of a finding or disease.

While this attribute is useful to create subtypes of specific concepts and to differentiate the severity of a single disorder, it is not commonly used, and care must be taken when applying it. This is because:

- Severity may be interpreted in different ways, depending on the set of values available. Consider the different meaning of severity in each of the following value sets:
  - mild / moderate / severe
  - minimal / mild / moderate / severe / very severe
  - mild / mild to moderate / moderate / moderate to severe / severe / life threatening / fatal
- Severity is defined relative to the expected degree of intensity or hazard of the Clinical finding that is being qualified. For example, the common cold has a baseline intensity or hazard that is much less than a more serious disease like lupus erythematosus or pneumonia; thus, a severe cold might be considered less intense or less hazardous than mild pneumonia.
- Some disorders that are life-threatening do not ordinarily have a severity assigned to them. Cancer, for example, is not usually described as mild, moderate, or severe, but rather by stage or grade.

The Severity attribute is not applied to subtypes of 162465004 |Symptom severity (finding)| because the severity of a symptom is different to the severity of a disease. Please note this piece of guidance does not align with the MRCM but is an editorial guideline.

557 http://snomed.info/id/370135005
558 http://snomed.info/id/116676008
559 http://snomed.info/id/708039003

Modeling

Generally, 246112005 |Severity (attribute)| is not used to model concepts precoordinated in the International Release, but there are some exceptions.

A valid exception requires an internationally accepted definition that can be consistently applied and used reliably for international comparison. Even though a reference may be internationally sourced, its use may not always be uniformly applied by multiple countries. Classifications of severity that represent variation in clinical presentations and enact limitations with age ranges, sex, or pregnancy status, do not apply universally to all patients of all ages, prove problematic, and may not be generally useful.

The requestor is responsible for obtaining permission for use in SNOMED CT if required by the international body.

As an alternative to precoordination in the international release, this attribute can be used as a qualifier in postcoordination. However, beware that postcoordination of severity results in the same irreproducibility issues as pre-coordination.

Temporally related to

726633004 |Temporally related to (attribute)| applies to perioperative complications and clinical findings where there is no causal relationship, but a time-relative association exists.

The attribute subhierarchy specifies the associated time period (i.e. before, during, after) between two procedures, two clinical findings, or a procedure and a clinical finding, e.g. perioperative complications temporally related to a surgical procedure (i.e. preoperative, intraoperative, and postoperative); Multisystem inflammatory syndrome in children temporally associated with SARS-CoV-2. This attribute is self-grouped.

3.8.3.3 Clinical Finding and Disorder Naming Conventions

A Clinical finding/Disorder concept's fully specified name (FSN) must be specific, though the preferred term (PT) can be a more clinician-friendly, word-order variant.

The FSN must conform to a specific pattern of "Disease of x" where a specific body structure is involved. For the preferred term, end users can choose the desired description that conforms to common clinical usage.

For example,

FSN: Disease of kidney (disorder)

PT: Can be either 'Kidney disease' or 'Renal disease'

The use of *-opathy* is to be used in the preferred term, because the FSN is to be specific and explicit, and there are often various interpretations of *-opathy*. A term containing the suffix -opathy can only be used in the FSN if a definition is applied via the DEF description.

For example,

FSN: Disorder of macula of retina (disorder)

PT: Can be either 'Disorder of macula of retina' or 'Maculopathy'

The morphologic abnormality is named before naming the anatomical site.

For example,

- In 399525009 | Inflammation of ampulla of Vater (disorder)|[560] , *Inflammation* is the morphologic abnormality and A*mpulla of Vater is* the finding site.

While the general naming convention for findings and disorders is <*Morphology*> *of* <*x body structure*>, there are some exceptions:

- Disorders with a well recognized name that represents the morphology; e.g. pneumonia is the well established clinical name for inflammation and consolidation of the lung
- Disorders where the meaning is not equivalent to <*morphology*> *of* <*x*> site convention; e.g. *inflammatory bowel disease* has a more specific meaning than *inflammation of bowel*
- Disorders which are not described by an anatomical site; e.g. metabolic disease, hereditary disease, bacterial disease

Please see documented naming patterns:

- Completed or in review - Precoordination Naming Pattern Project[561]
- Proposed for future review - Unreviewed Naming Patterns by Hierarchy[562]

Descriptions that include body structures

Descriptions for Clinical findings and disorders should follow the naming guidelines for Body structures if they are to be used within the Clinical finding/disorder concept. Concepts describing limbs are abundant, and the use of *limb* in the FSN and the synonyms of upper/lower extremity, arm/leg should be followed.

For example,

249945007 |Monoparesis of lower limb (disorder)|

Because the finding site is 61685007 |Lower limb structure (body structure)|, which follows the anatomical guidelines, the disorder concept reflects *lower limb* in the FSN, while using synonyms of *Monoparesis of leg* and *Monoparesis of lower extremity*.

Disorder

In the disorder hierarchy, the following naming conventions apply:

- The word *disorder* should be singular, so correct convention is *Disorder of nose*, not *Disorders of nose*.

Exceptions

Plurals may be used:

- As synonyms for grouper concepts, e.g. *disorders* or *diseases*
- In bilateral concepts, e.g. Disorder of bilateral eyes, Disorder of both eyes (see also *Lateralized Disorder Naming Conventions*)

560 http://snomed.info/id/399525009
561 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project
562 https://confluence.ihtsdotools.org/display/IHTSDO1/Unreviewed+Patterns+by+Hierarchy

- When the concept is a general grouping of disorders of a body system, body site, or other broad category, the word *disorder* is preferred over the word *disease* for the FSN, e.g. Disorder of reproductive system, not Disease of reproductive system. This does not apply at the leaf level.

  For example,

  - 417683006 | Sickle cell-hemoglobin C disease without crisis (disorder)|[563]

For naming conventions concerning *surgical complications, sequelae, and late effects*, see this section at Complication and Sequela Modeling(see page 241).

Disorder X without Disorder Y

The vast majority of existing X without Y concepts originated from ICD-9 with the specific meaning of "X disorder *without mention* of Y disorder". As the phraseology indicates a lack of data about disorder Y as opposed to a specific exclusion, this type of concept has not been included in ICD-10, nor proposed for ICD-11, except in the case of "Traumatic brain injury without open intracranial wound".

Addition of new X without Y concepts may only be made under the following conditions:

- The request for new content must be accompanied by a rationale as to the difference between "X disorder without Y disorder" and "X disorder"
- Approval of addition by the Chief Terminologist

For the most part, existing *X without Y* concepts will be inactivated as AMBIGUOUS with a historical MAY BE relationship to "X disorder". Exceptions to inactivation will be made on a case-by-case basis.

Requires [procedure/drug] (finding)

SNOMED international is no longer accepting new requests for concepts of the type – Requires [procedure/drug] (finding). These are administrative statuses rather than clinical findings, and this status should be represented outside of the terminology in the information model. The only exceptions relate to legacy content, and requests for subtypes of 723620004 |Requires vaccination (finding)| will continue to be accepted.

Region

If the 363698007 | Finding site (attribute)|[564] value of a concept is a body structure with "region" in its FSN, then the description of the finding site within the clinical finding concept's FSN should also include "region".

For example, 274205003 | Burn of eye region (disorder)|[565] has a finding site of 371398005 | Eye region structure (body structure)|[566] .

- FSN: Burn of eye region (disorder)
- PT: Burn of eye region

563 http://snomed.info/id/417683006
564 http://snomed.info/id/363698007
565 http://snomed.info/id/274205003
566 http://snomed.info/id/371398005

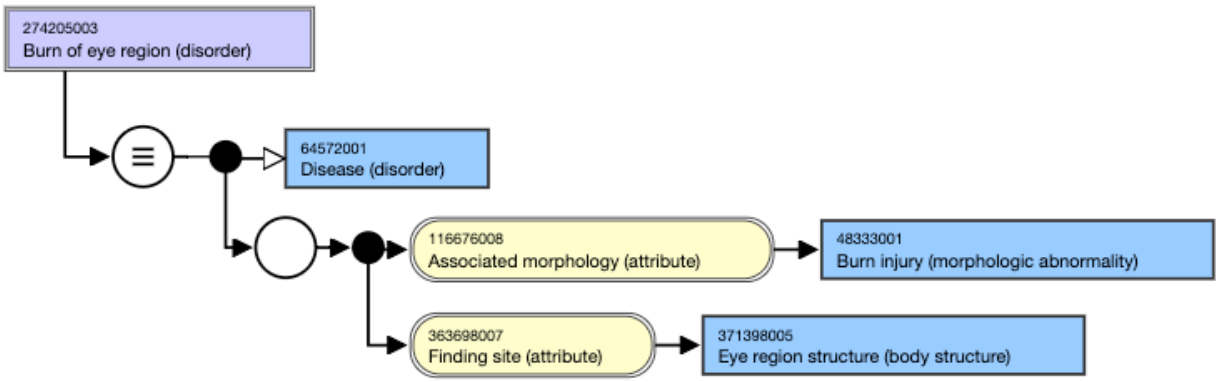


Figure 1: Stated view of |Burn of eye region (disorder)|

Allergy to substances, multiple substances

Previously, allergies caused by multiple substances were modeled by multiple causative agents suggesting that the allergy is caused by all those substances. However, when multiple substances are noted in the FSN, the intended clinical meaning is that a patient might be affected by one or more of these substances (or products containing them). To convey this meaning, these types of concepts should be modeled GCIs to represent the disjunctive meaning. e.g. 870731003 |Allergy to carbidopa and/or levodopa (finding)|

> **Information**
>
> The modeling approach for multiple-ingredient concepts is a temporary solution. It incorrectly asserts an allergy/adverse reaction to each, rather than to one, agent. The use of concepts from the Pharmaceutical/ biologic product hierarchy is being considered as a final solution, but further work is required to determine if this would be a viable solution.

Allergic and nonallergic hypersensitivity (pseudoallergic) *dispositions*

Allergic and nonallergic hypersensitivity (pseudoallergic) dispositions are the propensity to develop adverse allergic or nonallergic hypersensitivity (pseudoallergic) disorders. A description for any concept that names a substance or an organism should be consistent with the corresponding hierarchy description rules.

> **Drug allergies**
>
> Allergic and nonallergic hypersensitivity (pseudoallergic) concepts include drug allergies.

Patterns:

FSN: Allergy to X (finding)

PT: Allergy to X

For example,

- FSN: Allergy to abacavir (finding)
- PT: Allergy to abacavir

- FSN: Allergy to Artemisia vulgaris pollen (finding)

- PT: Allergy to mugwort pollen

FSN: Allergy to X and Y (finding)

PT: Allergy to X and Y

- X and Y in alphabetical order for concepts representing multiple substances

Allergic and nonallergic hypersensitivity (pseudoallergic) *disorders*

These disorders represent manifestations of pathologic processes that may result in abnormal structures (e.g., allergic rhinitis).

Disorder	**Patterns and examples**
FSN	Patterns: • FSN: Allergic disease X (disorder) • FSN: Allergic disease X (caused by Y) (disorder) For example, • Allergic rhinitis (disorder) • Allergic conjunctivitis (disorder) • Allergic rhinitis caused by grass pollen (disorder) • Allergic rhinitis caused by house dust mite (disorder)
PT	Patterns: • Allergic disease X • Allergic disease X (caused by Y) For example, • Allergic rhinitis • Allergic conjunctivitis • Allergic rhinitis caused by grass pollen • Allergic rhinitis caused by house dust mite

Allergic and nonallergic hypersensitivity (pseudoallergic) *reactions*

These disorders represent pathological processes that are defined as adverse reactions and allergic conditions with a pathological process of allergic or nonallergic hypersensitivity (pseudoallergic) process.

Reaction	Patterns and examples
FSN	Patterns: • Allergic reaction (caused by X) (disorder) • Anaphylactic reaction (caused by X) (disorder) • Anaphylactoid reaction (caused by X) (disorder) For example, • Allergic reaction caused by dye (disorder) • Allergic reaction caused by pollen (disorder)
PT	Patterns: • Allergic reaction caused by X For example, • Allergic reaction caused by dye • Allergic reaction caused by pollen

Contact hypersensitivity

Contact hypersensitivity represents a response elicited by contact of the skin or mucous membranes with a substance. The response may be immune mediated (allergic) or nonimmune (irritant) using the pathological process *contact hypersensitivity process (qualifier value).*

For example,

- Contact dermatitis (disorder)
- Irritant contact dermatitis (disorder)

Intolerance to substances

An intolerance is the propensity to develop an adverse reaction to a substance. The nature of the adverse reaction can represent a variety of pathological processes but specifically excludes hypersensitivity (allergic and nonallergic hypersensitivity (pseudoallergic) reactions.

Due to the difficulty in precisely defining an intolerance pathological process, it is problematic to apply the model for hypersensitivity dispositions to defining intolerance to substance. For this reason, as well as the difficulty in associating a material agent with a disposition, substances are related to the intolerance disposition with the *associated with* attribute.

Intolerance	Patterns and examples
FSN	Pattern: • Intolerance to X (finding) Example, • Intolerance to milk (finding)

Intolerance	Patterns and examples
PT	Pattern: • Intolerance to X Example, • Intolerance to milk

Inadequate and excessive intake of energy and nutrients

Identification of findings of inadequate or excessive intake of nutrients inconsistent with nutrient requirements and established reference standards includes nutrients with a variety of forms where applicable.

For example, 870465001 | Excessive intake of vitamin A and vitamin A derivative (finding)|[567]

FSN: Excessive intake of vitamin A and vitamin A derivative (finding)

PT: Excessive intake of vitamin A and vitamin A derivative

Lateralized Disorder Naming Conventions

For more information

See also Anatomical Structure Naming Conventions section Naming Convention for Digits of Hand and Foot[568] and Laterality section Laterality[569]

Right, left disorder concepts

When creating a lateralized disorder concept, two concepts should be created:

1. concept for the left side
2. concept for the right side

Descriptions

- FSN: <morphologic abnormality> of *right/left* <body structure> (disorder)
- PT: *Right/left* <disorder>

For example, 1089071000119109 | Inflammation of left mastoid (disorder)|[570]

- FSN: Inflammation of left mastoid (disorder)
- PT: Left mastoiditis

567 http://snomed.info/id/870465001
568 https://confluence.ihtsdotools.org/display/WIPEG/Naming+Convention+for+Digits+of+Hand+and+Foot?src=sidebar
569 https://confluence.ihtsdotools.org/display/WIPEG/Laterality?src=sidebar
570 http://snomed.info/id/1089071000119109

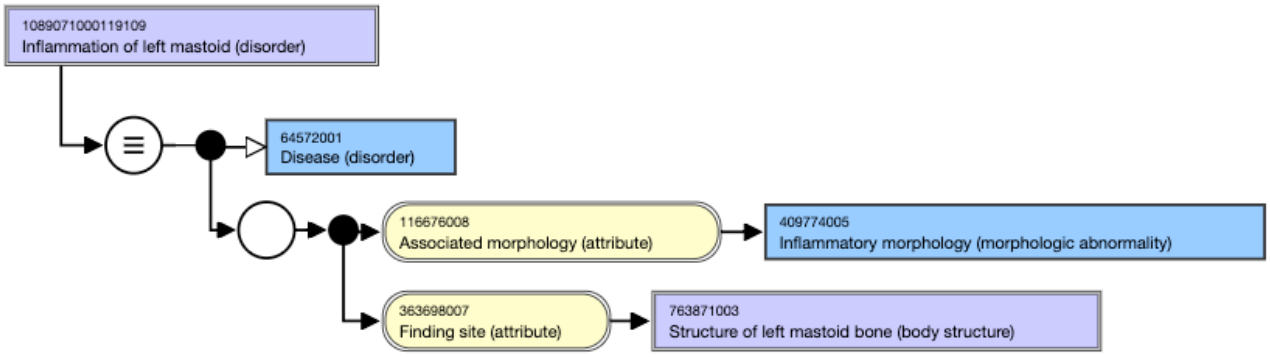


Figure 1: Stated view of Inflammation of left mastoid (disorder)

When creating a lateralized disorder concept, if a non-lateralized parent does not exist, then it should be created as well. In other words, do not just create the right and left versions, but also create a concept to represent the laterality-agnostic parent.

For example,

When creating *Inflammation of left mastoid* and *Inflammation of right mastoid*, also ensure a concept for *Inflammation of mastoid* exists.

Where the disorder is left/right of a specific anatomical site, and the preferred term naming pattern of *Right/ left* <disorder> causes a combination that does not sound like natural flowing English, the guidance above can be circumvented. See the section Naming Convention for Digits of Hand and Foot[571] and Laterality section Laterality[572].

For example,

Left interphalangeal thumb joint open traumatic dislocation should follow naming guidance of *Open traumatic dislocation of interphalangeal joint of left thumb*.

Left abscess of foot is an incorrect term; instead, this should read *Abscess of left foot*.

Unilateral

With the addition of lateralized content in the International Release, the need for unspecified unilateral concepts is removed, as well as potentially dangerous, if used directly in a patient record. Unilateral concepts are not accepted.

Bilateral disorder concepts

Where the bilateral disorder description causes a combination that does not sound like natural flowing English, the guidance below can be circumvented.

When the body structure and the morphologic abnormality are combined into one word, the following naming pattern applies:

FSN: <Morphologic abnormality> of bilateral <body structure> (disorder)

571 https://confluence.ihtsdotools.org/display/WIPEG/Naming+Convention+for+Digits+of+Hand+and+Foot?src=sidebar
572 https://confluence.ihtsdotools.org/display/WIPEG/Laterality?src=sidebar

PT: Bilateral <disorder>

SYN: <Disorder> of bilateral <body structure>

SYN: <Disorder> of both <body structure>

For example, 1084011000119100 | Inflammation of bilateral mastoids (disorder)|[573]

- FSN: Inflammation of bilateral mastoids (disorder)
- PT: Bilateral mastoiditis
- SYN: Inflammation of bilateral mastoids
- SYN: Inflammation of both mastoids

When the body structure and morphologic abnormality are separate, the following naming pattern applies:

FSN: <Morphologic abnormality> of bilateral <body structure> (disorder)

PT: <Morphologic abnormality> of bilateral <body structure> (disorder)

SYN: <Morphologic abnormality> of both <body structure> (disorder)

Note the PT of Bilateral <disorder> is not required. *Bilateral* is to describe the body site, not the morphologic abnormality.

For example, 15725081000119100 | Effusion of joint of bilateral feet (disorder)|[574]

- FSN: Effusion of joint of bilateral feet (disorder)
- PT: Effusion of joint of bilateral feet
- SYN: Effusion of joint of both feet

Also note that *joint* is singular. This is to denote that the joint may be singular on each side of the body; the plurality of feet will represent the laterality. Using *joints* as plural may incorrectly reflect that there are multiple joints affected in both feet.

Do not use *both* to describe disorders of the eyelids unless the concept's means *both upper eyelids* or *both lower eyelids*, only then can that synonym be included for bilateral eyelid disorder concepts.

Modeling of bilateral disorders

Bilateral disorders should be modeled using two relationship groups, one for each lateralized body structure.

573 http://snomed.info/id/1084011000119100
574 http://snomed.info/id/15725081000119100

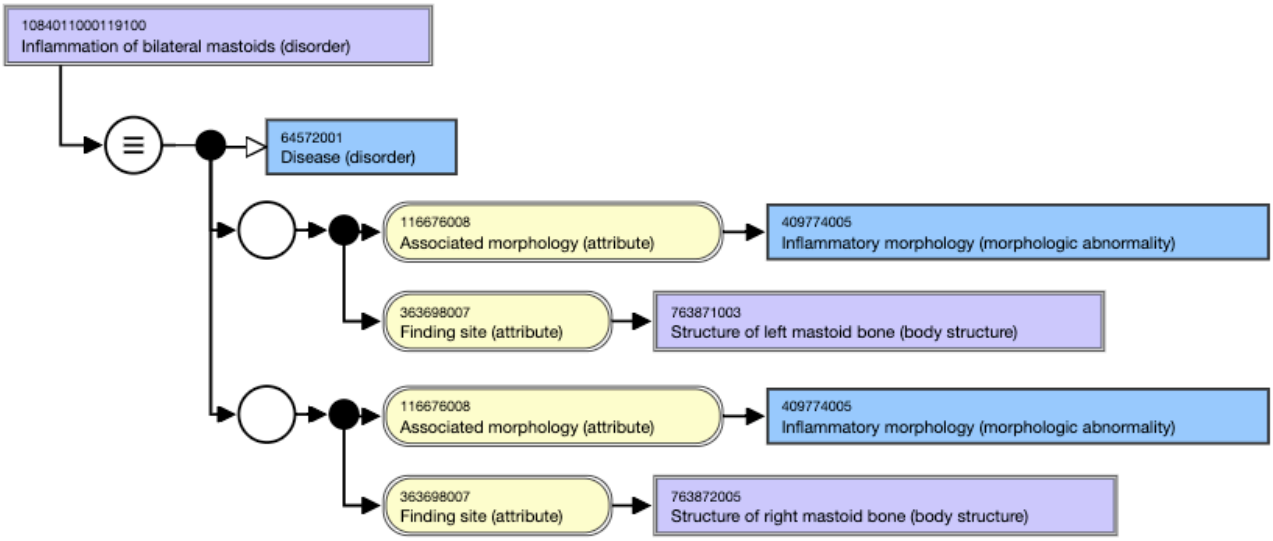


Figure 2: Stated view of Inflammation of bilateral mastoids (disorder) with a role group for each side

Structure, Structure of

Lateralized disorder concepts should not include the words *structure* or *structure of*.

For example,

- With use of 266005 | Structure of lower lobe of right lung (body structure) |[575] ,
  - a disorder concept is termed 724056005 | Malignant neoplasm of lower lobe of right lung (disorder) |[576]
  - a procedure is termed 726425007 | Lobectomy of lower lobe of right lung (procedure) |[577]

3.8.3.4 Clinical finding and Disorder Modeling

A disorder is always and necessarily an *abnormal clinical state*.

Disorder modeling information is as follows:

- Specific Clinical finding and Disorder Modeling(see page 186)
- Disorder Combination Modeling(see page 233)
- Complication and Sequela Modeling(see page 241)

Specific Clinical finding and Disorder Modeling

- Acquired abnormality of congenital anomaly(see page 187)
- Adverse reaction to X vaccine(see page 187)
- Allergy to X vaccine(see page 192)

575 http://snomed.info/id/266005
576 http://snomed.info/id/724056005
577 http://snomed.info/id/726425007

Acquired abnormality of congenital anomaly

For those concepts that describe a congenital anomaly that has been repaired and subsequently acquired an abnormality, follow the naming convention of |Acquired abnormality of X following repair of congenital X (disorder)|.

For example,

- 871598001 |Acquired abnormality of common arterial trunk following repair of truncus arteriosus (disorder)|[578]

Adverse reaction to X vaccine

Overview
The following modeling and terming guidelines apply to concepts in the International Release.

Modeling (stated view)

578 http://snomed.info/id/871598001

"Adverse reaction to X vaccine" concepts shall be modeled using the proximal primitive modeling pattern. Due to the small number of concepts (n<50), no template will be created. The "Adverse reaction to substance" template can be consulted for generalized modeling guidance.

	Single or multiple ingredient vaccine
Stated parent concept	281647001 |Adverse reaction (disorder)| • Exceptions: none identified
Semantic tag	(disorder)
Definition status	900000000000074008 |Not sufficiently defined by necessary conditions definition status (core metadata concept)| • Exceptions: none identified • Note: Because 'Adverse reaction to X vaccine' represents the propensity to an adverse reaction to any component (including excipients) of a vaccine rather than the modeled active ingredient(s), these concepts cannot be sufficiently defined. As a result, there will not be subsumption between "Adverse reaction to X vaccine" concepts. • Exceptions: Grouper concepts 293104008 |Adverse reaction to component of vaccine product (disorder)|, 219075006 |Adverse reaction to component of vaccine product containing bacteria antigen (disorder)|, and 408672009 |Adverse reaction to component of vaccine product containing virus antigen (disorder)| are modeled as sufficiently defined and subsume the remaining concepts.

Attribute:
Causative agent
	• Range: <<787859002 |Vaccine product (medicinal product)|
	  • Exceptions: none identified
	• Cardinality: 1..1
	  • Adverse reaction to X vaccine concepts should have one and only one |Causative agent| attribute.
	  • Concepts representing "vaccine product containing only" should not be used in modeling Adverse reaction to X vaccine concepts.
	  • Exceptions: none identified

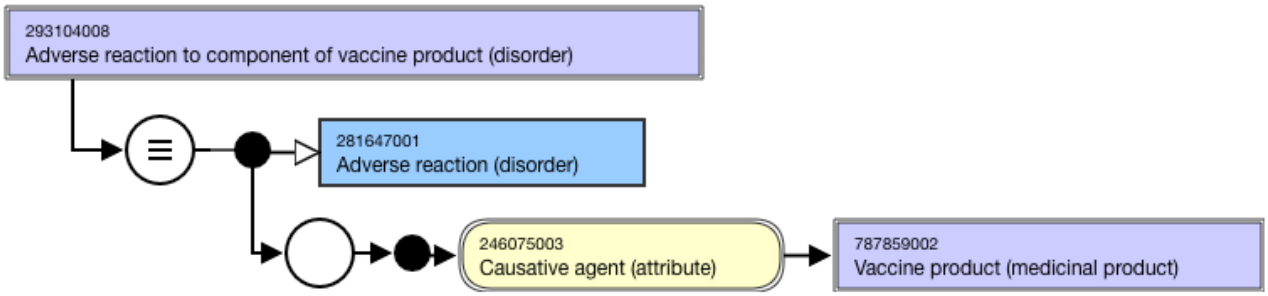
GCI	Not applicable

Terming Guidelines

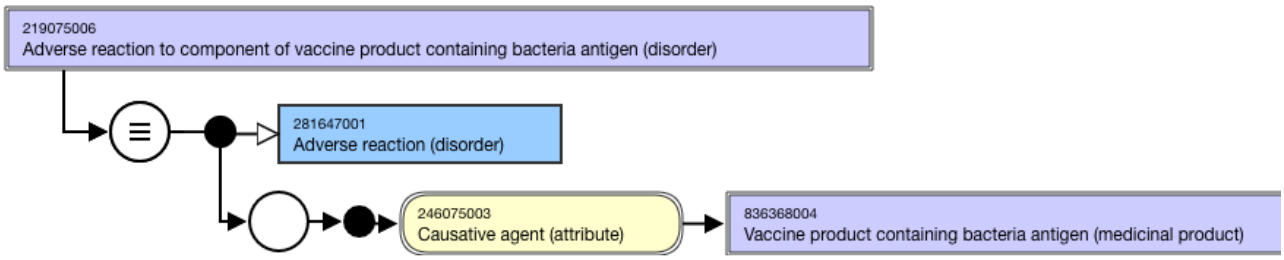
FSN	Use the following pattern for the FSN; align terming and case sensitivity with the FSN for the concept that represents the vaccine product that is the cause of the adverse reaction. • Adverse reaction to component of <Causative agent FSN> (disorder) Example: • Adverse reaction to component of vaccine product containing Hepatitis A virus antigen (disorder) • Adverse reaction to component of vaccine product containing Streptococcus pneumoniae antigen (disorder) • Adverse reaction to component of vaccine product containing only Clostridium tetani and Corynebacterium diphtheriae antigens (disorder) • Adverse reaction to component of vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (disorder)
Preferred Term	Use the following pattern for the PT; align terming and case significance with the PT for the disorder that is the target of the vaccine. For multiple ingredient vaccine products, the disorders must be listed in alphabetical order and separated by the word "and". • Adverse reaction to <disorder> vaccine • Adverse reaction to <disorder> and <disorder> vaccine • Adverse reaction to <disorder> and <disorder> and <disorder> vaccine Example: • Adverse reaction to hepatitis A vaccine • Adverse reaction to pneumococcal vaccine • Adverse reaction to diphtheria and tetanus vaccine • Adverse reaction to measles and mumps and rubella vaccine NOTE: For national extensions modeling using "vaccine containing only" product concepts, these disorder-based descriptions will need to reflect "only" to eliminate duplicate descriptions.

Synonyms	• A synonym corresponding to the FSN is required. • Synonyms beginning with the disorder that is the target of the vaccine are allowed. For multiple ingredient vaccine products, the disorders must be listed in alphabetical order and separated by the word "and". Note that these are not true synonyms; they may be updated and identified as "near-synonym" descriptions when that functionality becomes available although that would also potentially require updating the PT. Example: • Hepatitis A vaccine adverse reaction • Pneumococcal vaccine adverse reaction • Diphtheria and tetanus vaccine adverse reaction • Measles and mumps and rubella vaccine adverse reaction NOTE: For national extensions modeling using "vaccine containing only" product concepts, these disorder-based descriptions will need to reflect "only" to eliminate duplicate descriptions.

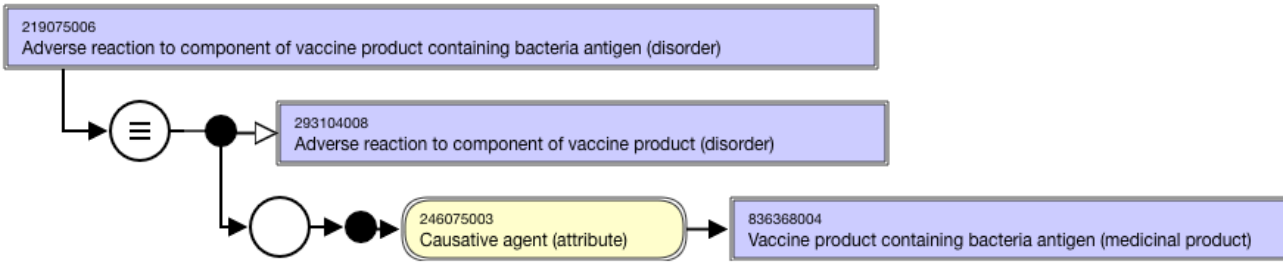
Exemplars
The following illustrates the **stated** and **inferred** view for top level grouper 293104008 |Adverse reaction to vaccine product (disorder)|:



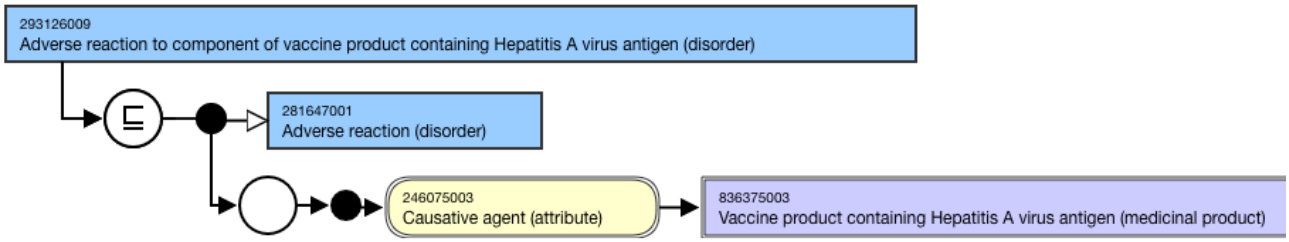
The following illustrates the **stated** view for top level grouper 219075006 |Adverse reaction to vaccine product containing bacteria antigen (disorder)|:



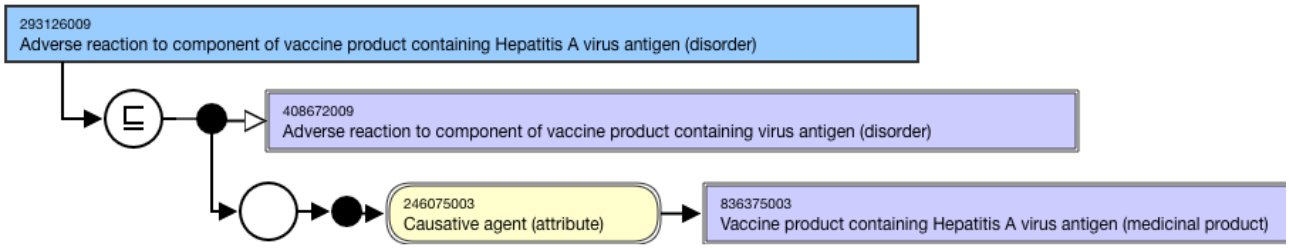
The following illustrates the **inferred** view for top level grouper 219075006 |Adverse reaction to vaccine product containing bacteria antigen (disorder)|:



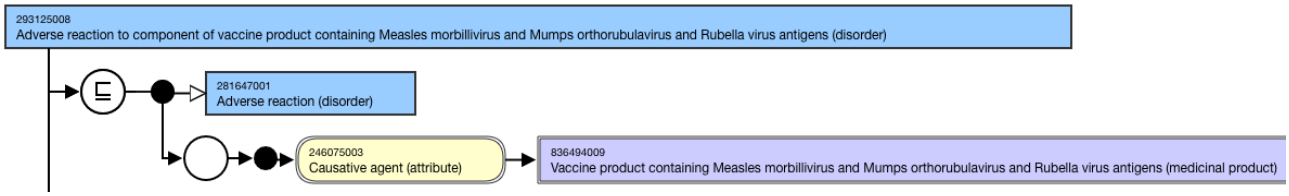
The following illustrates the **stated** view for single ingredient vaccine 293126009 |Adverse reaction to vaccine product containing Hepatitis A virus antigen (disorder)|:



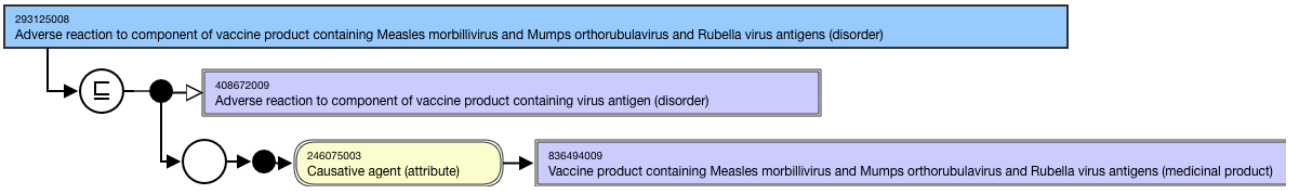
The following illustrates the **inferred** view for single ingredient vaccine 293126009 |Adverse reaction to vaccine product containing Hepatitis A virus antigen (disorder)|:



The following illustrates the **stated** view for multiple ingredient vaccine 293125008 |Adverse reaction to vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (disorder)|:



The following illustrates the **inferred** view for multiple ingredient vaccine 293125008 |Adverse reaction to vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (disorder)|:



Allergy to X vaccine

Overview
The following modeling and terming guidelines apply to concepts in the International Release.

Modeling (stated view)
"Allergy to X vaccine" concepts shall be modeled using the proximal primitive modeling pattern. Due to the small number of concepts (n<25), no template will be created. The "Allergy to substance" template can be consulted for generalized modeling guidance.

	Single or multiple ingredient vaccine
Stated parent concept	420134006 |Propensity to adverse reaction (finding)| • Exceptions: none identified
Semantic tag	(finding)
Definition status	900000000000074008 |Not sufficiently defined by necessary conditions definition status (core metadata concept)| • Note: Because 'Allergy to X vaccine' represents the propensity to an allergic reaction to any component (including excipients) of a vaccine rather than the modeled active ingredient(s), these concepts cannot be sufficiently defined. As a result, there will not be subsumption between "Allergy to X vaccine" concepts. • Exceptions: Grouper concept 863903001 |Allergy to component of vaccine product (finding)| is modeled as sufficiently defined and subsumes the remaining concepts.
Attribute: **Has realization**	Attribute value = 472964009 |Allergic process (qualifier value)| • Exceptions: none identified

Attribute:
Causative agent
	• Range: 787859002 |Vaccine product (medicinal product)|
	  • Exceptions: none identified
	• Cardinality: 1..1
	  • Allergy to X vaccine concepts should have one and only one |Causative agent| attribute.
	  • Concepts representing "vaccine product containing only" should not be used in modeling Allergy to X vaccine concepts.
	  • Exceptions: none identified

GCI	Not applicable

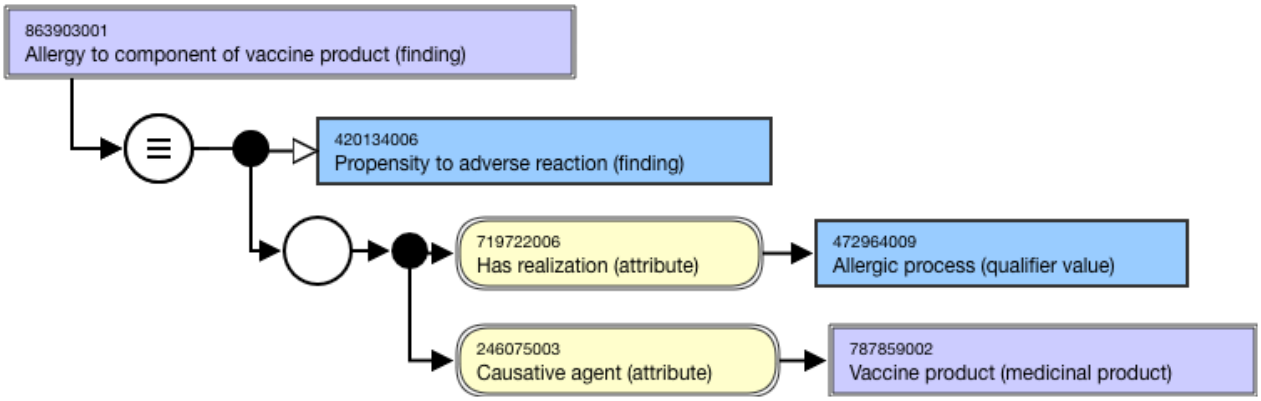
Terming Guidelines

FSN	Use the following pattern for the FSN; align terming and case sensitivity with the FSN for the concept that represents the vaccine product that is the cause of the allergy. • Allergy to component of <Causative agent FSN> (finding) Example: • Allergy to component of vaccine product containing Hepatitis A virus antigen (finding) • Allergy to component of vaccine product containing Streptococcus pneumoniae antigen (finding) • Allergy to component of vaccine product containing Clostridium tetani and Corynebacterium diphtheriae antigens (finding) • Allergy to component of vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (finding)
Preferred Term	Use the following pattern for the PT; align terming and case significance with the PT for the disorder that is the target of the vaccine. For multiple ingredient vaccine products, the disorders must be listed in alphabetical order and separated by the word "and". • Allergy to <disorder> vaccine • Allergy to <disorder> and <disorder> vaccine • Allergy to <disorder> and <disorder> and <disorder> vaccine Example: • Allergy to Hepatitis A vaccine • Allergy to pneumococcal vaccine • Allergy to diphtheria and tetanus vaccine • Allergy to measles and mumps and rubella vaccine NOTE: For national extensions modeling using "vaccine containing only" product concepts, these disorder-based descriptions will need to reflect "only" to eliminate duplicate descriptions.

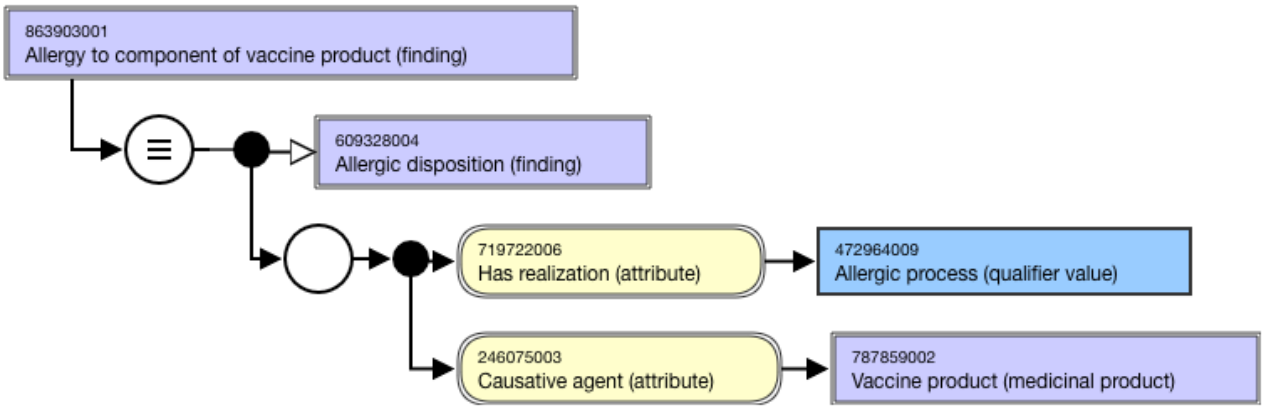
Synonyms	• A synonym corresponding to the FSN is required. • Synonyms beginning with the disorder that is the target of the vaccine are allowed. For multiple ingredient vaccine products, the disorders must be listed in alphabetical order and separated by the word "and". Note that these are not true synonyms; they may be updated and identified as "near-synonym" descriptions when that functionality becomes available although that would also potentially require updating the PT. Example: • Hepatitis A vaccine allergy • Pneumococcal vaccine allergy • Diphtheria and tetanus vaccine allergy • Measles and mumps and rubella vaccine allergy NOTE: For national extensions modeling using "vaccine containing only" product concepts, these disorder-based descriptions will need to reflect "only" to eliminate duplicate descriptions.

Exemplars

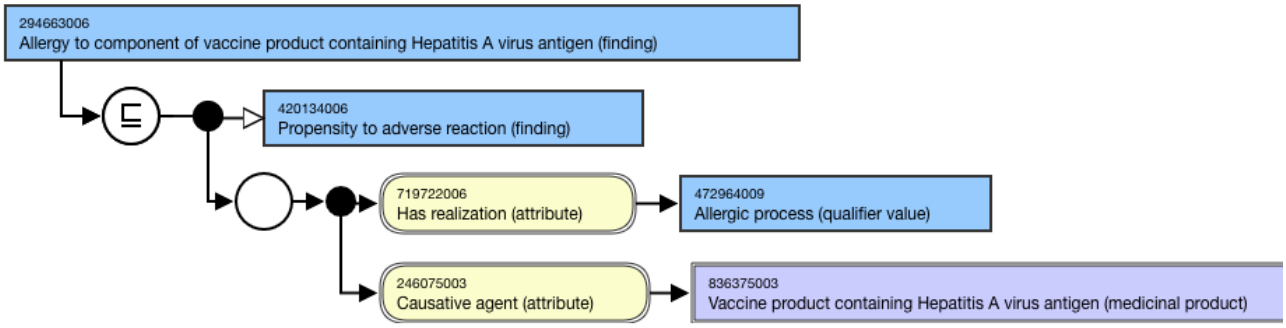
The following illustrates the **stated** view for top level grouper 863903001 |Allergy to component of vaccine product (finding)|:



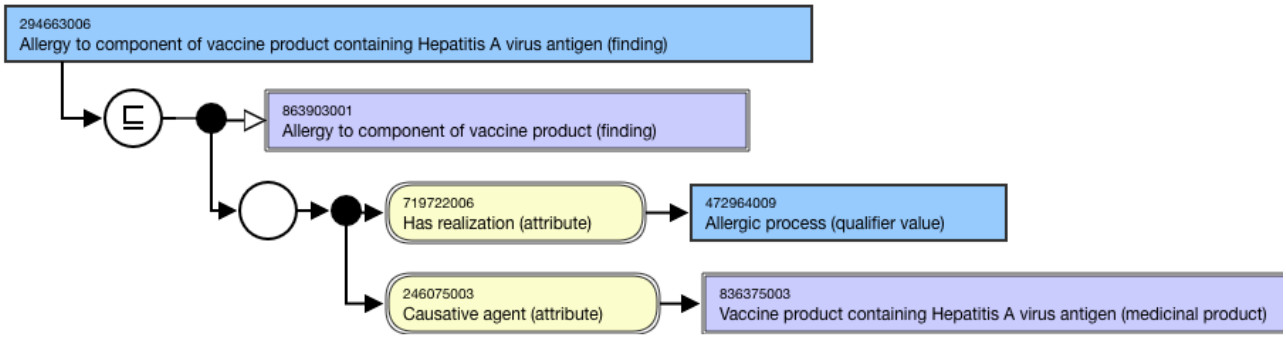
The following illustrates the **inferred** view for top level grouper 863903001 |Allergy to component of vaccine product (finding)|:



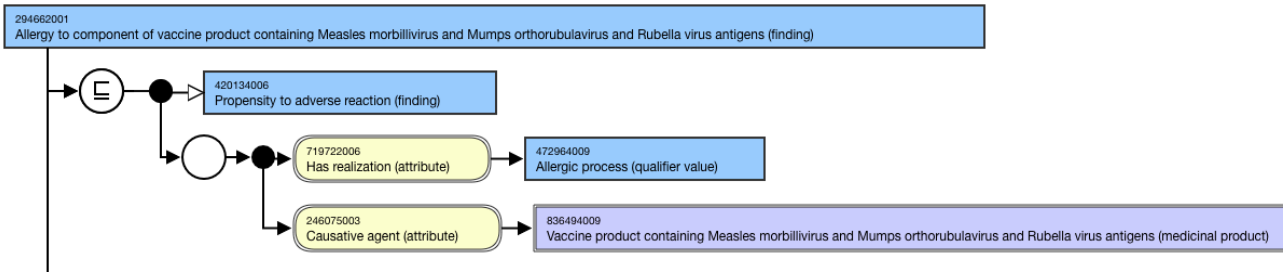
The following illustrates the **stated** view for 294663006 |Allergy to component of vaccine product containing Hepatitis A virus antigen (finding)|:



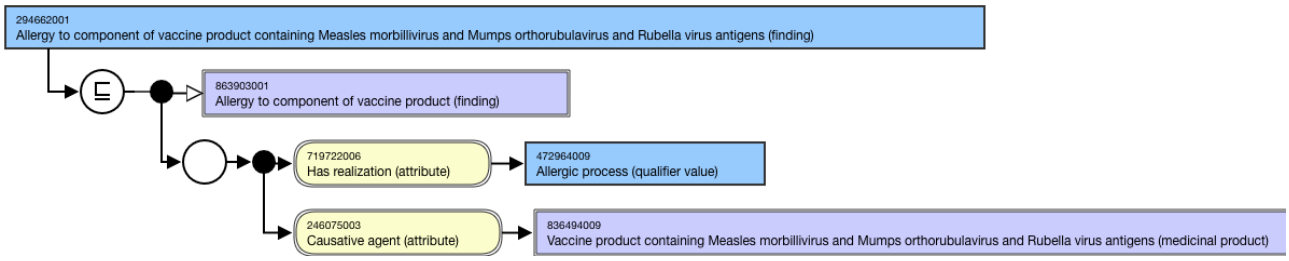
The following illustrates the **inferred** view for 294663006 |Allergy to component of of vaccine product containing Hepatitis A virus antigen (finding)|:



The following illustrates the **stated** view for 294662001 |Allergy to component of vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (finding)|:



The following illustrates the **inferred** view for 294662001 |Allergy to component of vaccine product containing Measles morbillivirus and Mumps orthorubulavirus and Rubella virus antigens (finding)|:



Arrythmia

Cardiologists noted confusion in the placement of *Conduction disorder of the heart (disorder)* as a broad grouping that subsumed arrhythmias and heart blocks. In common usage *arrhythmia* refers to a broad set of conditions that include conduction disorders, under which are heart blocks. The concept Cardiac arrhythmia (disorder) is a parent of Conduction disorder of the heart (disorder), and the active referent of the inactive concepts named *dysrhythmia* or *arrhythmia*.

For example,

- Arrhythmias, like 72654001 |Supraventricular arrhythmia (disorder)|[579], are under 698247007 |Cardiac arrhythmia (disorder)|[580]

Conduction disorders include heart block, AV block, bundle branch block, conduction delay, and conduction defect, like 418341009 | Atrioventricular conduction disorder (disorder) |. Other arrhythmias were moved from under 44808001 |Conduction disorder of the heart (disorder)|[581] and placed under 698247007 |Cardiac arrhythmia (disorder)|[582].

Bacterial disorders with organism or toxin

In modeling some bacterial disorders, there will be situations where either the organism or the toxin (substance), or both values, are required for the causative agent attribute. The decision is often determined by whether or not the bacteria are considered endotoxins or exotoxins. The most common exotoxins are:

- Botulinum Toxin
- Enterotoxin
- Cholera Toxin
- Diphtheria Toxin
- Tetanospasmin

579 http://snomed.info/id/72654001
580 http://snomed.info/id/698247007
581 http://snomed.info/id/44808001
582 http://snomed.info/id/698247007

Exotoxins are more lethal in comparison to endotoxins, but there are vaccines against many exotoxins whereas there are no vaccines against endotoxins. There can be instances where an infection is present but the disease-causing toxins are not; in this case, model the concept only with the organism and not the toxin substance.

Example,

276202003 |Infection caused by Clostridium tetani (disorder)|[583] is modeled with a causative agent of 30917009 |Clostridium tetani (organism)|[584] only.

In the situation where a disease is caused by both the infection and the associated toxin, model with both the causative agent and the toxin substance.

Example,

76902006 |Tetanus (disorder)|[585] is modeled with a causative agent of 30917009 |Clostridium tetani (organism)|[586] as well as 26159005 |Clostridium tetani toxin (substance)|[587].

Combining morphologic abnormalities

When modeling a concept requiring two role groups with the same body structure but two different morphologies (because a combined morphology does not exist), then those morphologic abnormalities can be combined to create a single morphologic abnormality concept. Keep the newly-created morphologic abnormality concept primitive, as all morphologic abnormality concepts are primitive.

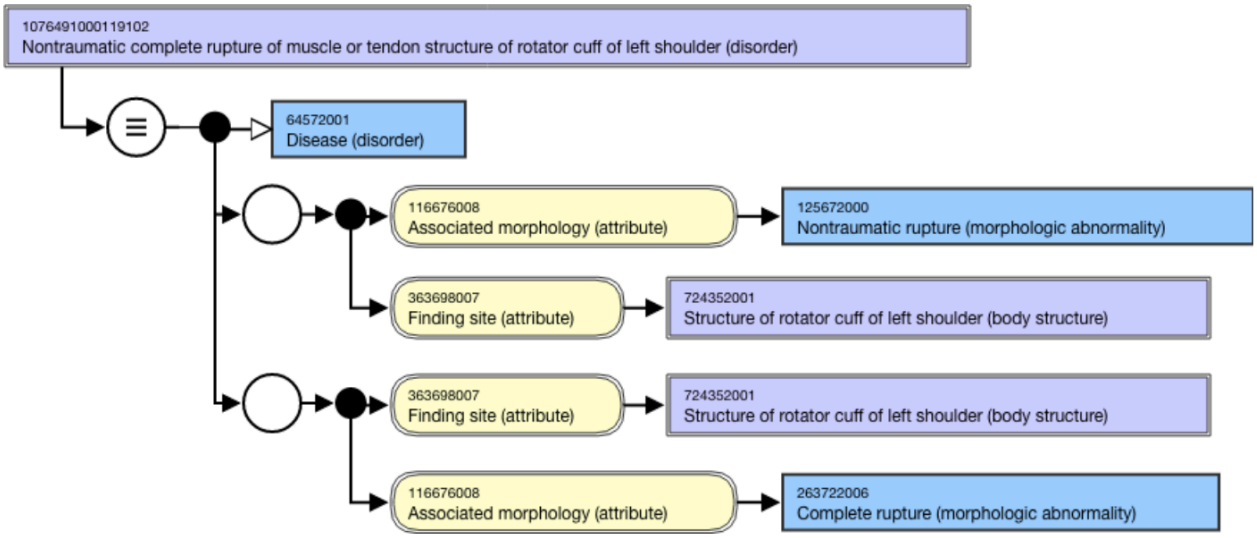
For example,			
Disorder concept	**Associated morphology**	**Associated morphology**	***Combined* Associated morphology**
Calcified hematoma of head (disorder)	Pathologic calcification, calcified structure (morphologic abnormality)	Hematoma (morphologic abnormality)	Calcified hematoma (morphologic abnormality)

Another example is 1076491000119102 |Nontraumatic complete rupture of muscle or tendon structure of rotator cuff of left shoulder (disorder)|[588].

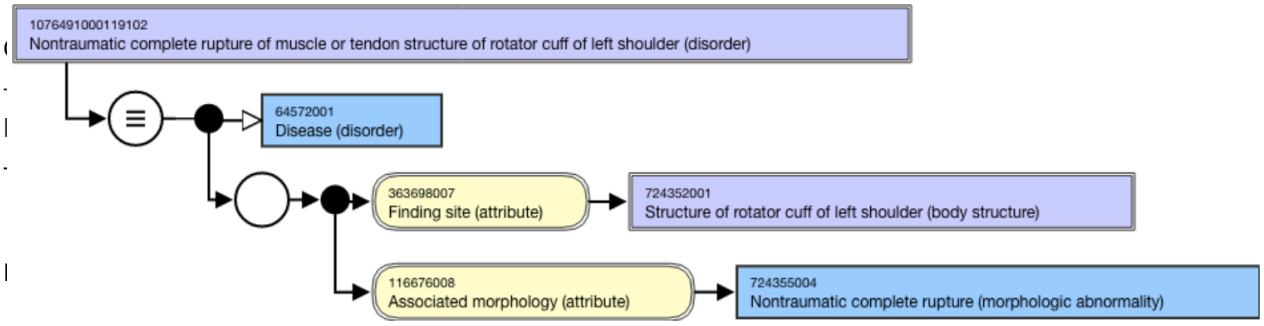
If this disorder had the same finding site of |Structure of rotator cuff of left shoulder (body structure)| with two different morphologic abnormalities of |Nontraumatic rupture| and |Complete rupture|, then those two morphologic abnormality concepts can be combined to create a single, primitive, morphologic abnormality concept of |Nontraumatic complete rupture (morphologic abnormality)|. This will prevent modeling with two relationship groups.

Instead of modeling as in this stated view:

583 http://snomed.info/id/276202003
584 http://snomed.info/id/30917009
585 http://snomed.info/id/76902006
586 http://snomed.info/id/30917009
587 http://snomed.info/id/26159005
588 http://snomed.info/id/1076491000119102



Model as shown in this stated view:



Associated morphology = X (morphologic abnormality)

Pathological process = Pathological development process (qualifier value)

All of these defining relationships should be grouped to indicate that the abnormal morphology occurs at the finding site, results from a pathological development process, and is present at birth. Where a morphologic abnormality occurs at more than one finding site, or one body structure has multiple morphologic abnormalities, multiple relationship groups should be created and the pathological process and occurrence relationships included in each relationship group.

The following guidelines apply:

A disorder with the word *congenital* in the FSN should classify under 66091009 |Congenital disease (disorder)|[590].

Congenital X (morphologic abnormality) concepts are being inactivated hence Congenital anomaly disorder grouper concepts, such as 9904008 |Congenital anomaly of cardiovascular system (disorder)|[591], should be modeled with an Associated morphology (attribute) of 49755003 |Morphologically abnormal structure (morphologic abnormality)I and a Pathological process relationship.

Whether creating new or revising existing concepts, only use Congenital X (morphologic abnormality) concepts if no non-congenital supertype of that morphologic abnormality is active.

- For example, use 399898009 |Misalignment (morphologic abnormality)|[592] not 102283003 |Congenital misalignment (morphologic abnormality)|[593]

Neonatal period

According to the American Medical Association, the periods of life in the *postnatal period* include all periods after birth including the neonatal or immediate postpartum period. It may be challenging to differentiate a congenital disorder from a neonatal disorder. A condition may be present at birth, i.e. congenital; however, clinical manifestations may take longer to appear, i.e. during the neonatal period (e.g. 14333004 |Alloimmune neonatal neutropenia (disorder)|[594]).

When modeling a congenital neoplasm disorder, the attribute-value relationship of *Pathological process (attribute) = Pathological development process (qualifier value)* is not used.

Congenital versus acquired
While some disorders are *only* congenital or *only* acquired, some disorders may be *either* congenital or acquired. The *acquired* form should only exist when there is a need to differentiate from the congenital form. Do not model a disorder as acquired if a congenital variant does not exist.

589 http://snomed.info/id/66091009
590 http://snomed.info/id/66091009
591 http://snomed.info/id/9904008
592 http://snomed.info/id/399898009
593 http://snomed.info/id/102283003
594 http://snomed.info/id/14333004

Congenital disorders are modeled using 246454002 |Occurrence (attribute)|[595] of 255399007 |Congenital (qualifier value)|[596]. If the FSN does not include *congenital*, it should not be modeled as congenital. The precise meaning of the FSN should be followed (e.g. many hereditary disorders have congenital appearances).

For example,

33534005 |Congenital bowing of femur (disorder)|[597] is modeled with 246454002 |Occurrence (attribute)|[598] of 255399007 |Congenital (qualifier value)|[599]

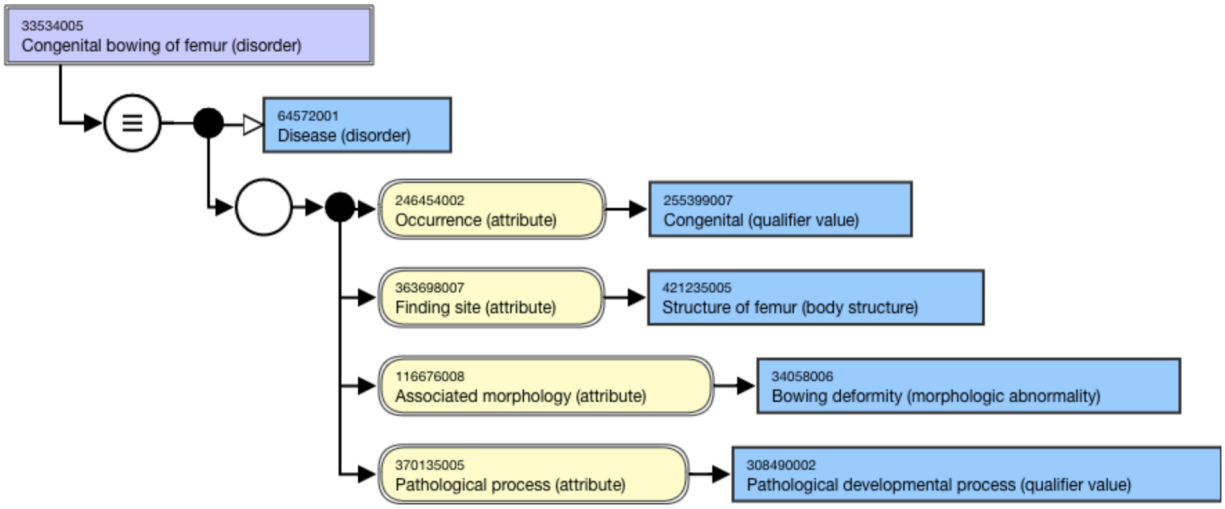


Figure 1: Stated view of 33534005 |Congenital bowing of femur (disorder)|

Acquired disorders are those that originate and manifest after birth. The disorders are associated with a period of life, as opposed to a specific process or structure. All diseases (disorders) that occur after birth are considered *acquired*.

Generally, concepts that explicitly state ***acquired*** in the FSN or in a synonym should be modeled with Occurrence = 767023003 |Period of life beginning after birth and ending before death (qualifier value)|.

For example,

240253004 |Acquired abduction deformity of foot (disorder)| has *acquired* in the FSN and is modeled with Occurrence = 767023003 |Period of life beginning after birth and ending before death (qualifier value)|.

595 http://snomed.info/id/246454002
596 http://snomed.info/id/255399007
597 http://snomed.info/id/33534005
598 http://snomed.info/id/246454002
599 http://snomed.info/id/255399007

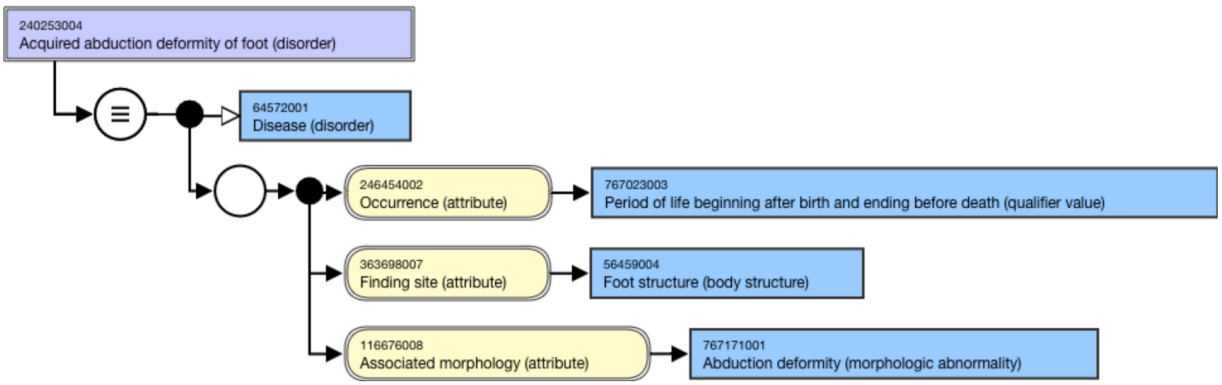


Figure 2: Stated view of 240253004 |Acquired abduction deformity of foot (disorder)|

Remodeling Acquired Disorders

When revising acquired disorders, remove any acquired morphologies and replace with general parent morphologies, e.g. replace 127560004 |Acquired deformity (morphologic abnormality)|[600] with 6081001 |Deformity (morphologic abnormality)|[601]. Then add Occurrence attribute with a value of 767023003 |Period of life beginning after birth and ending before death (qualifier value)|. One of its children may also be used if the FSN states the period of life, such as *Childhood* or *Adulthood*.

Congenital absence

Congenital absence can represent at least three different classes of absence:

1. Total developmental absence of the affected organ/structure
2. Partial absence of the affected organ/structure
3. In utero amputation of all or part of the affected organ/structure

Conventional use of the terms *aplasia* and *agenesis* often regard these as synonymous. However, proper definitions of these terms suggests a distinction that should be made in the terminology when included in the FSN.

- Aplasia - defective development resulting in the absence of all or part of an organ or tissue.
- Agenesis - absence of an organ due to nonappearance of its primordium in the embryo. (implies complete absence)

In order to conform to the intended meaning of the FSNs as described by the original source, the following modeling patterns are proposed for congenital absence terms:

Congenital absence of X

- Associated morphology = Absence (morphologic abnormality)
- Occurrence = Congenital (qualifier value)
- Finding site = Structure of X (body structure)
- Pathological process = Pathological developmental process (qualifier value)

Aplasia

- Associated morphology = Aplasia (morphologic abnormality)
- Occurrence = Congenital (qualifier value)
- Finding site = Structure of X (body structure)
- Pathological process = Pathological developmental process (qualifier value)

Partial absence of X

600 http://snomed.info/id/127560004
601 http://snomed.info/id/6081001

- Associated morphology = Aplasia (morphologic abnormality) or Transverse deficiency (morphologic abnormality)
- Occurrence = Congenital (qualifier value)
- Finding site = Part of X (body structure)
- Pathological process = Pathological developmental process (qualifier value)

Agenesis of X or Complete absence of X

- Associated morphology = Agenesis (morphologic abnormality)
- Occurrence = Congenital (qualifier value)
- Finding site = Entire X (body structure)
- Pathological process = Pathological developmental process (qualifier value)

See also relative sections:

- *Acquired abnormality of congenital anomaly*
- *Malformation, deformation, anomaly*

Death

Death is an event, not a disorder.

Sudden cardiac death
Sudden cardiac death is a term used in clinical practice. It refers to an arrhythmia that results in sudden loss of cardiac function which, if not quickly reversed, will lead to *actual* death. The FSN Sudden cardiac death (disorder) is modeled as a subtype of 127337006 |Acute heart disease (disorder)|[602]. It should not be classified as *death.* Individuals with sudden cardiac death have not necessarily been declared *dead* and are frequently revived. It is regarded as a *subtype* of *cardiac dysrhythmia*.

Enteritis

The term *enteritis* is broad and commonly refers to inflammation of the intestine, especially the small intestine. However, in some conditions, e.g. phlegmonous enteritis and regional enteritis, the term *enteritis* refers to any part of the digestive tract.

Thus, all descriptions of enteritis must stipulate the specific body structure that is affected to avoid potential misinterpretations and incorrect modeling.

For example,

- Enteritis of intestine
- Enteritis of small intestine

Genetic, developmental, congenital, and physical origin

The following figure shows the structure of genetic, developmental, and congenital categories, along with non-genetic, non-developmental, and postnatal categories. A dimension, called *extrinsic physical force*, is included to distinguish *deformations* from *malformations.* The sections of the diagram represent categories formed from the combination of the dimensions, each which represents the answer to one of the following questions:

- Is it genetic or not?
- Is it developmental or not?
- Is it present at birth or not?
- Is it due to an extrinsic physical force or not?

602 http://snomed.info/id/127337006

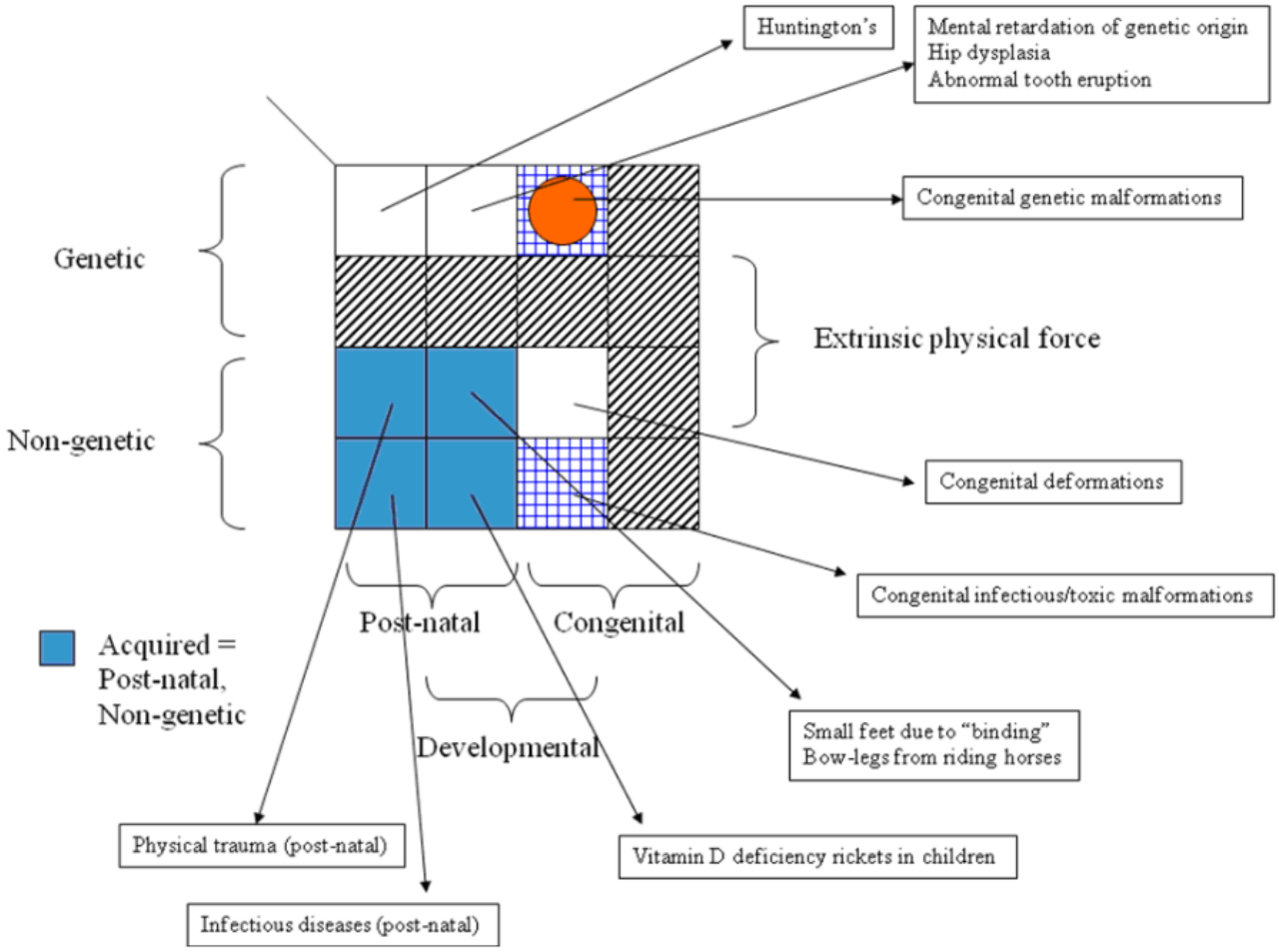


Figure 1: The relationships of genetic, congenital, developmental, and acquired disorders

Explanation of Figure

The sections with diagonal hashed lines represent combination categories that do not occur.

For example, there are no genetic disorders that are due to an extrinsic physical force. Likewise, there are no congenital disorders that are considered non-developmental.

The sections with blue crossing lines represent congenital malformations; they may be either genetic or non-genetic.

For example, congenital infectious malformations

The red circle represents congenital genetic malformations.

The blue sections represent *acquired*, i.e. disorders that are non-genetic and not present at birth.

For example, Vitamin D deficiency (rickets) in children is a non-genetic, non-congenital, developmental malformation.

The white sections represent genetic congenital or genetic postnatal disorders.

For example, Huntington's disease is a genetic disease that is neither congenital nor developmental. The gene defect is present at birth, but the disease does not manifest until adulthood.

Arrows leading from the sections point to examples of disorders for the category.

Developmental
Developmental is a useful label for disorders that affect developing structures or functions that may occur pre- or postnatally. They may be present at birth or develop later.

Familial
The term *familial* may also be ambiguous when used for broad categories. It may mean that the disorder is found in higher proportions in the immediate or extended family compared to other groups. Or, it may mean there is a possibility of a disease being inherited. It may be used; however, it may require clarification of meaning from the requestor. It should not be used as a synonym for *genetic*.

Hereditary
It may be a challenge to classify a condition as a 32895009 |Hereditary disease (disorder)|[603]. *Hereditary* requires case-by-case definition; it cannot be applied to broad categories. Nevertheless, the names by which many diseases are known include the term, and it is permitted, as long as it does not introduce ambiguity.

Co-occuring Genomic Disorders
Germline chromosomal abnormality *co-occurring* and *causing* disorder: 41040004 | Complete trisomy 21 syndrome (disorder)|[604]
If the phenotype is always caused by a specific genotype, there is no need to include the cause in the FSN or clarify with a *Due to* relationship.

Germline nucleotide sequence variant *co-occurring* and *causing* disorder: 190905008 | Cystic fibrosis (disorder)|[605]
Modeling for germline mutations causing conditions, such as cystic fibrosis, should have mutations, *Occurrence* = congenital, and *Due to* (attribute) the mutation finding.

For example,

- Cystic fibrosis *due to* G542X mutation

Somatic NSV (NCBI structural variant) *co-occurring* and *poly-etiologic*: BRAF V600E positive melanoma
Somatic mutations leading to cancer, such as *malignant melanoma with BRAF V600E mutation*, should have *dual supertypes*, including the malignant disorder and the somatic mutation, and *Due to* (attribute) with the associated somatic mutation finding.

For example,

- Melanoma with BRAF V600E mutation

Somatic IHC (immunohistochemical) finding *co-occurring* but not etiologic: Estrogen-receptor status in breast cancer
Representing two associated findings in a single concept may be convenient for recording; however, the representation of the two notions should be recorded separately.

For example,

- Breast cancer occurring with positive estrogen-receptor assay should be recorded in the information model as two separate concepts

603 http://snomed.info/id/32895009
604 http://snomed.info/id/41040004
605 http://snomed.info/id/190905008

The term phrase, "co-occurrent and due to" is no longer to be used in the fully specified name. There are existing concepts that use the co-occurrent and due to pattern, but these will be re-termed. Genetic mutations that cause a disorder are by definition co-occurrent, so there is no need to represent this in the FSN, but they should be modeled as co-occurring, i.e. supertypes for both conditions should be present.

Hematologic and lymphatic conditions

Hematologic, lymphatic
There is more than one meaning of *hematologic*. A definition based on hematological system *structure* includes hematopoietic and lymphoid structures (including bone marrow, spleen, thymus, lymph nodes, etc), as well as the cellular components of blood. *Hematologic neoplasms* clearly fit this definition.

A definition based on *clinical usage by hematologists* is broader. Disorders of hemostasis and thrombosis are often managed by hematologists, but these do not have a common structural overlap with the lymphoid and hematopoietic systems (with the exception of platelets and megakaryocytes). For clarity, *hematologic disorder* is a navigational concept that is used to define a *reference set* that includes disorders of blood and blood forming organs, as well as disorders of hemostasis and thrombosis, depending on what is intended.

Hematologic disorders, lymphoid and myeloid neoplasms
Hematologic disorders may refer to disorders of: hematopoietic cell origin; blood forming organs (bone marrow, lymph nodes, spleen, thymus, and other lymph tissues); cellular components of blood; or function of hemostatic and thrombotic systems.

Diseases of the blood forming organs (bone marrow, lymph nodes, etc.) can be defined by any one or a combination of the following:

The morphology (neoplastic diseases, at a minimum, include those morphologies covered by neoplasms in the International Classification of Diseases for Oncology, ICD-O).

For example,

- 118599009 |Hodgkin's disease (disorder)|[606] has 128930002 |Hodgkin lymphoma - category (morphologic abnormality)|[607]. The body site involved (especially specific lymph node groups or skin sites).

For example,

- 400122007 |Primary cutaneous T-cell lymphoma (disorder)|[608] has Finding site, skin structure (body structure)

For some disorders, like T-cell lymphomas, and plasma cell and immunosecretory disorders, it is important to distinguish those defined by morphology, site, or manifestation.

T-cell lymphomas can be subcategorized according to the primary site, a lymph node, the skin, or other extranodal site. This means that a *site* of lymphoid structure cannot be the defining characteristic of the parent concept *T-cell lymphoma*. Its defining attribute should be morphology alone.

Plasma cell and immunosecretory disorders (e.g. monoclonal gammopathy, heavy chain disease, Waldenstrom's macroglobulinemia) are defined by their manifestations, i.e. the type of monoclonal protein they secrete. Others (e.g. myeloma, plasmacytoma) are defined by their morphology, regardless of whether or not they are secretory.

Immunosecretory disorders may have a morphology of *plasma cell neoplasm*, even though no mass has been identified and the monoclonal protein may be the only evidence that there is a clonal neoplasm.

606 http://snomed.info/id/118599009
607 http://snomed.info/id/128930002
608 http://snomed.info/id/400122007

In general, lymphoid and myeloid neoplasms can be modeled with their morphologies, but without a site. Leukemias and myelodysplastic syndromes are modeled with Finding Site, bone marrow structure (body structure).

Coagulation, hemostasis, thrombosis
There is more than one meaning of *coagulation*. A broad meaning, to stop bleeding, is better described as *hemostasis*. A more narrow definition, limited to the formation of the fibrin clot, might exclude certain components of hemostasis (e.g the ability to stop hemorrhage through the actions of blood vessels, collagen, endothelial cells, and platelets, in the absence of clotting). Individuals with *congenital fibrinogen deficiency* cannot form fibrin clots, yet their bodies are able to stop bleeding. Therefore, *coagulation disorders* are kinds of *hemostatic disorders*.

Hernia

Hernias involve two body structures, one is the hernial opening and the other is the herniated structure. When modeling hernias, use two role groups to represent the body structures and the respective associated morphology for each site. If the herniated structure is not explicit, use the supertype concept for the finding site.

For example,

The concept 50063009 |Femoral hernia (disorder)|[609] is modeled with Finding site = 818983003 |Structure of abdominopelvic cavity and/or content of abdominopelvic cavity and/or anterior abdominal wall (body structure)| to represent the herniated structure.

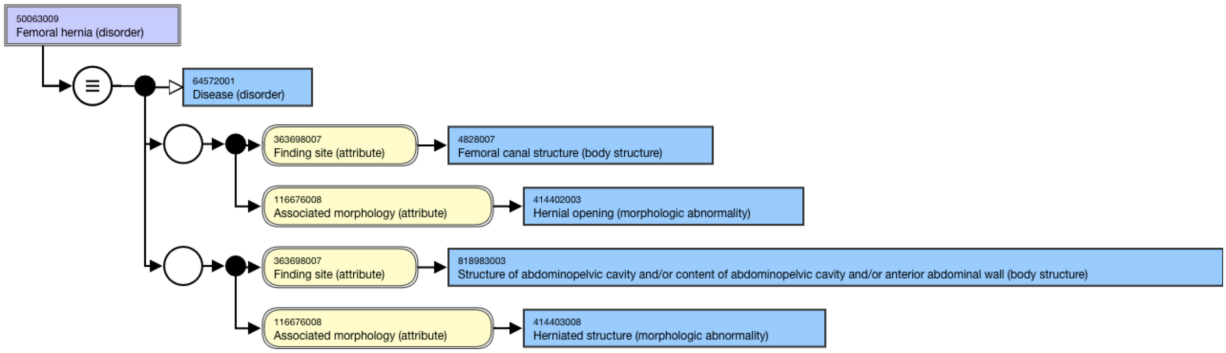


Figure 1: Stated view of Femoral hernia (disorder)

Iatrogenic

Adding further concepts to the iatrogenic disorder hierarchy is discouraged. Concepts must have *iatrogenic* in the FSN to be modeled with an IS_A relationship to 12456005 |Iatrogenic disorder (disorder)|[610]. An iatrogenic disorder should remain as a primitive concept if dependent only upon parent relationships to describe the disorder. In cases where the modeling is explicit, e.g. 202762009 |Iatrogenic cervical spinal stenosis (disorder)|, the concept can be defined.

For example,

609 http://snomed.info/id/50063009
610 http://snomed.info/id/12456005

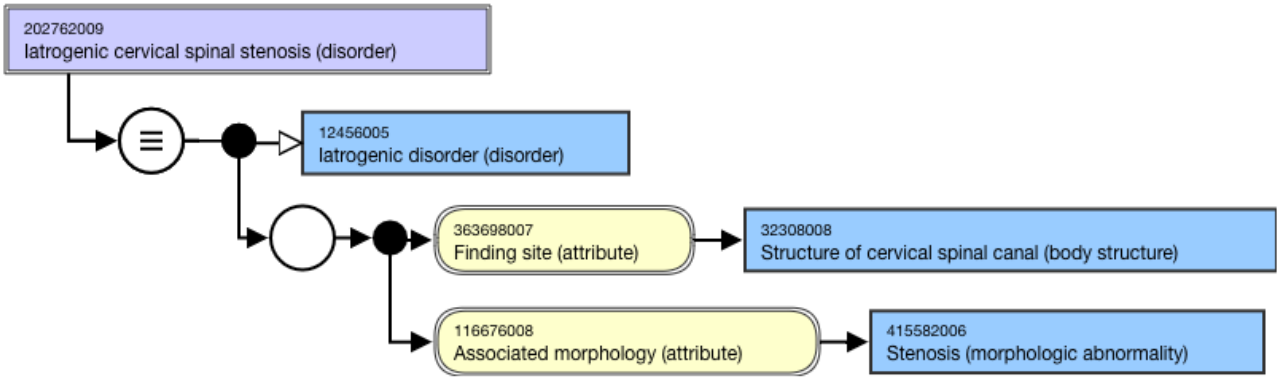


Figure 1: Stated view of |Iatrogenic cervical spinal stenosis (disorder)| using IS_A 12456005 |Iatrogenic disorder (disorder)|

Immune function disorders

Hypersensitivity

473010000 |Hypersensitivity condition (finding)|[611] is a primitive concept. It subsumes 473011001 |Allergic condition (finding)|[612] and 609405001 |Non-allergic hypersensitivity condition (finding)|[613].

473010000 |Hypersensitivity condition (finding)|[614] is a direct descendant of 404684003 |Clinical finding (finding)|[615].

473011001 |Allergic condition (finding)|[616] and 609405001 |Non-allergic hypersensitivity condition (finding)|[617] are both primitive concepts. Each has three main subhierarchies representing:

- Diseases/disorders: abnormal structures
- Processes: allergic and nonallergic hypersensitivity (pseudoallergic) reactions
- Dispositions: propensities to develop allergic and nonallergic hypersensitivity (pseudoallergic) reactions; they do not have pathophysiologic manifestations prior to allergic and nonallergic hypersensitivity (pseudoallergic) processes, i.e. reactions

Diseases/disorders and reactions, but not dispositions, are defined by underlying pathological processes.

Pathological process (qualifier value) hierarchy

In order to fully describe the full range of hypersensitivity responses, there are qualifier values in the Pathological process (qualifier value) hierarchy. (See also *Qualifier Value* page).

Allergic reaction

Allergic reaction (disorder) has a Causative agent (attribute) of Substance (substance) or its subtypes. This attribute-value pair is grouped with another attribute-value pair of Pathological process (attribute) and Allergic process (qualifier value).

611 http://snomed.info/id/473010000
612 http://snomed.info/id/473011001
613 http://snomed.info/id/609405001
614 http://snomed.info/id/473010000
615 http://snomed.info/id/404684003
616 http://snomed.info/id/473011001
617 http://snomed.info/id/609405001

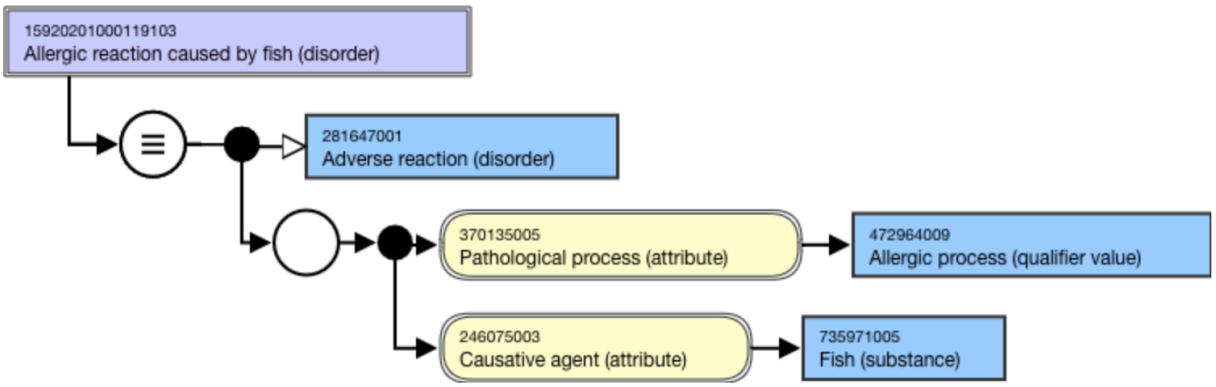


Figure 1: Stated view of 15920201000119103 |Allergic reaction caused by fish (disorder)|

Allergic process (qualifier value) is a subtype of Abnormal immune process (qualifier value) which means allergic disorders, as well as autoimmune disorders, classify as types of disorders of immune function. Disorder of immune function (disorder) modeling with Abnormal immune process (qualifier value) allows allergic and autoimmune disorders to correctly classify as subtypes of Disorder of immune function (disorder).

Allergic and nonallergic hypersensitivity (pseudoallergic) disease
Allergic and nonallergic hypersensitivity (pseudoallergic) diseases represent manifestations of pathologic processes that result in abnormal structures. Modeling an allergic and nonallergic hypersensitivity (pseudoallergic) disease includes the following relationship group:

IS A: Disease (disorder)

Associated morphology (attribute): subtype of Morphologically abnormal structure (morphologic abnormality) representing the abnormal structure

Finding site (attribute): subtype of Anatomical or acquired body structure (body structure) representing the abnormal structure

Pathological process: Hypersensitivity process (qualifier value) or one of its descendants

Causative agent (attribute): Substance (substance) or one of its descendants, if known

For example,

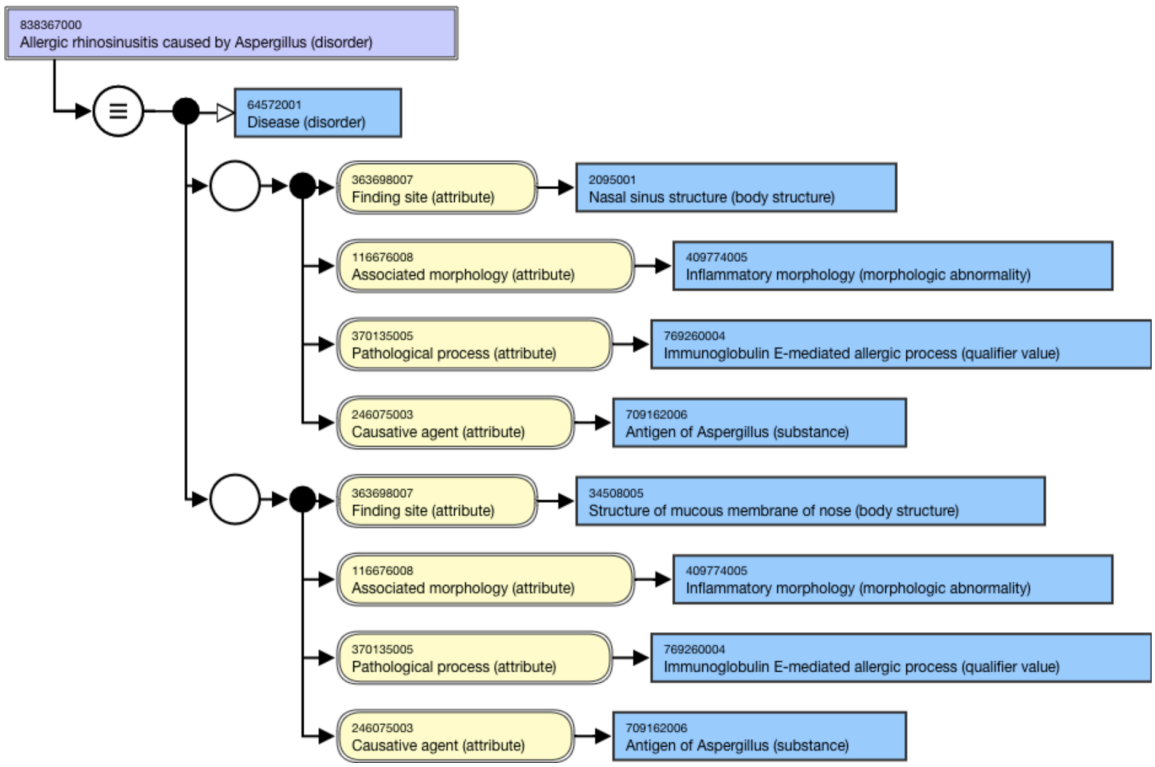


Figure 2: Stated view of 838367000 |Allergic rhinosinusitis caused by Aspergillus (disorder)|

Allergic and nonallergic hypersensitivity (pseudoallergic) disposition
Allergic and nonallergic hypersensitivity (pseudoallergic) dispositions are propensities to develop allergic and nonallergic hypersensitivity (pseudoallergic) reactions; they do not have pathophysiologic manifestations prior to reactions. They are considered clinical findings, not disorders. This further distinguishes them from allergic and nonallergic hypersensitivity (pseudoallergic) reactions.

Allergy to X (finding) will have the following modeling:

IS A: Propensity to adverse reaction (finding)

Role group of:

Has realization (attribute): Allergic process (qualifier value)

Causative agent (attribute): subtype of Substance (substance)

For example,

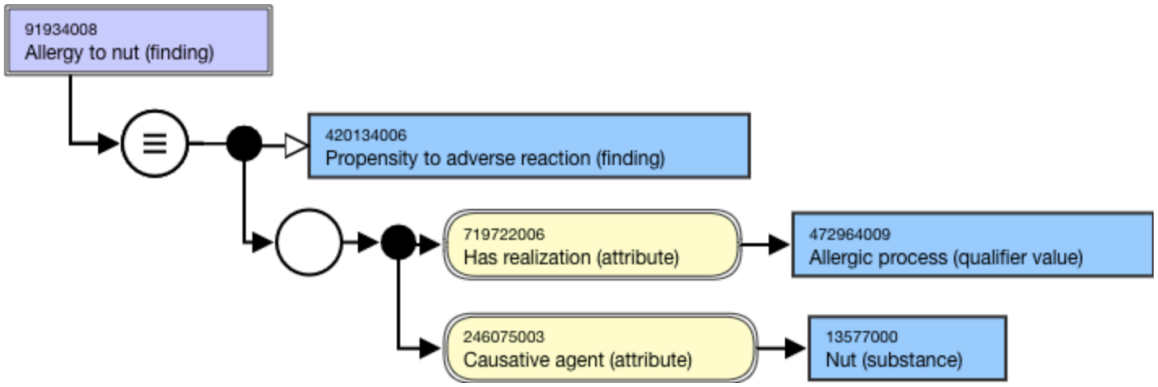


Figure 3: Allergic and nonallergic hypersensitivity (pseudoallergic) disposition example, stated view of Allergy to nut (finding)

For example,

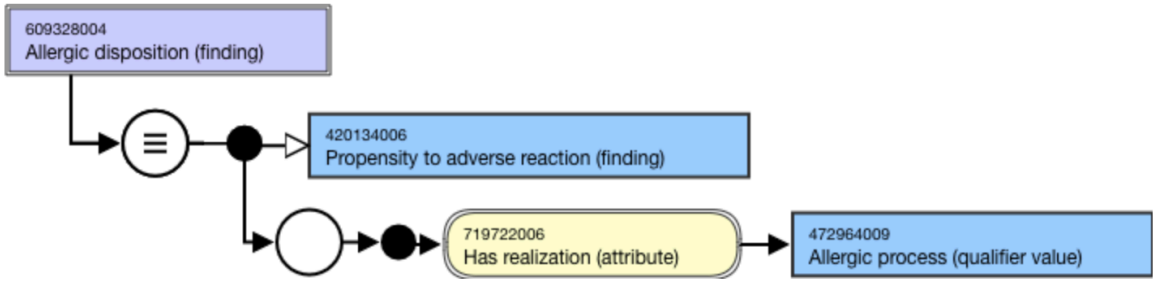


Figure 4: Allergic disposition (finding) model in stated view

Nonallergic hypersensitivity (pseudoallergic) reaction
Nonallergic hypersensitivity (pseudoallergic) reactions are adverse reactions; they are defined by an underlying pathological process.

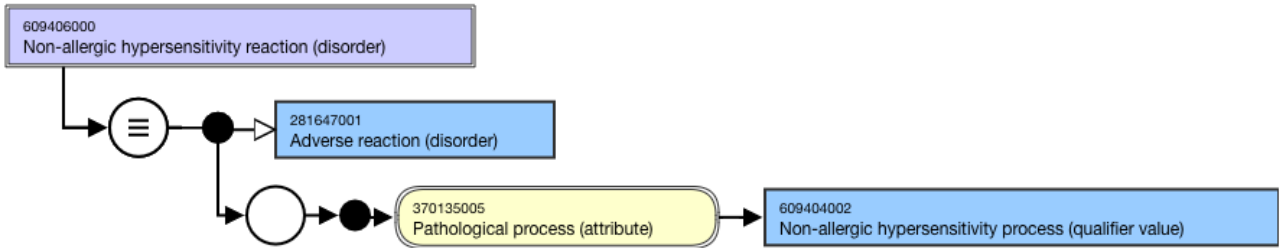


Figure 5: Nonallergic hypersensitivity (pseudoallergic) reaction model in stated view

For example,

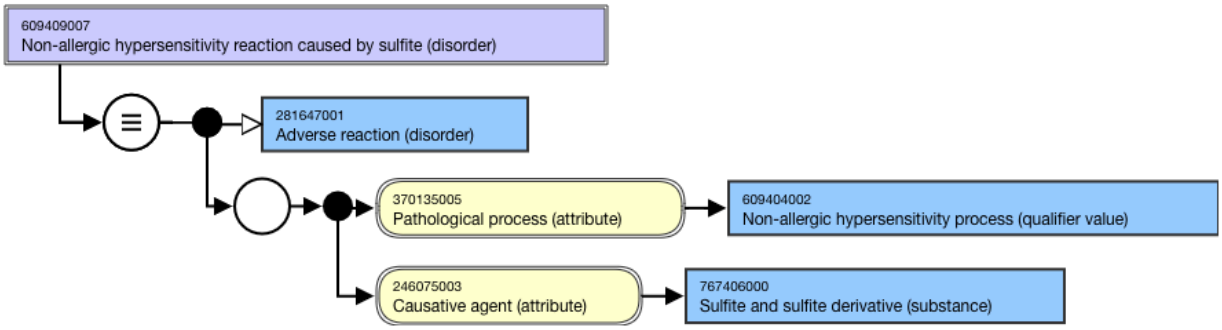


Figure 6: Example of nonallergic hypersensitivity (pseudoallergic) reaction model in stated view

Intolerance to substance

An *intolerance* is the propensity to develop an adverse reaction to a substance. The adverse reaction may be associated with various pathological processes, but specifically excludes hypersensitivity reactions.

It may be difficult to define the pathological process and to associate the substance with the propensity to develop a reaction. Consequently, 47429007 |Associated with (attribute)|[618] is used to model intolerance to substances.

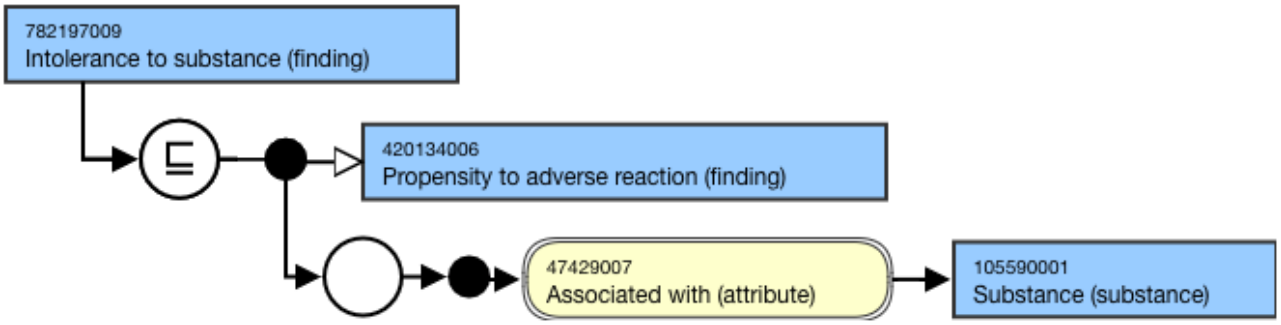


Figure 7: Stated view of Intolerance to substance (finding) model

For example,

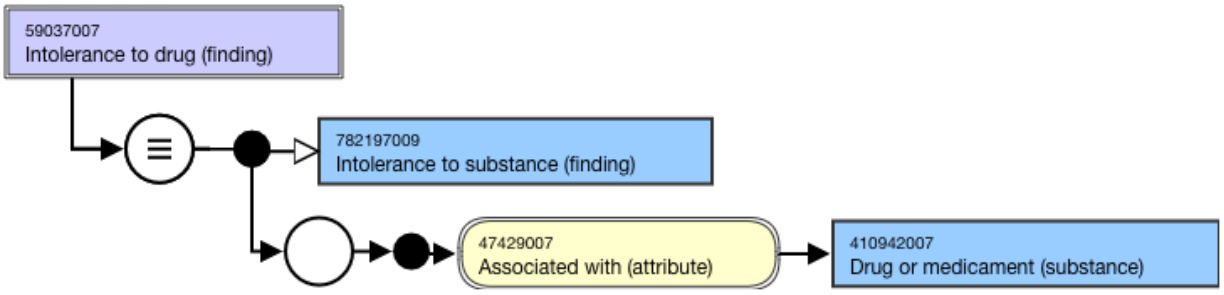


Figure 8: Stated view of 59037007 Intolerance to drug (finding)

618 http://snomed.info/id/47429007

Infectious vs. inflammatory

Disorders with the suffix "-itis" (e.g. cystitis, prostatitis, tonsillitis, appendicitis) are often infectious as well as inflammatory in nature.

For inflammatory conditions whose FSNs specify an *infective cause*, the modeling should include:

- |Causative agent (attribute)|[619] with the specified organism
- |Pathological process (attribute)|[620] with the type of infectious process
- |Associated morphology (attribute)|[621] with Inflammatory morphology or subtype
- |Finding site (attribute)|[622] with a body structure when known

For inflammatory conditions whose FSNs do *not* specify an infective cause, an infectious cause should neither be assumed nor modeled when the FSN does not specify it. The modeling would then exclude a Causative agent and Pathological process and should include only:

- |Associated morphology (attribute)|[623] of Inflammatory morphology or subtype
- |Finding site (attribute)|[624] with a body structure when known

Example of inflammatory *and* infectious disorder,

441551009 |Inflammation of larynx caused by virus (disorder)|[625] (synonym, Viral laryngitis) includes a |Causative agent (attribute)|[626] of |Virus (organism)|[627] and a |Pathological process (attribute)|[628] of |Infectious process (qualifier value)|[629].

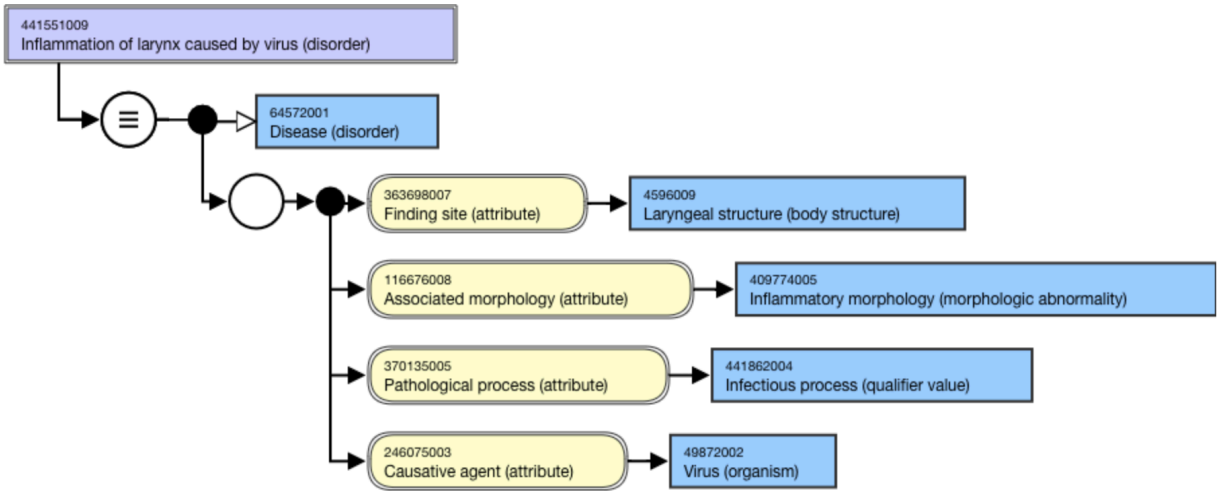


Figure 1: Stated view of 441551009 |Inflammation of larynx caused by virus (disorder)|

Example of inflammatory disorder *not* specified as infectious,

619 http://snomed.org/-fictid
620 http://snomed.org/-fictid
621 http://snomed.org/-fictid
622 http://snomed.org/-fictid
623 http://snomed.org/-fictid
624 http://snomed.org/-fictid
625 http://snomed.info/id/441551009
626 http://snomed.org/-fictid
627 http://snomed.org/-fictid
628 http://snomed.org/-fictid
629 http://snomed.org/-fictid

446292002 |Necrotizing inflammation of lymph node (disorder)|[630] (synonym, Necrotizing lymphadenitis) does not specify an infective cause, so it is neither modeled with Causative agent nor Pathological process. The model contains an |Associated morphology (attribute)|[631] and a |Finding site (attribute)|[632].

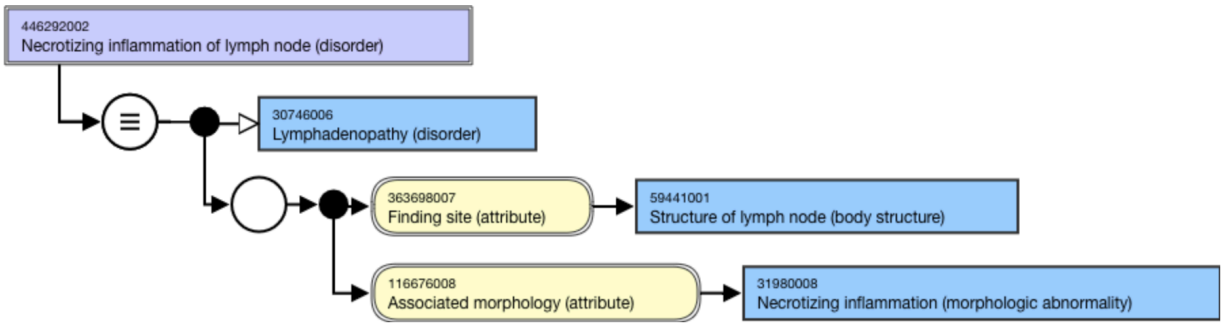


Figure 2: Stated view of 446292002 |Necrotizing inflammation of lymph node (disorder)|

Ischemia

Ischemic disorder

Ischemic disorders are defined by a morphology of ischemic structural change. This need not be permanent, but it is assumed that all ischemia results in some structural alterations at the molecular level.

Ischemic heart disease

Ischemic heart disease includes myocardial infarction, myocardial ischemia (without infarction), angina, and other disorders of the heart that have ischemic structural change (reversible or non-reversible) as a *defining characteristic*.

Coronary arteriosclerosis can, of course, be present without causing ischemia, so coronary arteriosclerosis is not a *subtype* of ischemic heart disease.

Likewise, there are causes of myocardial ischemia and infarction other than coronary arteriosclerosis, so ischemic heart disease is not a *subtype* of coronary arteriosclerosis.

Lesion

The word *lesion* can be used to refer to both structural and functional abnormalities. This makes a subtle distinction between the clinical finding and disorder semantic tags. The majority of lesions in SNOMED CT are in the disorder subhierarchy.

Lesion as a disorder

If a concept refers to a lesion that is a structural abnormality, then apply the (disorder) semantic tag, and model with an 116676008 |Associated morphology (attribute)|[633] of << 52988006 | Lesion (morphologic abnormality)|[634] .

If a *procedure* refers to a lesion that is a structural abnormality, then model with a 405816004 |Procedure morphology (attribute)|[635] of << 52988006 | Lesion (morphologic abnormality)|[636] .

Lesion as a finding

Lesion concepts referencing characteristics of a lesion are subtypes of 300577008 |Finding of lesion (finding)|.

630 http://snomed.info/id/446292002
631 http://snomed.org/-fictid
632 http://snomed.org/-fictid
633 http://snomed.info/id/116676008
634 http://snomed.info/id/52988006
635 http://snomed.info/id/405816004
636 http://snomed.info/id/52988006

Imaging-related lesion findings remain as finding concepts.

Functional lesions should not be modeled using values from the 52988006 |Lesion (morphologic abnormality)| subhierarchy.

Malformation, deformity, anomaly

The word *anomaly* is, by itself, ambiguous as it may mean either a structural or functional abnormality, depending on the body structure to which it is applied. Concepts using the term *anomaly* must be evaluated to determine whether it represents a structural or functional abnormality. Using the term "anomaly" in new concept FSNs is not allowed. The terms "structural abnormality" should be used when it is unclear whether the morphology results from malformation or deformation.

A *deformity* is a structural abnormality that is due to an extrinsic physical force. Newly created concepts representing a deformity should be considered disorders.

A malformation is a structural abnormality that results from intrinsically disordered development.

For example,

- *Congenital anomaly of <body structure>* is currently modeled as a structural abnormality but is not the same as *Congenital malformation* (structural abnormality due to intrinsically disordered development present at birth). Therefore, it can be regarded as having the more general meaning of *structural abnormality present at birth*.

When referring to a broad term to denote an intrinsic structural abnormality (e.g., Structural abnormality of fetal bladder) and plan to include 49755003 |Morphologically abnormal structure (morphologic abnormality)| in the model, use the pattern *Malformation of fetal X* or *Congenital malformation of X*.

See other relative sections in guide

- Genetic, developmental, congenital, and physical origin
- Acquired abnormality of congenital anomaly
- Congenital

Maternal, fetal, neonatal

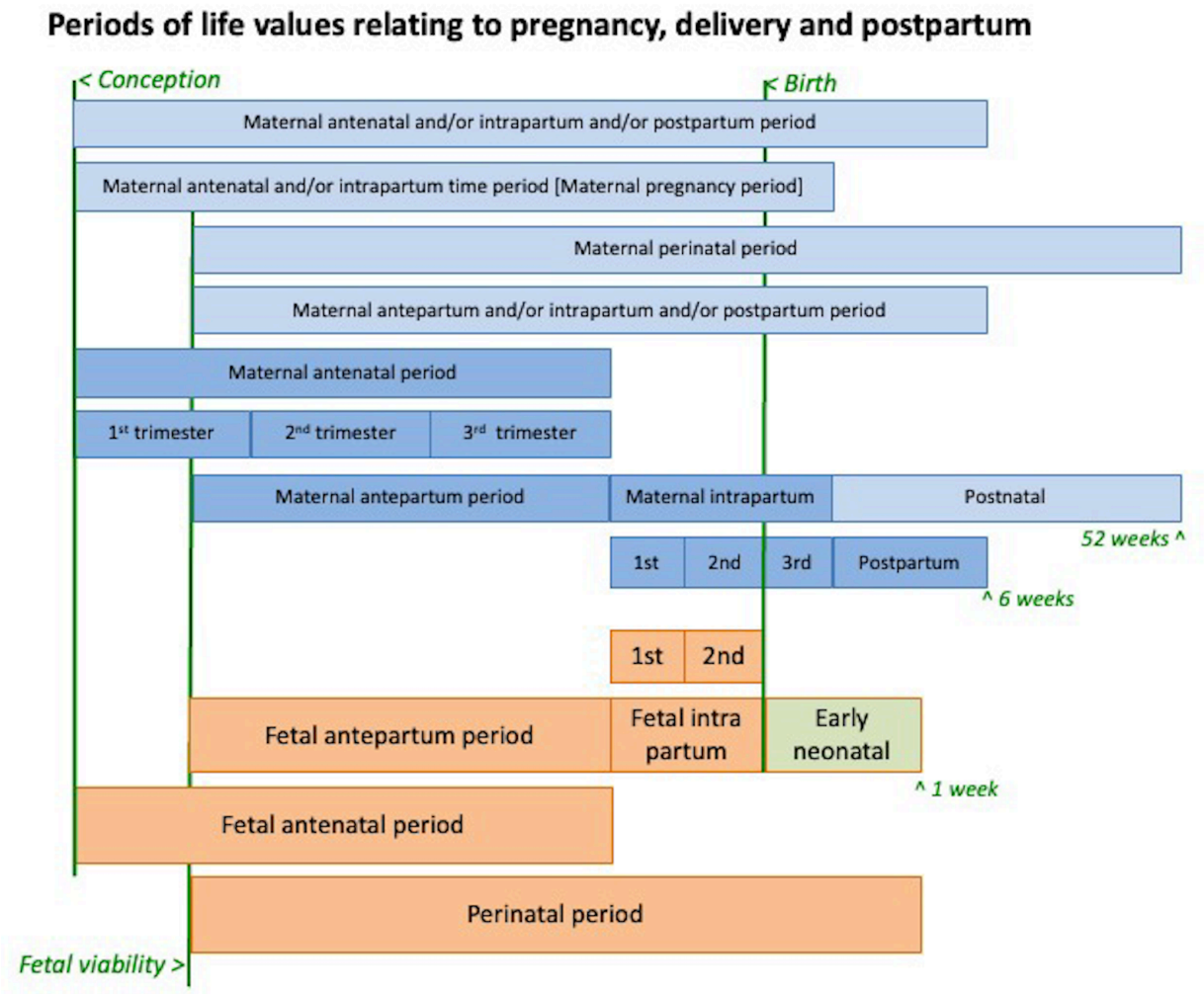
Pregnancy Periods
The life phase of pregnancy is unique in that two *actors* are participants in the scenario, and modeling must distinguish between the two.

For example,

Fetal tachycardia in antepartum versus *Maternal tachycardia in antepartum*

Mother and fetus share many time periods, such as antenatal. However, some periods are not shared, as in the case of intrapartum. The mother's intrapartum period includes stages one, two, and three; the fetus' intrapartum period includes only stages one and two.

A diagram of the relationships between these periods is shown below:



The life phase of pregnancy-related findings and disorders is applied using the Occurrence (attribute). A concept must identify:

1. Which actor (mother or the fetus/neonate) does the circumstance relate
2. In which life phase of the actor does the condition necessarily relate

In the majority of circumstances, the *actor* to which the condition relates is straight forward: mother or fetus or neonate.

For example,

- *Antenatal care* relates to both the mother and fetus/neonate
- *Antenatal depression* clearly relates to the mother
- *Short cord with antenatal problem* directly relates to the fetus

Other instances such as *Intrapartum hemorrhage due to marginal placenta previa* may not be so clear without explicit modeling, as hemorrhage with placenta previa can relate to the fetus or mother.

PERINATAL & NEONATAL

The word *perinatal* within finding terms is problematic, because it almost always relates to the fetus/neonate. Due vigilance is required to exclude the rare possibility that the condition could relate to the mother. *Perinatal* can refer to the mother alone (perinatal depression) or to a time period relating to the fetus until the neonate is seven days old.

This situation creates two problems:

#1

The term *perinatal* is a term with widely varying definitions across countries due in part to legal variations in the time period that defines stillbirth.

The term *neonatal* generally describes an infant within the first 28 days. Where the condition relates to an infant within the first *seven* days, the term *early neonatal* is allocated. The term *late neonatal* is used from day eight to 28 (WHO, 1992). Although these descriptions are used widely, they are not universally accepted worldwide. These time periods are useful, however, in modeling existing content which was derived from WHO sources.

Future content should use the term *neonatal* unless a valid use case can be supported in the content request to distinguish between the early and late neonatal period.

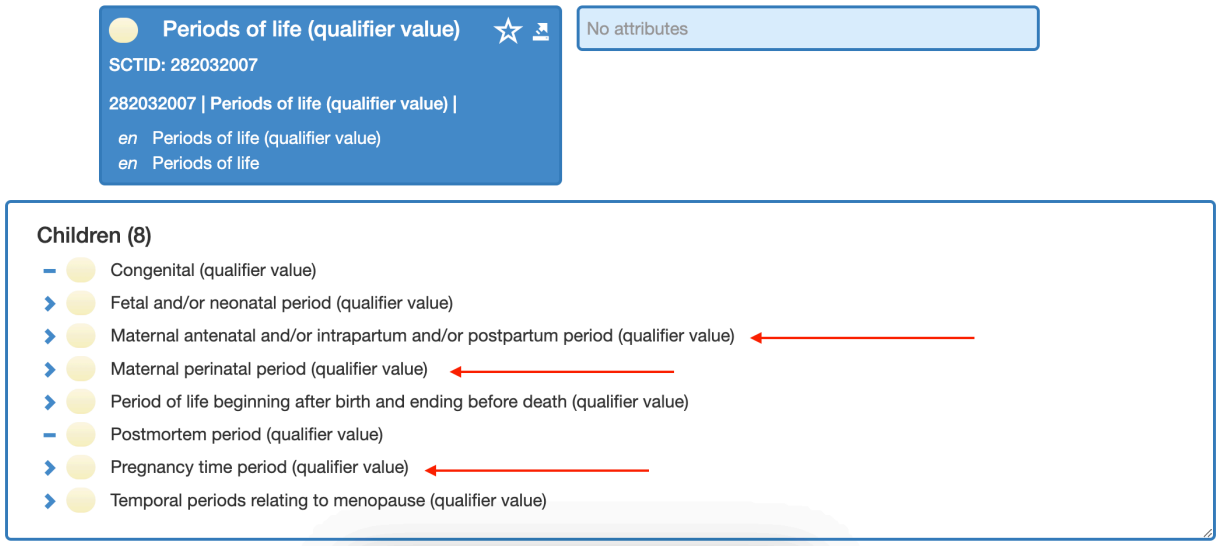
#2

The terming of the perinatal period for the fetus and neonate is problematic as there is not a clinically useful name for the *actor* that covers this entire temporal period. It is possible that *baby* might be applicable, i.e., *Perinatal disorder of baby*, but this is not used clinically. To create an explicit FSN, the rather ungainly term |[Clinical finding] of fetus and/or early neonate| has been used. This problem is anticipated to be temporary, as new content will be steered to explicitly state whether the condition relates to the fetus or to the neonate.

In relation to the neonate, there is a clinical and epidemiological distinction between the early neonatal period and the late neonatal period. Conditions in the immediate (early) neonatal period are largely influenced by intrauterine conditions; those in the late neonatal period are more influenced by early extrauterine life. This distinction is important as *perinatal disorders* historically were often considered a concatenation of disorders occurring in the fetal phase and the early neonatal phase. However, one unresolvable difficulty with this definition is that there is no international agreement in the definition of *perinatal phase*, which has variable definitions:

- WHO = 22 completed weeks of gestation and ends seven completed days after birth
- UK = the time from fetal viability from about 24 weeks of pregnancy up to seven days of life
- USA = 28 weeks of gestation to the end of the seventh day of life
- Australia = 20 completed weeks of gestation and ends 28 completed days after birth

Pregnancy Period Values
Maternal time period values can be found in the subhierarchies below:



Generally, it is clear what the appropriate value is, but some knowledge is required to distinguish the correct choice in some circumstances. Definitions have been added to aid in correct selection.

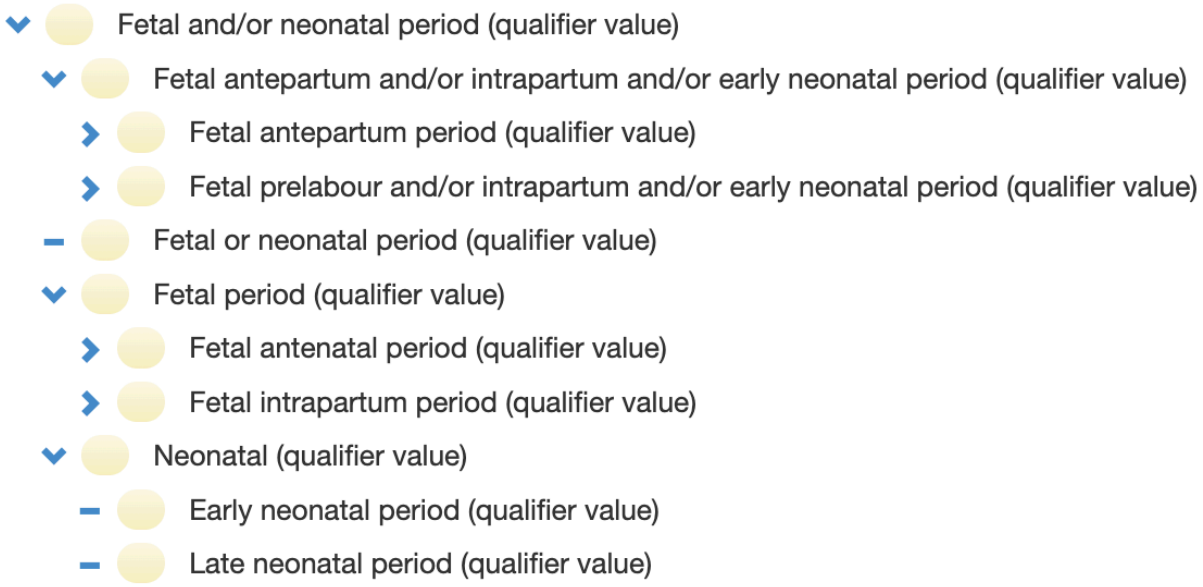
For example,

In relation to *postpartum uterine hemorrhage*, this would be modeled using an Occurrence (attribute) of Postpartum period. The puerperium is generally defined as the period within 42 days after birth, and thus, the postpartum period relates to this six-week timeframe. Some conditions can occur more than 6 weeks post-delivery, e.g., *postpartum thyroiditis*, *postnatal depression* (onset can range from a few days to a few weeks following delivery, generally in the first 2–3 months following childbirth). In this situation, the choice of the more general *Maternal postnatal* period should be made.

Obstetric conditions

Use of the term *obstetric* is confusing in regards to both timing and determination of the intended person. Concepts should rather explicitly identify these elements.

Fetal Neonatal Period Values
Similar to the Maternal time periods above, the fetal period is the superordinate as illustrated below. There is no label for the concatenated time of the actor during the fetal and neonatal period within medicine (though colloquially called baby), and so the superordinate is named *fetal and/or neonate*. Similarly, to find concepts which describe conditions of this global phase requires a preferred term expressing this, but in the case of perinatal conditions relating to the fetus and/or early neonate, the word perinatal is commonly used as a substitute.



When modeling a fetal finding or fetal disorder, the |Finding site (attribute)| should not be a *fetal* body structure unless the structure is unique to the fetal period, such as |Umbilical cord structure (body structure)|.
Note: This is guideline has not been applied to fetal procedures at this point in time.

Fetal and/or neonatal period *versus* Fetal or neonatal period

Review is ongoing of all disorder concepts containing the phrase *fetal or neonatal.* The concept 450426006 |Fetal **or** neonatal period (qualifier value)| will be inactivated, leaving only 1156676003 |Fetal **and/or** neonatal period (qualifier value)|.

- The *fetal **or** neonatal* value is historically derived from ICD and may contain legacy context causing ambiguity.
- The *fetal **and/or** neonatal* period is explicitly designed to subsume the fetal period, the *neonatal period*, and in rare cases where these two may overlap, as in 1193538001 |Fetal intrapartum second stage and/or early neonatal period (qualifier value).

Umbilical cord complication
Model as IS A 362972006 | Disorder of labor / delivery (disorder)|[637] due to X (disorder). The concept 48287005 | Umbilical cord complication (disorder)|[638] is to be inactivated.

Measurement findings

The following applies to the subcategory of 118245000 |Measurement finding (finding)|:

- *Detected* and *Not detected* are used in the FSN, PT, and modeling of measurement findings instead of *Present*, *Positive*, *Absent,* and *Negative*.
  - Existing acceptable descriptions with *Present*, *Positive*, *Absent,* and *Negative* can remain.
- *Above reference range*, *Below reference range*, *Within reference range*, and *Outside reference range* should be used in the FSN, PT, and modeling of measurement findings instead of *High*, *Raised*, *Elevated*, *Increased*, *Low*, *Decreased*, *Normal*, and *Abnormal*.
  - Existing acceptable descriptions with *High*, *Raised*, *Elevated*, *Increased*, *Low*, *Decreased*, *Normal*, and *Abnormal* can remain.
- *Borderline* measurement findings are ambiguous and should not be added.
- False positive and false negative measurement findings should not be included.

See template[639].

Mental health

Dependence-related concepts which express the current existence of abuse are acceptable.

For example,

- 191816009 |Drug dependence (disorder)|[640]

Dependence-related concepts which express the pattern as either continuous or episodic are not acceptable.

Unacceptable patterns:

- X with single episode
- X with multiple episodes
- Current episode of X
- First episode of X
- X with continuous pattern

Unacceptable legacy concepts:

- Drug abuse, continuous (disorder)
- Episodic drug abuse (disorder)

637 http://snomed.info/id/362972006
638 http://snomed.info/id/48287005
639 https://confluence.ihtsdotools.org/display/SCTEMPLATES/Measurement+%28finding%29+-+v0.2
640 http://snomed.info/id/191816009

Concepts describing *full* or *partial remission* are acceptable but not the phase of the remission.

Acceptable patterns:

- X in full remission
- X in partial remission

For example,

- 46244001 |Recurrent major depression in full remission (disorder)|[641]
- 5703000 |Bipolar disorder in partial remission (disorder)|[642]

Unacceptable patterns:

- X in early full remission
- X in sustained full remission
- X in sustained partial remission

Conditions with associated symptoms should be expressed and modeled like combined disorders. *Due to* situations are acceptable but not simple *Co-occurrent.*

For example,

- 703850002 |Delirium due to benzodiazepine withdrawal (disorder)|

Concepts containing X without Y are considered on a case-by-case basis.

Acceptable example:

- 724735003 |Oppositional defiant disorder without chronic irritability-anger (disorder)|[643]

Unacceptable example:

- Bipolar type II disorder with current episode moderately depressive without psychotic symptoms

See also relative page:
Remission[644]

Multisystem disorders

Multisystem disorders are often rare conditions. There may be limited information about such disorders, so they should be carefully modeled.

When determining parent concepts:

- A multisystem parent concept should be included.
- Genetic or inherited disorders should be modeled in the same way as other genetic and inherited disorders.
- The manifestations of the disorder must always necessarily be true before assigning the relevant parents.
- Attributes must also always necessarily be true.
  - For example,
    - 702410002 |Iris coloboma with ptosis, hypertelorism, and mental retardation (disorder)|[645] Since the coloboma of the iris is not always present, coloboma would not be explicitly modeled in the relationships.

Some multisystem disorders can be named by their manifestations. The FSN should be descriptive rather than just a list of names.

641 http://snomed.info/id/46244001
642 http://snomed.info/id/5703000
643 http://snomed.info/id/724735003
644 https://confluence.ihtsdotools.org/display/WIPEG/Remission
645 http://snomed.info/id/702410002

For example,

- 717909004 |Bilateral microtia with deafness and cleft palate syndrome (disorder)|[646]

A multisystem disorder with an eponymous syndrome name should be included as a synonym only.

Neoplasm

Tumor vs. neoplasm
The word *tumor* has two primary meanings: a mass, regardless of whether it is neoplastic or not; or a neoplastic mass. The term *neoplasm* is preferred since it is less ambiguous than tumor. The word *tumor* is acceptable as a synonym but not as a preferred term.

For example,

- 92385005 |Benign neoplasm of small intestine (disorder)|[647]

Primary malignant neoplasm
Previously in SNOMED CT, the hierarchy of 372087000 |Primary malignant neoplasm (disorder)| was defined by using an Associated morphology (attribute) relationship to <<86049000 |Malignant neoplasm, primary (morphologic abnormality)|. 86049000 |Malignant neoplasm, primary (morphologic abnormality)| and 367651003 |Malignant neoplasm of primary, secondary, or uncertain origin (morphologic abnormality)| have been inactivated in the November 2022 release and replaced with 1240414004 |Malignant neoplasm (morphologic abnormality)|.

Primary malignant neoplasm disorders are now defined with a role group combining:

- finding site
- associated morphology
- pathological process with a target value of 1234914003 |Malignant proliferation of primary neoplasm (qualifier value)|

For example,

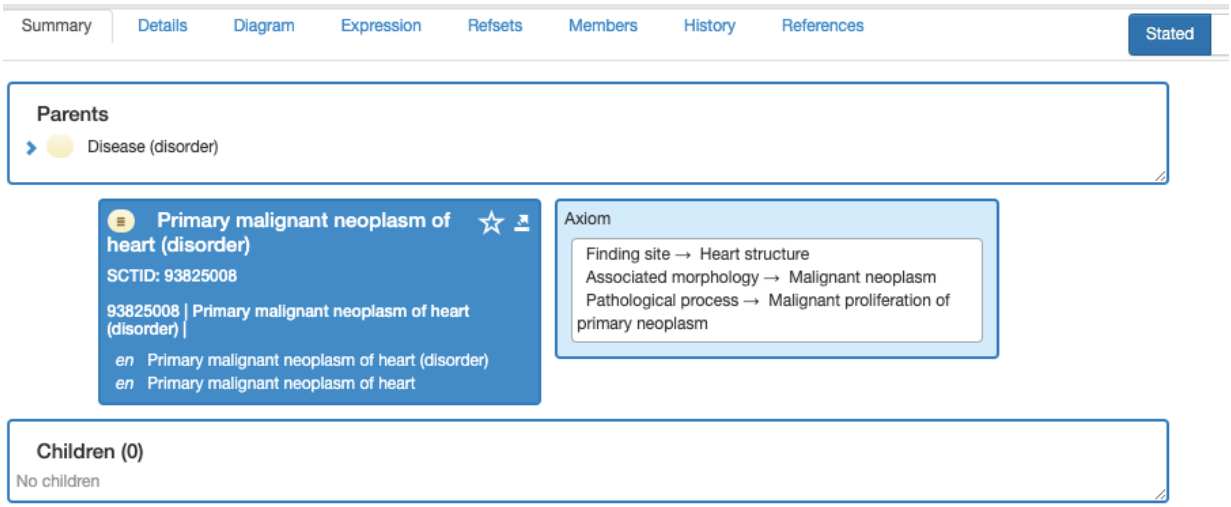


Figure 1: Stated view of 93825008 |Primary malignant neoplasm of heart (disorder)|

646 http://snomed.info/id/717909004
647 http://snomed.info/id/722671009

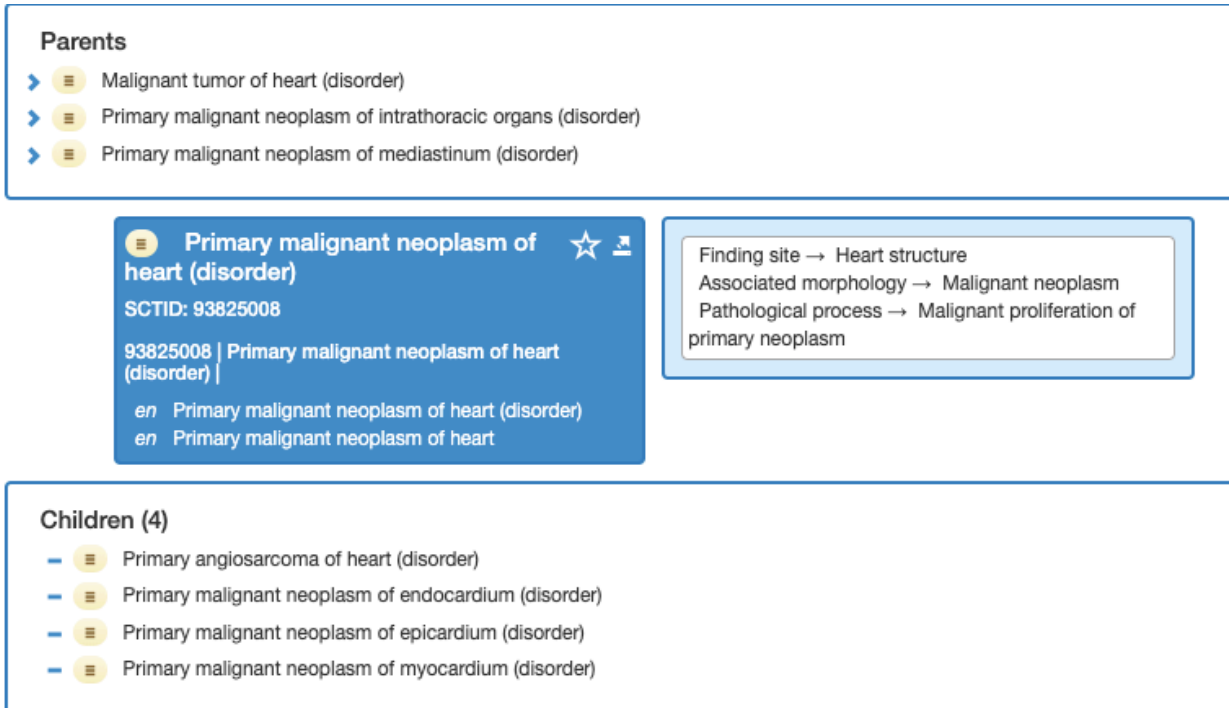


Figure 2: Inferred view of 93825008 |Primary malignant neoplasm of heart (disorder)|

Metastatic malignant neoplasm
Precoordination of the metastatic malignant neoplasm with both the primary and metastatic sites is not allowed. Having both metastatic malignant neoplasm from x body structure to y body structure in a single concept results in a combinatorial explosion of all possible malignant neoplastic morphological cell types, with all possible body sites of the primary malignancy, and with all possible sites of the metastases. Users are instead directed to record two separate concepts.

SNOMED CT joins ICD-O, ICD-10, and ICD-11 where *metastatic malignant neoplasm of site x* is uniformly interpreted to mean metastasis has occurred to site x. To make this explicit in SNOMED CT, the following terming has been adopted:

FSN: Metastatic malignant neoplasm to x body structure (disorder)
PT: Metastatic malignant neoplasm to x body structure
SYN: Secondary malignant neoplasm of x body structure
SYN: Metastatic malignant neoplasm of x body structure

For example,

FSN: Metastatic malignant neoplasm to foot (disorder)
PT: Metastatic malignant neoplasm to foot
SYN: Secondary malignant neoplasm of foot
SYN: Metastatic malignant neoplasm of foot

> *Secondary* is no longer the preferred word within the cancer & pathology community of practice; use *metastatic*.

Metastatic disorders are defined by a role group containing the finding site and specific metastatic morphologic abnormality.

For example,

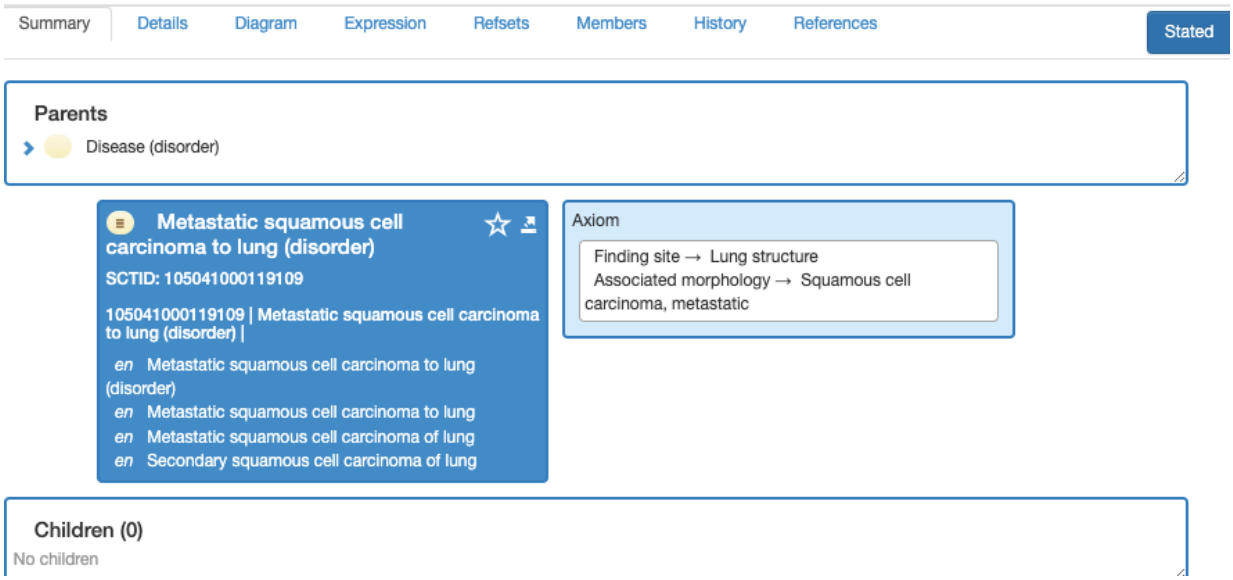


Figure 3: Stated view of 105041000119109 |Metastatic squamous cell carcinoma to lung (disorder)|

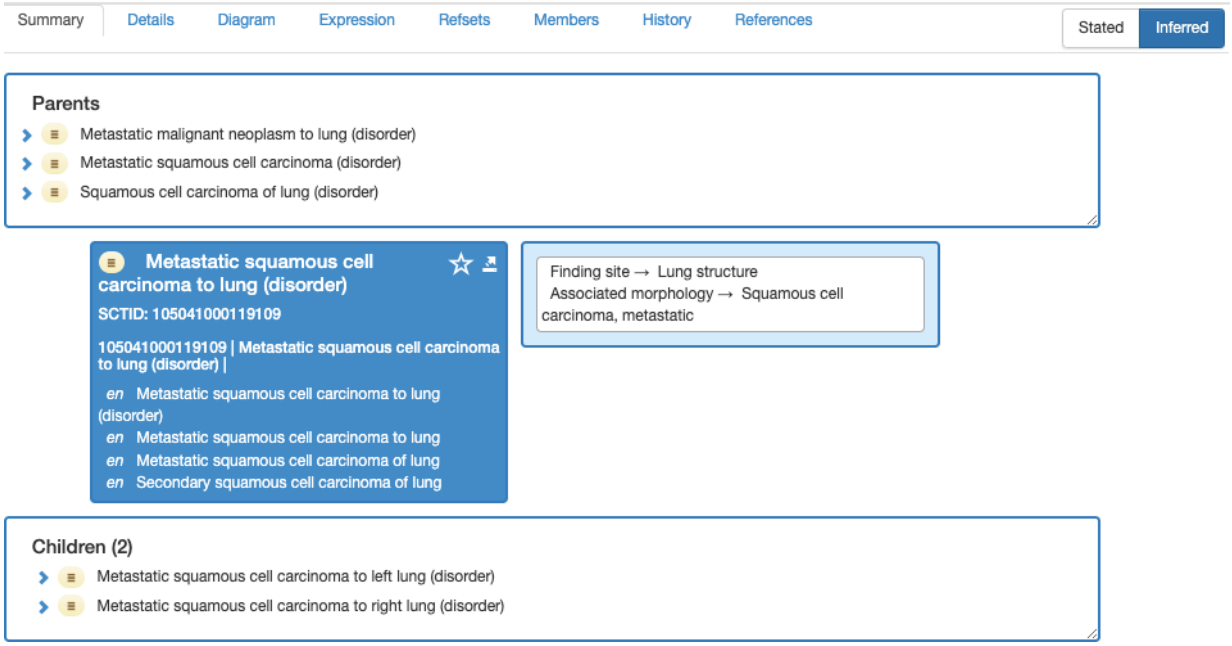


Figure 4: Inferred view of 105041000119109 |Metastatic squamous cell carcinoma to lung (disorder)|

See also Neoplasms Observable[648]page

Use of the term *cancer*
Disorder concepts defined with 1240414004 |Malignant neoplasm (morphologic abnormality)| may have *cancer* added as an acceptable synonym. The term *cancer* should not be used in the FSN or preferred term. Neither should it be used in descriptions for concepts that are more specific subtypes of the top level malignant neoplasm grouper (i.e., where the morphology is a specialized cell type).

The term *cancer* may also be used in the '*metastatic cancer to x body structure*' synonym description where the morphological type of metastatic neoplasm is unknown, i.e., it is defined with 14799000 |Neoplasm, metastatic (morphologic abnormality)|.

Neoplasia
When modeling neoplasia, distinguish structure from process. Do not use *neoplasia* in the FSN to identify the structure (even though it implies it). Use 126537000 |Neoplasm of bone (disorder)|[649], not *neoplasia of bone*.

Neoplastic disease refers to the process of *neoplasia*, leading to the formation of a *neoplasm*.

Neoplasm versus hamartoma
A neoplasm is defined as a growth of tissue no longer under normal control. A hamartoma is defined as a benign, self-limiting growth of disorganized mature cells normally found in the region, representing faulty development. SNOMED CT has disorder (and morphologic abnormality) concepts and subtypes representing neoplasia, hamartomas, and tumors.

The SNOMED CT concept 399981008 |Neoplasm and/or hamartoma (disorder)|[650] has six subtypes:

- angiomatosis
- hamartoma
- hemangioma
- lymphangioma
- melanocytic nevus
- neoplastic disease

The SNOMED CT concept 400177003 |Neoplasm and/or hamartoma (morphologic abnormality)|[651] also has six subtypes:

- angiomatosis
- blood vessel tumor
- hamartoma
- lymphatic vessel tumor
- melanocytic nevus
- neoplasm

Nevus
The word *nevus* has many different meanings. The differences are generally based on answers to the following questions:

- Is it necessarily on the skin? Or can it be located in mucosal sites or other sites?
- Is it necessarily visible? Or can it be in internal locations such as gastric mucosa, etc?
- Is it necessarily present at birth? Or can it occur later in life?

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648 https://confluence.ihtsdotools.org/display/WIPEG/Neoplasm+Observables
649 http://snomed.info/id/126537000
650 http://snomed.info/id/399981008
651 http://snomed.info/id/400177003

- Is it necessarily dark and made of melanocytes? Or can it be non-pigmented, or made of other types of cells?
- Is it necessarily made of tissue that is normally present at the site? Or can it be ectopic?
- Does it exclude benign neoplasms?

Some common meanings of nevus based on some combinations of answers to the questions are as follows:

- A birthmark, that is, any visible spot on the skin or oral mucosa present since birth, regardless of tissue of origin, excluding benign neoplasms.
- Any benign cluster of melanocytes, regardless of location, and regardless of pigmentation, whether present since birth or appearing later.
- Any cutaneous hamartoma. This excludes non-cutaneous sites, and excludes neoplasms and ectopic tissue, such as choristomas.

As a result of this wide variation in meaning, any SNOMED CT FSN containing the word *nevus* may be ambiguous. For example, the term *vascular nevus* may mean:

- Congenital blood vessel tumor in the skin
- Congenital blood vessel hamartoma or neoplasm that is visible somewhere (not only the skin, but also the mucosa, whether visible externally or not)
- Congenital blood or lymphatic vessel tumor in the skin
- Congenital blood or lymphatic vessel hamartoma or neoplasm that is visible somewhere
- Any of the above but not necessarily congenital

A better FSN for vascular nevus (morphologic abnormality) would be vascular hamartoma (morphologic abnormality). Likewise, a better FSN for congenital vascular nevus (disorder) would be congenital vascular hamartoma (disorder).

In those cases where common clinical usage of a term containing nevus is unambiguous, there is no need to inactivate the description or the concept.

Overlapping neoplasm
Overlapping neoplasm concepts refer to a neoplasm that overlaps two or more adjacent **sites.** For clarity, the phrase *overlapping sites* should be included in the descriptions for the FSN and PT for new overlapping neoplasm content.

Do not use *overlapping lesion* wording.

For example,
188247000 | Malignant neoplasm of overlapping sites of bladder (disorder)|[652]

For modeling an overlapping neoplasm concept, if the concept refers to contiguous sites involving more than one anatomical site, then a separate role group is used for each finding site.

However, assigning a role group for each finding site does not sufficiently define a concept but merely indicates the presence in both sites of a neoplasm. Where a relevant primitive existing overlapping neoplasm concept is available, this can be used as a stated primitive parent to sufficiently define the concept.

For example,
Sufficiently defined concept 721624000 |Primary adenocarcinoma of overlapping sites of esophagus (disorder)| has a stated primitive parent of 187824009 |Malignant neoplasm of overlapping sites of digestive system (disorder)|.

Colorectum

652 http://snomed.info/id/188247000

The terms *colorectal* and *colorectum*, commonly used by pathologists, are included in descriptions for concepts referring to neoplasms modeled with 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)|. 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)| is needed because neoplasms are the same from the cecum to rectum and are considered as a group in cancer synoptic reporting protocols. Note, there is no consensus concerning the definition of *colon* in the literature and between different domains.

Congenital neoplasm

When modeling a congenital neoplasm disorder, the attribute-value relationship of *Pathological process (attribute)* = *Pathological development process (qualifier value)* is not used.

Null values

Representing null values

The addition of new precoordinated content in the Clinical finding (finding) hierarchy that specifies null values, such as 'not recorded', is unacceptable.

There is a use case for recording the reason that data are missing; however, this information should be recorded using a concept from the Qualifier value (qualifier value) subhierarchy rather than a Clinical finding (finding) concept.

New qualifier values of this type should be agnostic as to what data are missing but support the reason why the data are missing.

Obstruction

Since an obstruction describes blockage inside the space of a tubular structure, the Finding site of obstruction concepts should be a value from the 113342003 |Structure of lumen of body system (body structure)| subhierarchy.

For example,

When modeling gastrointestinal tract obstruction concepts, the Finding site value should be a value from the 432899004 |Structure of lumen of gastrointestinal tract (body structure)| hierarchy as the site obstructed is the lumen of the tract.

At present, some but not all anatomy content exists to support this model for tracts, ducts and blood vessels beyond the gastrointestinal tract but is expected in the future.

Osteoarthritis

396275006 |Osteoarthritis (disorder)|[653] is regarded as a degenerative disease, despite the *-itis* in its name. Because of this, 396275006 |Osteoarthritis (disorder)|[654] is not a *subtype* of arthritis in the disorder hierarchy but instead, the more general, 399269003 |Arthropathy (disorder)|[655]**.** Arthritis is inflammatory by definition, but osteoarthritis has a subclass in the medical literature called non-inflammatory osteoarthritis. In fact, according to many authoritative sources, osteoarthritis is usually regarded as a non-inflammatory disease, and therefore it is not strictly a *subtype* of arthritis.

Structuring the hierarchy this way does not imply that there are no cases of osteoarthritis with inflammation, nor does it rule out inflammation as an etiologic or contributory factor. It is well established that inflammation often occurs in osteoarthritis, and treatment with anti-inflammatory agents has been more effective than pure analgesics

653 http://snomed.info/id/396275006
654 http://snomed.info/id/396275006
655 http://snomed.info/id/399269003

in many cases. Despite growing evidence of the role of inflammatory cytokines in osteoarthritis, it is not always necessarily an inflammatory disorder of the joint.

Overdose

Overdose of illicit drug

708079007 |Overdose of illicit drug (disorder)| is modeled without a Causative agent because the term "illicit drug" may have differing local interpretations.

Vaccine-related overdose

Vaccine-related overdose concepts in the Clinical Finding/Disorder hierarchy were inactivated in the January 2020 Release. They were replaced with concepts in the Event hierarchy, see 788094008 |Excessive dose of vaccine administered (event)|[656] and subtypes.

When authoring, determine whether the concept describes an overdose, which is a *disorder*, or the administration or ingestion of an excessive dose, which is an *event*.

Pneumonia vs. Pneumonitis

The terms *pneumonia* and *pneumonitis* are often used interchangeably. In SNOMED CT, pneumonia should be used for infectious causes, and pneumonitis should be used for noninfectious causes.

Pneumonia is a type of pneumonitis, as inflammation is present in both. The distinguishing feature between the two disorders is the presence of infection in pneumonia. Pneumonia should have a pathological process of infectious process, pneumonitis should not.

Consolidation is a feature of most forms of pneumonia. It may not be a feature of some atypical pneumonias, e.g. mycoplasma pneumonia.

Except as noted above, the morphologic abnormality for 233604007 |Pneumonia (disorder)|[657] is 707496003 |Inflammation and consolidation (morphologic abnormality)|[658].

The morphologic abnormality for 205237003 |Pneumonitis (disorder)|[659] is 409774005 |Inflammatory morphology (morphologic abnormality)|[660].

Poisoning

When modeling poisoning disorders, ensure that the disorder being described is caused by the substance or active ingredient in the product selected as the causative agent (attribute) value. Do not add poisoning disorders if the causative agent is a product constituent (e.g. adjuvant, carrier, preservative, flavoring, stabilizer, or other inactive ingredient) that cannot be identified as the causative agent.

Vaccine-related poisoning concepts have been inactivated.

Pressure ulcer Pressure injury

|Pressure injury (disorder)| has been created in SNOMED CT based on the recommendations of the *National Pressure Injury Advisory Panel* (NPIAP) and adopted for the 2019 International Clinical Practice Guidelines on Prevention and Treatment of Pressure Ulcers/Injuries. The NPIAP nomenclature favors the use of pressure *injury* over pressure

656 http://snomed.info/id/788094008
657 http://snomed.info/id/233604007
658 http://snomed.info/id/707496003
659 http://snomed.info/id/205237003
660 http://snomed.info/id/409774005

ulcer, due to confusion around the use of ulcer for two of the pressure ulcer stages which actually occur in intact skin.

New morphologies with text definitions have been created representing the various pressure injury stages:

- |Damage (morphologic abnormality)|
- |Pressure injury (morphologic abnormality)|
- |Pressure injury stage I (morphologic abnormality)|
- |Pressure injury stage II (morphologic abnormality)|
- |Pressure injury stage III (morphologic abnormality)|
- |Pressure injury stage IV (morphologic abnormality)|
- |Deep tissue pressure injury (morphologic abnormality)|

1163215007 |Pressure injury (disorder)|and its descendants representing the pressure injury stages are defined with the morphologies above, similar to how burn injuries have been modeled in SNOMED CT.

- Pressure injury morphology stages II - V have been assigned an additional parent of 56208002 |Ulcer (morphologic abnormality) |
- Pressure injury morphology stage I has been assigned an additional parent of 70819003 |Erythema (morphologic abnormality) |
- Pressure injury disorder concepts representing stages II - IV have a synonym of *Pressure ulcer stage x*

The following concepts have been inactivated and replaced with corresponding Pressure injury concepts:

- 421076008 |Pressure ulcer stage 1 (disorder)|
- 420324007 |Pressure ulcer stage 2 (disorder)|
- 421927004 |Pressure ulcer stage 3 (disorder)|
- 420597008 |Pressure ulcer stage 4 (disorder)|
- 421594008 |Nonstageable pressure ulcer (disorder)|
- 165260000 |Deep pressure ulcer (disorder)|

723071003 |Pressure injury of deep tissue (disorder)| has previously been created but has been remodeled according to the above heuristics.

399912005 |Pressure ulcer (disorder)| has been inactivated and the remaining 33 descendants that do not mention a specific stage have been renamed using Pressure *injury* instead of pressure *ulcer* with the value of associated morphology value changed from 420226006 |Pressure ulcer (morphologic abnormality)| to 1163214006 |Pressure injury (morphologic abnormality)|. This results in these concepts being relocated under |Pressure injury (disorder)|.

Summary

The NPIAP classification best supports the disambiguation of pressure ulcer from intact skin lesions. The SNOMED CT pressure injury disorder hierarchy follows the NPIAP terminology most closely but accommodates legacy classifications by including an ulcer morphology in the model as well as additional descriptions of *pressure ulcer* for pressure injury stages II - VI.

Pulmonary embolism

Pulmonary embolus (PE) refers to obstruction of the pulmonary artery or one of its branches by material (e.g. thrombus, tumor, air, or fat) that originated elsewhere in the body. When modeling embolism disorder concepts with pulmonary in the FSN, the Finding site is 782966009 |Structure of artery of pulmonary circulation (body structure)|.

Remission

Disorder in remission
<X> disorder in remission concepts require a stated relationship to the appropriate primitive *Disorder in remission* supertype, in addition to the appropriate supertype for the disorder.

For example,

16270831000119107 |Bulimia nervosa in partial remission (disorder)|[661] has stated parents of 698698008 | Bulimia nervosa in remission (disorder)| and 765207007 |Disorder in partial remission (disorder)|[662].

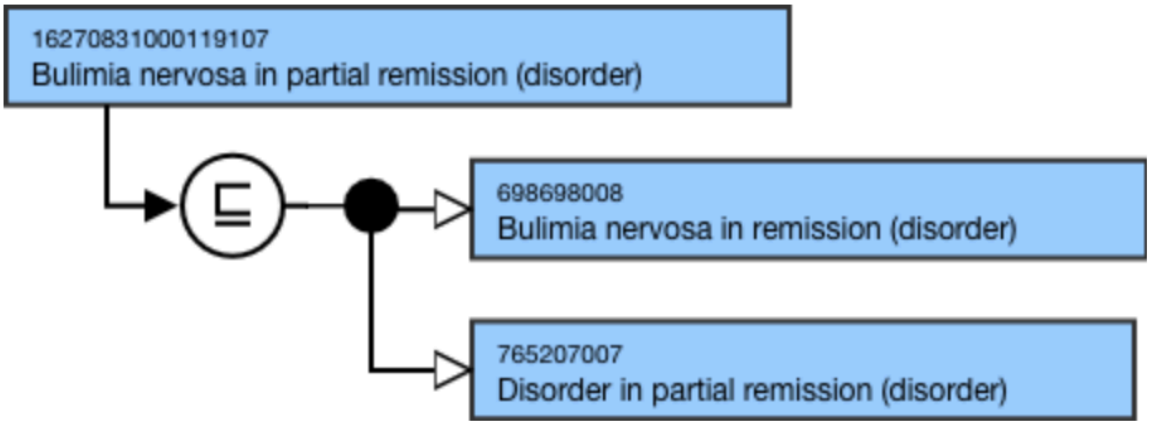
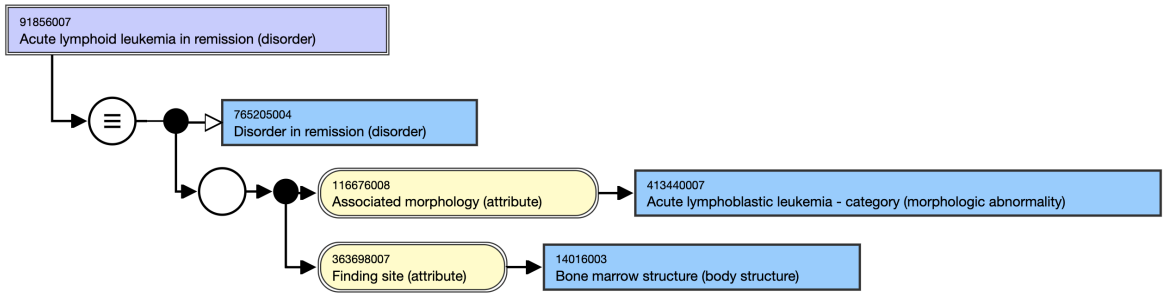


Figure 1: Stated view of 16270831000119107 |Bulimia nervosa in partial remission (disorder)|

Where the primitive supertype for the disorder is |Disease (disorder)|, only the *Disorder in remission* supertype will be required.

For example,

91856007 |Acute lymphoid leukemia in remission (disorder)|[663] has only one stated parent of 765205004 | Disorder in remission (disorder)|[664], because a potential supertype of 64572001 |Disease (disorder)|[665] would be unnecessary.



661 http://snomed.info/id/16270831000119107
662 http://snomed.info/id/765207007
663 http://snomed.info/id/91856007
664 http://snomed.info/id/765205004
665 http://snomed.info/id/64572001

Figure 2: Stated view of 91856007 |Acute lymphoid leukemia in remission (disorder)|

See also relative section(s):

Mental health

Rheumatoid arthritis

Rheumatoid arthritis (RA) is a multisystem, inflammatory, autoimmune disorder; the exact etiology is unknown. RA is a disease primarily of the joints and is clinically known as an 'arthritis' although extra-articular manifestations occur. Extra-articular features include nodules, carditis and pericarditis, vasculitis, lung disorders, and other manifestations.

69896004 |Rheumatoid arthritis (disorder)| remains a primitive concept in SNOMED CT and must be stated as a parent (IS A relationship) for all rheumatoid arthritis concepts.

For example,

201776007 |Rheumatoid arthritis of sacroiliac joint (disorder)|

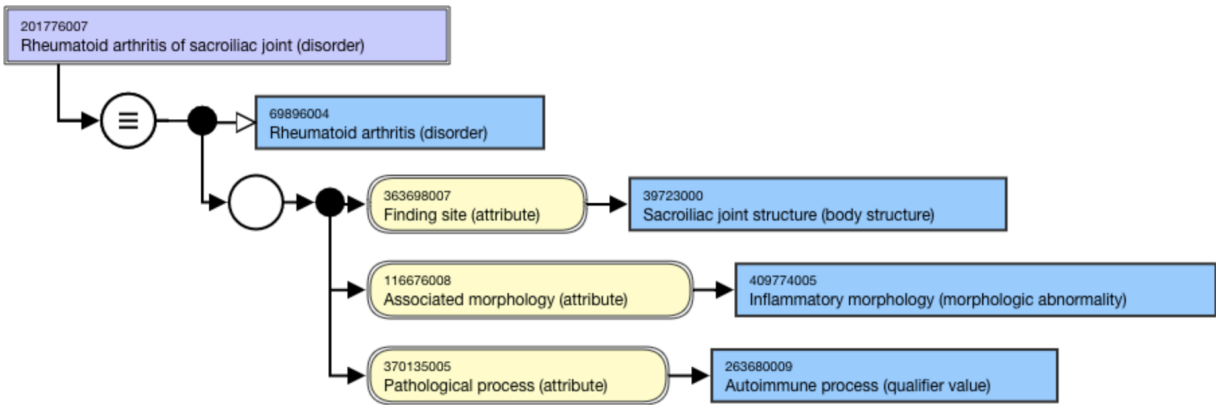


Figure 1: Stated view of 201776007 |Rheumatoid arthritis of sacroiliac joint (disorder)|

Example of extra-articular rheumatoid manifestation,

28880005 |Rheumatoid arthritis with carditis (disorder)|

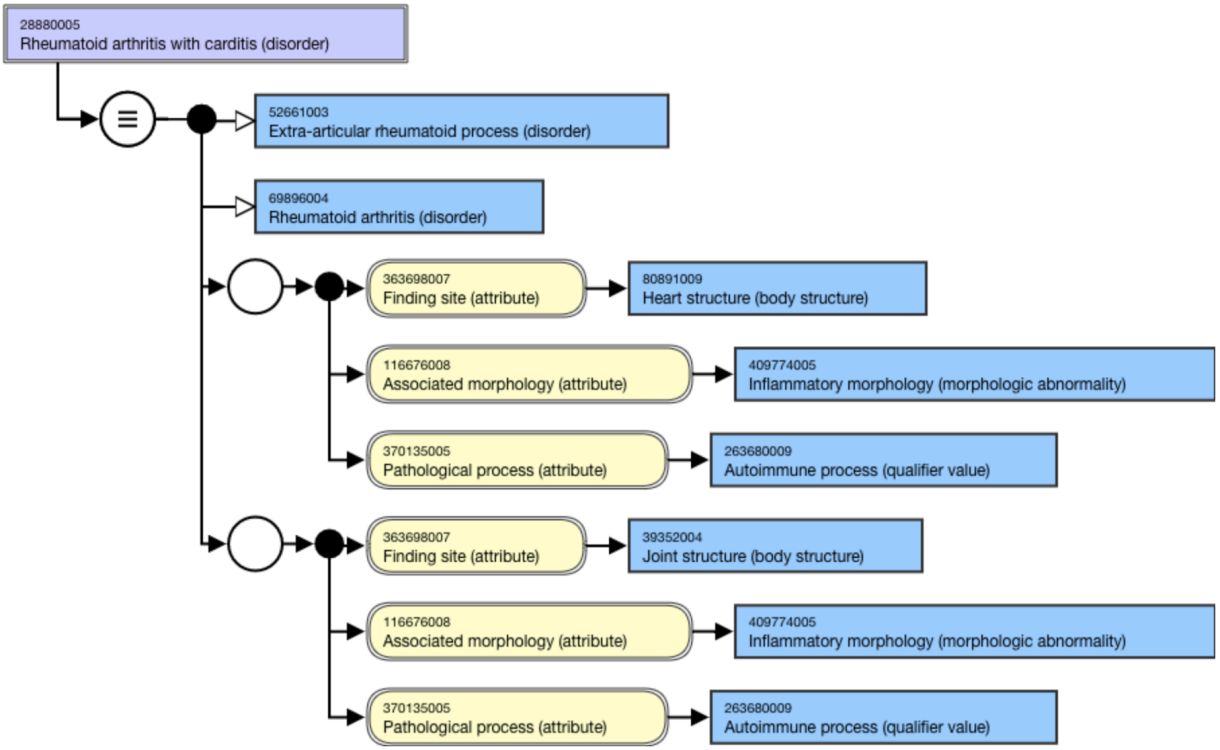


Figure 1: Stated view of 28880005 |Rheumatoid arthritis with carditis (disorder)|

410795001 |Juvenile rheumatoid arthritis (disorder)| has been inactivated with an inactivation reason of *Outdated* with a target replacement of 410502007 |Juvenile idiopathic arthritis (disorder)|. Subtypes of Juvenile idiopathic arthritis (disorder) are now modeled to reflect the up-to-date classification of this disorder.

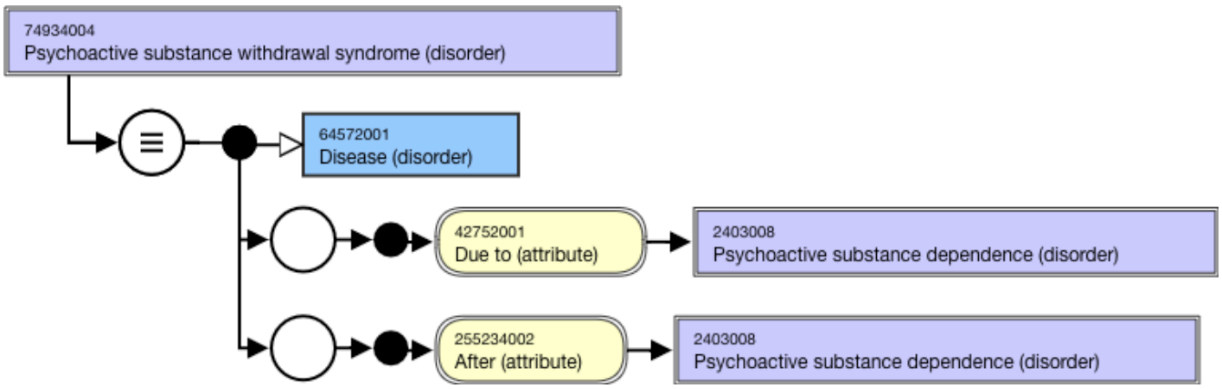
Substance withdrawal syndrome

The concepts in the 1254795002 |Substance withdrawal syndrome (disorder)| subhierarchy are modeled as direct children of 64572001 |Disease (disorder)| and are further defined using *Due to* and *After* attributes of |<Substance> dependance (disorder)|.

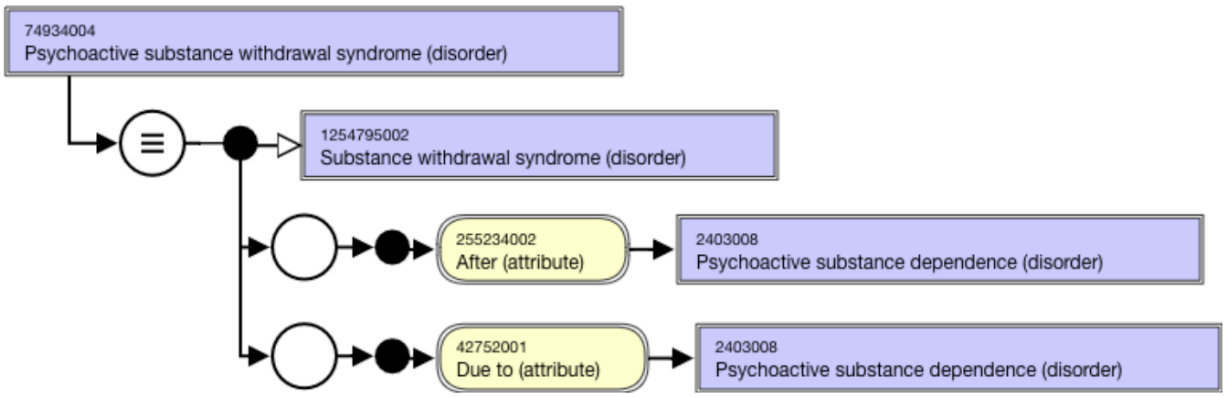
For example,

74934004 |Psychoactive substance withdrawal syndrome (disorder) has a stated proximal primitive parent of Disease (disorder) and Due to and After attributes of Psychoactive substance dependence (disorder).

Stated view of 74934004 |Psychoactive substance withdrawal syndrome (disorder)|:



Inferred view of 74934004 |Psychoactive substance withdrawal syndrome (disorder)|:



Trauma and Injury

Trauma, injury

There is a need to represent both traumatic and non-traumatic injuries as well as those in which it is undetermined whether the cause of the injury was due to trauma or not. There are forms of trauma that do not result in structural damage, such as *emotional trauma*, which are defined as traumatic injuries.

Concepts that do not specify *trauma* are now modeled with the appropriate morphology concept or <<Damage (morphologic abnormality) but are not necessarily assigned a Due to (attribute) of Traumatic event (event), unless the form of injury can only occur with morphologic trauma. In other words, if a concept refers to an injury, and that injury may occur either through trauma or non-traumatic means (e.g. tumor, ischemia, etc.), then it should be modeled without a Due to (attribute) of |Traumatic event|. If, however, the term does not specify trauma, but the type of injury can only occur as a result of trauma (e.g. open wounds), then these concepts would have the DUE TO attribute added.

Historically, *injury* concepts have been modeled in SNOMED CT as damage to a body structure, unless specifically stated as *non-traumatic*. 19130008 |Traumatic abnormality (morphologic abnormality)| has been inactivated effective January 2021 in order to separate mechanism of injury (i.e. trauma) from structure (i.e. damage).

- Traumatic injuries are now being modeled as morphologic changes to a body structure due to traumatic event.
- Non-traumatic injuries are being remodeled as morphologic changes to a body structure but without a |Due to (attribute)| relationship to |Traumatic event (event)|. Nontraumatic injuries should be modeled as a subtype of 1119219007 |Nontraumatic injury (disorder)|.

417163006 |Traumatic or non-traumatic injury (disorder)| is currently modeled with GCIs to reflect the two notions of *damage without trauma* (non-traumatic injury) and *trauma with or without damage* (traumatic injury).

Traumatic injury (disorder)

The use of |Spontaneous event (event)| is in development, as many of the concepts that related to *non-traumatic* are not in fact spontaneous.

- In those cases where it is clinically apparent that the cause is spontaneous, the concept is modeled with a |Due to (attribute)| of |Spontaneous event (event)|.
- In those cases where it cannot be determined that the clinical condition is actually spontaneous (i.e., no known underlying mechanism), a |Due to (attribute)| relationship to |Spontaneous event (event)| would be omitted.

Friction injury, abrasion

An injury due to *friction* can be represented using 400152004 |Friction injury (morphologic abnormality)|[666], in which case it will not classify as a kind of wound.

For example,

- 47222000 |Friction injury of tooth (disorder)|[667]
- 400068007 |Mechanical irritation (morphologic abnormality)|[668]

However, most disorders that are named *abrasion* imply that skin or other tissue has been abraded (scraped or worn away). Thus, they are also considered wounds and will correctly classify as wounds after assigning the correct morphology, 400061001 |Abrasion (morphologic abnormality)|[669].

For example,

- 211039006 |Abrasion of skin of chest (disorder)|[670]

While many medical definitions refer to abrasions as superficial injuries of the skin and subcutaneous structures, the term is also used for areas such as dentistry to define superficial excoriations of teeth, ophthalmology, and also can be used for other integumentary structures such as nails. The FSN should clearly identify which structure the concept refers to and where this structure is skin, this must be specified.

Rupture

Ruptures are modeled with an |Associated morphology (attribute)| of 125671007 |Rupture (morphologic abnormality)|. A disorder concept modeled with a Rupture (morphologic abnormality) will classify as a subtype of 417163006 |Traumatic or non-traumatic injury (disorder)|.

- Traumatic rupture concepts are modeled with a |Due to (attribute)| of << |Traumatic event (event)|
- Nontraumatic rupture concepts are modeled as a subtype of 1119219007 |Nontraumatic injury (disorder)|

Effective July 2021

Both 415747007 |Traumatic rupture (morphologic abnormality)| and 125672000 |Nontraumatic rupture (morphologic abnormality)| are inactive effective from July 2021.

666 http://snomed.info/id/400152004
667 http://snomed.info/id/47222000
668 http://snomed.info/id/400068007
669 http://snomed.info/id/400061001
670 http://snomed.info/id/211039006

Disorder Combination Modeling

Many disorders can occur in combination within the same patient. Guidance on the modeling and terming of FSNs for disorder combinations aims to achieve consistency. Clinically significant disorder combinations are represented in SNOMED CT by a single concept so that users can document temporal (timing) and causal (cause/effect) relationships between the conditions.

Expressing Associations

To express an association between conditions, one of the following associations is used:

- Simple co-occurrence: two or more conditions have no direct causal or temporal relationship but are found together more often than by random chance
- Causation 1: the cause is another finding or disorder, an event, or procedure
- Causation 2: the cause is a physical force, physical object, organism, or substance
- Temporal association: the timing of the two conditions occur before, during, or after each other

When considering disorder combinations two questions can be asked:

1. Is there a *causal* relationship?
2. What is the *temporal* relationship?

The following table provides the possible combinations of answers. It allows authors to assign combination disorders to a corresponding category below, to which the appropriate modeling and FSN construction is applied.

		Is there a stated causal relationship?		
		Yes, the cause is another finding or disorder, an event, or procedure. This is causation 1.	Yes, the cause is a physical object or force, organism, or substance. This is causation 2.	No
What is the temporal relationship?	Not stated	X due to Y	X caused by Y	X and Y should be documented separately
	X follows Y	X due to and following Y	N/A	X after Y
	X precedes Y	X before Y	N/A	X before Y
	X occurs during Y	X due to and during Y	N/A	X during Y
	X occurs before, during, and/or after Y	X due to and temporally related to Y	N/A	X temporally related to Y*

*Note: *Temporally related to (attribute)* and its subtypes *Before* and *During* are only approved to model perioperative complications and a limited number of other clinical findings.

Simple Co-occurrence	
Modeling pattern	Naming pattern
Assign each condition as a supertype (or ensure that each participating disorder is present in the ancestor tree following classification) Use simple co-occurrence for two or more conditions that are strongly associated by means other than causality or a temporal relationship (e.g. a common predisposition) where representing such conditions as separate statements would result in a loss of the associated between the conditions For example, • Named syndromes, such as 398114001 | Ehlers-Danlos syndrome (disorder)|[671] • Manifestations of systemic disorders, such as 83901003 |Sjögren's syndrome (disorder)| Do not use simple co-occurrence for those disorders with more than one anatomical site or more than one associated morphology. Those disorders should rather be represented as individual concepts in a medical record.	FSN: *X with Y*
Correct examples: • Sinusitis with nasal polyps (disorder) • Acute bronchitis with bronchiectasis (disorder) Incorrect examples not to be repeated: • Psoriasis-eczema overlap condition (disorder) • Hay fever with asthma (disorder)	
Be aware of conditions which likely exist prior to a disorder or procedure. For example, legacy term 609454008 | Induced termination of pregnancy complicated by acute necrosis of liver (disorder)|[672] • *Acute necrosis of liver* was likely present prior to the procedure; there is no explicit causation. The concept will be inactivated. Instead, separate concepts 714812005 | Induced termination of pregnancy (procedure)|[673] and 197269008 | Acute necrosis of liver (disorder)|[674] should be documented in the medical record.	

671 http://snomed.info/id/398114001
672 http://snomed.info/id/609454008
673 http://snomed.info/id/714812005
674 http://snomed.info/id/197269008

Be aware of conditions which likely exist prior to a disorder or procedure.
For example, legacy term 609454008 | Induced termination of pregnancy complicated by acute necrosis of liver (disorder)|[675]
- *Acute necrosis of liver* was likely present prior to the procedure; there is no explicit causation. The concept will be inactivated. Instead, separate concepts 714812005 | Induced termination of pregnancy (procedure)|[676] and 197269008 | Acute necrosis of liver (disorder)|[677] should be documented in the medical record.

Causation 1	
Cause is another finding, disorder, event, or procedure	
Modeling pattern	Naming pattern
For a condition caused by a clinical finding/disorder • Assign the causal disorder as the target of a *Due to* relationship • When modeling only causation, ensure the caused condition is represented in the supertypes and/or axioms • When modeling co-occurrence and causation, ensure both the causal and the caused conditions are represented in the supertypes and/or axioms For a condition caused by a procedure • Ensure the caused condition is represented as a supertype and/or axiom • Ensure Disease (disorder) or the appropriate intermediate primitive is a supertype • Assign the procedure as the target of a *Due to* relationship For a condition caused by an event • Ensure the caused condition is represented as a supertype and/or axiom • Assign the event as the target of a *Due to* relationship	*For conditions that are causal, or causal and co-occurring, construct the FSN with due to* • *X due to Y* For conditions specified as causal and temporal, construct the FSN with *due to* and the temporal relationship • For example, • *X due to and following Y*

675 http://snomed.info/id/609454008
676 http://snomed.info/id/714812005
677 http://snomed.info/id/197269008

Causation 1

Correct examples:

- 735173007 | Shock due to anaphylaxis (disorder)|[678] is an example of a condition caused by a clinical finding/disorder. Because the shock and the anaphylaxis are co-occurring, both conditions are represented in the supertypes and axioms, in addition to the Due to relationship.
- 413532003 | Anemia due to blood loss (disorder)|[679] is an example of a condition caused by a clinical finding/disorder. Because the bleeding could have been controlled and thus not necessarily present, only causation is modeled in this concept. The blood loss/bleeding is not represented as a supertype.

Incorrect examples not to be repeated:

- Neutropenia associated with acquired immunodeficiency syndrome (disorder) - Do not use 'associated'; use only 'with' instead. So, |Neutropenia with acquired immunodeficiency syndrome (disorder)|.
- Dilated cardiomyopathy secondary to granuloma (disorder) - Do not use 'secondary to'; use 'due to' instead. So, |Dilated cardiomyopathy due to granuloma (disorder)|.

Determining causation only versus causation and co-occurrence

There are no heuristics to standardize the determination of a precoordinated combination modeled using only the *Due to* relationship versus modeling the *Due to* relationship in addition to representing the causative condition in the supertypes. If both conditions must be present for the other to occur, both should be represented in the supertypes. Whether both conditions must be present concurrently is determined by an understanding of the disease process. Considerations include whether the conditions are chronic diseases, as these types of conditions will be ever present and thus require representation in the supertypes. If the causing condition resolves but the resultant condition can remain, then representation of both conditions in the supertypes is unwarranted.

There are approximately 425 legacy concepts with '*co-occurrent and due to'* in the description. Do not add new concepts with the terming '*co-occurrent and due to'*, instead use co-occurrence modeling (both conditions are represented in a supertype) in addition to the *Due to* (attribute) if warranted by the clinical condition.

Causation 2

Causation 2 is when [1]the cause is a material entity, and [2]the means of exposure/introduction are not significant.

1. A material entity refers to a concept within the Substance, Physical object, Pharmaceutical/biologic product, Physical force, and Organism hierarchies.
2. If the means of exposure/introduction are significant, then the causal factor is represented by a concept from the Event hierarchy, and the concept is modeled as Causation 1.

678 http://snomed.info/id/735173007
679 http://snomed.info/id/413532003

Causation 2	
Modeling pattern	Naming pattern
Assign the caused disorder (X) as a supertype, or ensure that the caused disorder is a supertype following classification Assign the causal factor (Y) as the value of a *Causative agent (attribute)*	*X caused by Y*
Correct example: • 291000119100 | Contact dermatitis caused by chemical (disorder)|[680] Incorrect examples not to be repeated: • Choking due to airway obstruction (finding) • Coma associated with diabetes mellitus (disorder) • Laser-induced burn (disorder)	

Temporal sequencing without causation	
Modeling pattern	Naming pattern
Assign the condition or procedure that occurred first in the patient as the target of an After (attribute) relationship. Assign the condition that occurred second as a supertype (or ensure its presence in the ancestor tree). Examples: • 402490007 |Calcinosis following localized fat necrosis (disorder)| The fat necrosis occurred first in the patient, so this concept will have an After (attribute) with a value of Fat necrosis (disorder). The calcinosis occurred secondarily, and thus Calcinosis (disorder) is a supertype of this concept. • 16055031000119100 |Astigmatism of right eye following operative procedure (disorder)| The operative procedure occurred first in the patient, so this concept will have an After (attribute) with a value of Surgical procedure (procedure). The astigmatism occurred secondarily, so Astigmatism (disorder) is a supertype of this concept.	Where X occurs after Y: • if it is not specified that X is due to Y (although causality is frequently implied), construct the FSN as *X following Y*

680 http://snomed.info/id/291000119100

Caution against combination

Not all disorders occurring in combination should be precoordinated into a single concept. Multiple clinical conditions should not be precoordinated in order to facilitate convenient recording in the medical record, even if the two conditions are often reported together.

For example,

- The clinical conditions *gastroenteritis* and *dehydration* often occur in combination but require separate resolution, and therefore, are best recorded separately in the medical record as 25374005 |Gastroenteritis (disorder)| and 34095006 |Dehydration (disorder)|.

Associated with (attribute)

In general, 47429007 |Associated with (attribute)|[681] should be avoided due to the ambiguity which it conveys and the difficulty in applying this role consistently. Instead, *Due to* is used when there is a direct causal relationship between the conditions; otherwise, the clinical conditions should be recorded as separate concepts in the medical record.

There are a couple of exceptions when the use of 47429007 |Associated with (attribute)|[682] is appropriate:

1. General grouping concepts which aggregate more specific associations
   e.g. 6211002 |Polyarthritis associated with another disorder (disorder)|[683] subsumes two children
   201972000 |Allergic arthritis of multiple sites (disorder)|[684] modeled with 42752001 |Due to (attribute)|[685] of 419076005 |Allergic reaction (disorder)|[686]
   422565003 |Post-infective polyarthritis (disorder)|[687] modeled with 255234002 |After (attribute)|[688] of 40733004 |Infectious disease (disorder)|[689]
2. Device infections, i.e an infection of the tissue surrounding an implanted or inserted device, not due to the device itself.
   - *Associated with* is used to associate the device with the infection.
3. Intolerance to substances, i.e the propensity of an adverse reaction to a substance to occur (other than hypersensitivity or allergic or non-allergic hypersensitivity).
4. There is no intolerance process that serves as the value for *Has realization*.
   - *Associated with* is used to associate the intolerance to the substance.

When to use "caused by" and when to use "due to"

Is cause a disorder or material entity?
It must be determined if a disorder is caused either by another disorder or by a material entity. A material entity is a concept found in Substance, Physical object, Pharmaceutical/biologic product, Physical force, or Organism subhierarchies. These subhierarchies are the current range constraints for the Causative agent (attribute) in the Clinical finding domain. For combined disorders where a cause can be either a disorder (eg, alcoholism) or a material entity (eg, alcohol):

Model as *due to disorder* if it is the indirect cause.

681 http://snomed.info/id/47429007
682 http://snomed.info/id/47429007
683 http://snomed.info/id/6211002
684 http://snomed.info/id/201972000
685 http://snomed.info/id/42752001
686 http://snomed.info/id/419076005
687 http://snomed.info/id/422565003
688 http://snomed.info/id/255234002
689 http://snomed.info/id/40733004

For example,

- Megaloblastic anemia *due to alcoholism* (disorder)

Model as *caused by material entity* if it is the direct cause.

For example,

- Inflammation of pancreas *caused by alcohol* (disorder)

Is cause a disorder or infectious organism?

In modeling concepts related to infectious diseases, a number of considerations need to be taken in to account.

1. When the disorder is an infectious disease itself, and the organism is specified, then the concept will be modeled with
    - |Causative agent (attribute)| with the specified organism
    - |Pathological process (attribute)| with the type of infectious process

2. Disorders can be modeled with |Due to|, with |After|, or with both |Due to| and |After| relationships to infectious diseases. If the focus disorder is itself an infectious disorder, it will also have a |Causative agent| relationship when the organism is specified.

For example,

|Causative agent| relationship: 721742004 |Otitis media caused by Streptococcus pneumoniae (disorder)|

|Due to| relationship: 698733009 |Intestinal obstruction due to tuberculosis (disorder)|

|Due to| and |Causative agent| relationship: 866044006 |Mycosis due to human immunodeficiency virus infection (disorder)|

|After| relationship: 182961000119101 |Acute disseminated encephalomyelitis following infectious disease (disorder)|

|After| and |Causative agent| relationship: 4740000 |Herpes zoster (disorder)|

|Due to| and |After| relationship: 1148594002 |Chronic arthritis due to and following rheumatic fever (disorder)|

|Due to| and |After| and |Causative agent| relationship: 15992311000119100 |Keratitis of left eye due to herpes zoster (disorder)|

> *Applying the |Due to|, |After|, or both |Due to| and |After| relationships to a concept will not lead to it being a subtype of |Infectious disease (disorder)| unless it is itself an infectious disease.*

Generally, when |Causative agent| is used in the concept's modeling, the terming 'caused by' is used in the FSN. Similarly, when |Due to| is used in the concept's modeling, the terming 'due to' is used in the FSN. In some situations, both the |Causative agent| and |Due to| are used in a concept's model, and so the naming may vary based on the situation.

In some cases, the DUE TO takes precedence because of a relationship between the causative agent and the DUE TO disorder.

For example,

288021000119107 |Disorder due to alcohol abuse (disorder)|

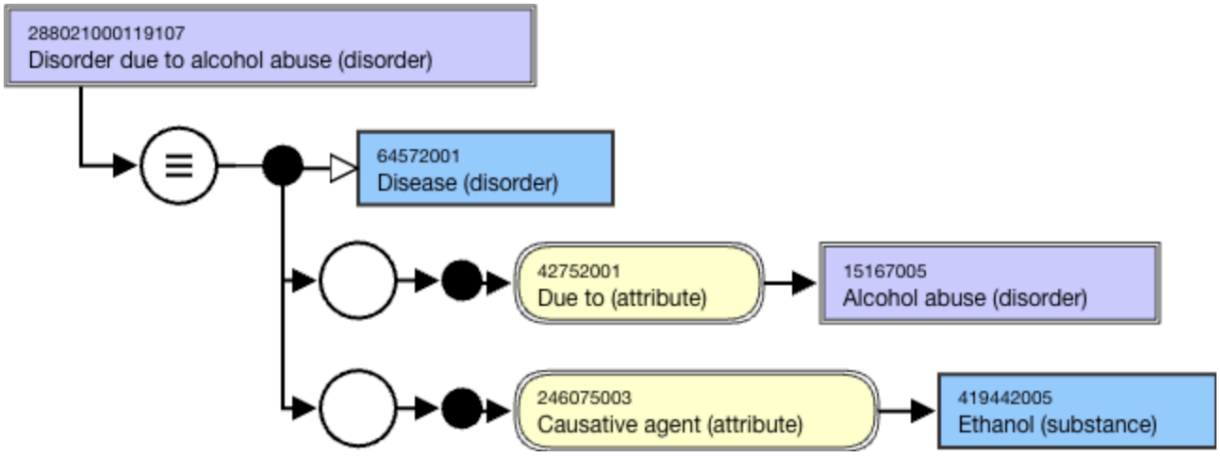


Figure 1: Stated form of |Disorder due to alcohol abuse (disorder)|

In other cases, the DUE TO relationship is used as a means to classify the concept appropriately while the CAUSATIVE AGENT takes precedence.

For example,

1251395000 |Injury of skin caused by class Anthozoa (disorder)|

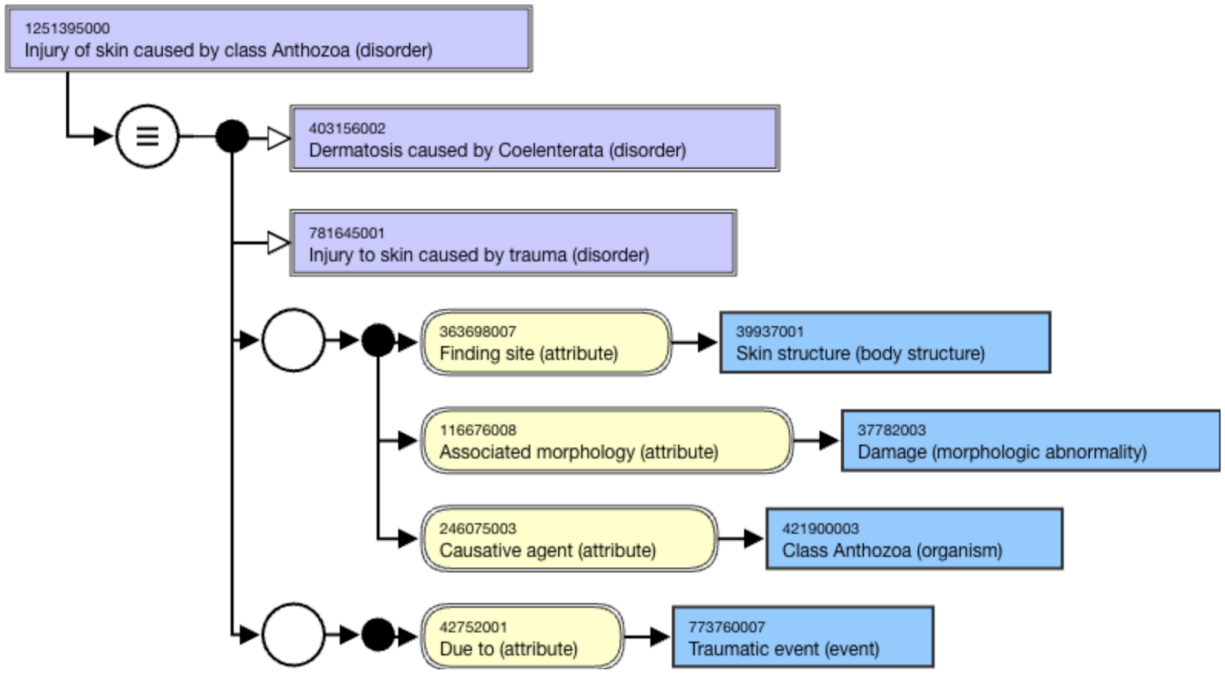


Figure 2: Inferred form of |Injury of skin caused by class Anthozoa (disorder)|

In this case, the DUE TO represents the "injury" part of the concept and allows classification as a traumatic injury. An alternative, but less appealing FSN would have been "Disorder of skin due to traumatic injury caused by class Anthoza". So, if the concept FSN specifies a disorder causally associated with another disorder, then use "due to" in

the FSN; if the FSN specifies a disorder causally associated with an "agent" (organism, physical object, substance, etc.), then use "caused by" in the FSN.

Exception to naming convention for combined disorders

Exceptions may exist to the above guidance which requires review on a case-by-case basis.

The FSN submitted by a requestor may be used as preferred term even if it does not comply with the above recommended pattern. However, do not use phrases such as *secondary to*, *as a result of*, etc. in lieu of *due to*.

Rather than the naming conventions described above, use the names that are accepted clinical parlance and that represent specific pathophysiologic entities for some combined disorders, as the preferred term.

The stricter rules for FSN construction do not prevent the addition of more familiar connectives in other descriptions, for example *with,* or *associated with*.

Disorder combination modeling

- Covers combinations of only two disorders. However, combinations often include more than two disorders (for example, syndromes). Document multiple conditions in a single statement only for syndromes or strong associations based on a common predisposing factor.
- Does not cover absent components or *negation*
- Does not cover cases where combination concepts are demonstrably classification-derived (This limitation accepts that some content may be so obviously based on a class or category in a classification that it would be undesirable to reinterpret its semantics.)
- The modeling approach may be difficult to apply in all cases of combined disorders; domain-specific templates should be developed to ensure modeling consistency and accuracy.

(See also, Appendix, Concept Models: *Disorder Combinations*)

Complication and Sequela Modeling

Combined disorders can occur, for example:

- One disorder causes the other (causal relationship)
- One disorder is temporally related to another
- Two disorders have both a causal and temporal relationship to each other

Attributes that can be used to define such causal and temporal relationships are:

- Associated with (attribute)
- Causative agent (attribute)
- Due to (attribute)
- Temporally related to (attribute)
    - Before (attribute)
    - During (attribute)

- After (attribute)

Complication

The ubiquitous use of *complication* is not defined in relation to criteria; a *complication* is really just a disorder due to another disorder or procedure. For this reason, 116223007 |Complication (disorder)| is no longer active in the SNOMED CT terminology. Instead, concepts of a disorder caused by another disorder, or for disorders following either medical or surgical procedures should be modeled using a parent of 64572001 |Disease (disorder)| or the appropriate intermediate primitive.

Descriptions with the phrase "*complication of*" imply causality, and thus *"due to"* should be used in the description instead.

Perioperative complications
Perioperative complications refer to complications temporally related to a surgical procedure. They include pre-operative, intra-operative and post-operative complications and are modeled with a parent of Disease (disorder) and a relationship consisting of Temporally related to (attribute) or an appropriate subtype with a value of <<387713003 |Surgical procedure (procedure)|. A temporal complication does not necessarily imply a causal (Due to) relationship to the surgery itself, as the complication may be related to any disorder, event, or procedure occurring either prior, during, and/or after surgery. For this reason, perioperative complications do not have a stated Due to relationship unless an underlying cause is clearly stated in the FSN.

The following naming convention applies to those conditions that occur temporally, i.e. either before, during, or after the operative episode but do not have a causal relationship.

FSN: Postoperative X (disorder)

PT: Postoperative X

For example,

- Perioperative hematoma (disorder)
- Postoperative hypothyroidism (disorder)

88797001 |Complication of surgical procedure (disorder)| is not a subtype of perioperative complication, as it does not include a temporal relationship. Similarly, 738668004 |Perioperative complication (disorder)| is not a subtype of 88797001 |Complication of surgical procedure (disorder)|, as there is no causal relationship. Some disorders may specify both a causal and temporarily relationship and would be modeled such that they would classify under both 738668004 |Perioperative complication (disorder)| and 88797001 |Complication of surgical procedure (disorder)|.

The following attributes are used in the modeling of various combinations:

After
After without causal relationship
This attribute is used to model concepts in which a clinical finding occurs after another clinical finding, procedure, or event. Neither asserting nor excluding a causal relationship, it instead emphasizes a sequence of events. Naming pattern is ‘x following y’.

For example,

123948009 |Disorder following viral disease (disorder)| occurs After 34014006 |Viral disease (disorder)|[690]

690 http://snomed.info/id/34014006

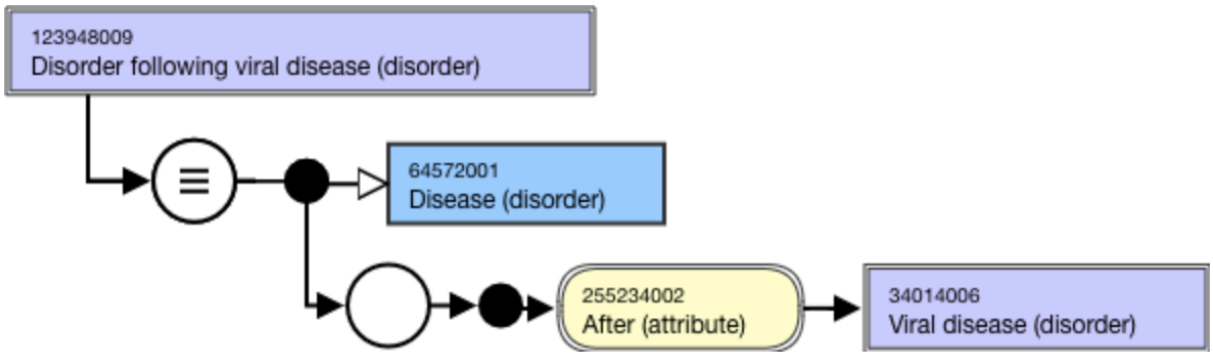


Figure 1: Stated view of 123948009 |Disorder following viral disease (disorder)|

> Post-infectious disorders are not subtypes of infectious disorders (unless the disorder is itself an infectious disease). The |After (attribute)| is used for linking post-infectious disorders with their associated infections.

After with causal relationship
The Due to and After attributes are used to model a disorder that occurs after a disorder or procedure with a causal relationship. Both the cause and the After relationship must be specified. The naming pattern is 'due to and following'.

Before
This attribute is used to model a preoperative complication. Strictly, a preoperative complication is a disorder that complicates the procedure, rather than being a complication of that procedure. A preoperative complication might be considered to be a disorder that exists prior to surgery that adversely affects the surgery or that results in an intraoperative or postoperative complication.

During
During without causal relationship
This attribute is used to model a disorder that occurs during a procedure.

For example,

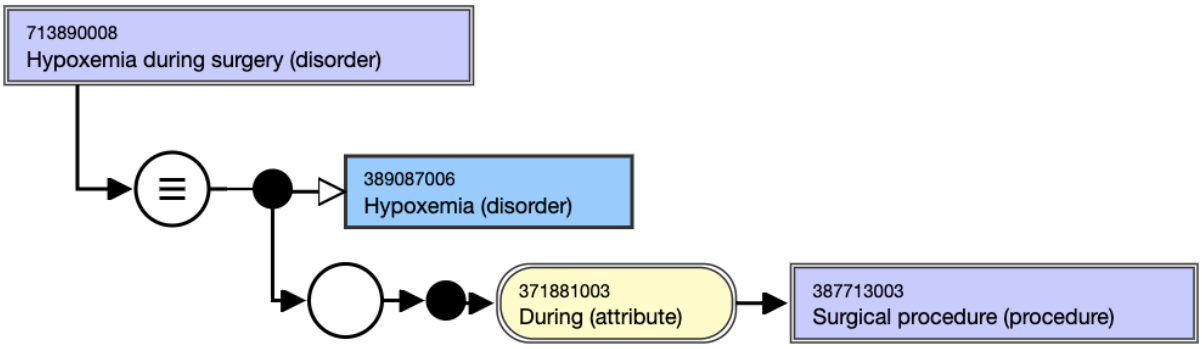


Figure 2: Stated view of 713890008 |Hypoxemia during surgery (disorder)|

During with causal relationship

Due to and During attributes can be used to model a disorder that occurs during a procedure (e.g. intraoperative complication) with a causal relationship. Both a cause and a temporal relationship to the cause must be specified.

Sequelae

A *sequela* is a disorder that is a consequence, but not an unexpected outcome, that follows after another disorder, procedure, or event. These conditions are often described with the words *following, after, post, sequela(e),* or *late effects.*

Sequelae can be in the following forms:

- Following
- Due to and following/after
- During and following/after

These conditions should be modeled with *After* (and also *Due to* if there is a causal relationship).

> 362977000 |Sequela (disorder)| is no longer allowed as a stated supertype. Concepts currently modeled with a supertype of Sequela will be remodeled in the next few editing cycles, and |Sequela (disorder)| will eventually be inactivated. However, descriptions with the terms *sequela* and *late effect* are still permitted.

For example,

Disorder due to and following another disorder = 698737005 |Obstructive hydrocephalus due to and following meningitis (disorder)|

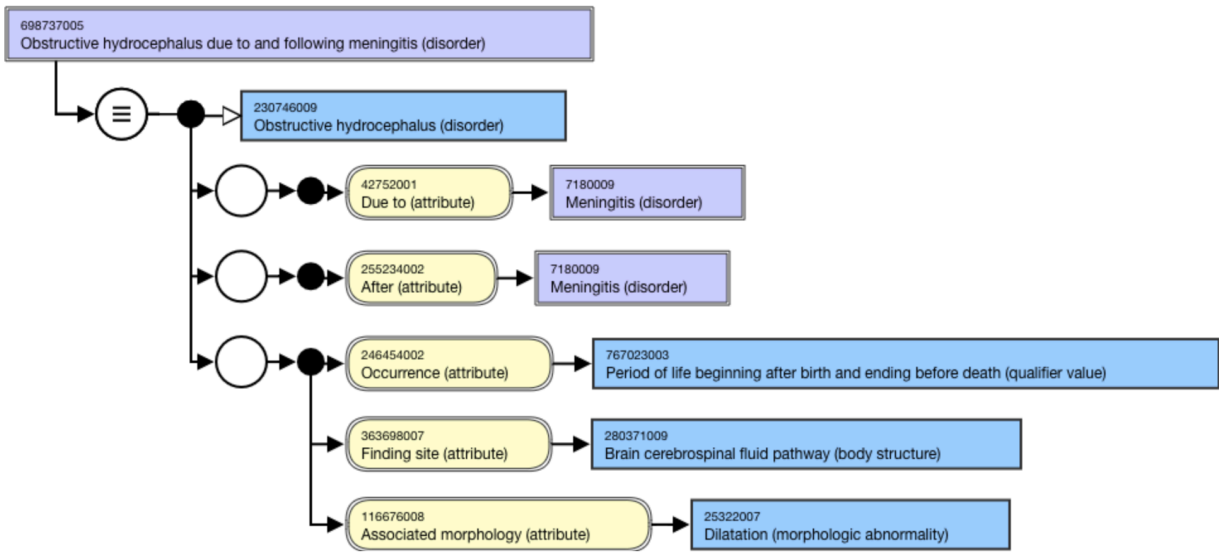


Figure 3: Stated view of 698737005 |Obstructive hydrocephalus due to and following meningitis (disorder)|

Naming conventions for sequelae
FSN: Disorder X [due to and] following <<disorder /<<procedure /<event

PT: Disorder X [due to and] following <<disorder /<<procedure /<event

SYN: [Disorder X as a] Sequela of <<disorder /<<procedure /<event

SYN: [Disorder X as a] Late effect of <<disorder /<<procedure /<event

For example,

- Disorder due to and following another disorder (disorder)
- Disorder due to and following meningitis (disorder)
- Disorder due to and following procedure (disorder)

Naming conventions for surgical sequelae (temporal relationship but *no* causal relationship)
Not all surgical sequelae are complications of surgery but rather expected late effects. Conditions that occur following surgery, but not necessarily *Due to* the surgery, are modeled only with an *After* relationship.

FSN: Disorder X following << 387713003 |Surgical procedure (procedure)

PT: Disorder X following << 387713003 |Surgical procedure (procedure)

For example,

- Contraction of eye socket following enucleation (disorder)
- Scar following surgery (disorder)

Naming conventions for surgical sequelae complications (temporal relationship *and* causal relationship)
Conditions that occur following surgery and are explicitly stated as causal/due to are modeled with a Due to (attribute) of << 387713003 Surgical procedure, and an After (attribute) of << 387713003 Surgical procedure.

FSN: Disorder X due to and following <<387713003 |Surgical procedure (procedure)

PT: Disorder X due to and following <<387713003 |Surgical procedure (procedure)|

For example,

- Encephalopathy due to and following cardiopulmonary bypass (disorder)
- Cataract lens fragments in vitreous of eye due to and following cataract surgery (disorder)
- Disorder due to and following breast reduction (disorder)

3.8.4 Environment and Geographical Location

Definition	Examples
• Environment: types of environments • Location: named locations such as countries, states, or regions	• 398156002 | Medical or surgical floor (environment) |[691] • 223565009 | Nigeria (geographic location) |[692]

691 http://snomed.info/id/398156002
692 http://snomed.info/id/223565009

3.8.5 Event

Definition	Examples
Occurrences impacting health or health care; not procedures or interventions	• 242039002 | Abuse of partner (event)|[693] • 405621004 | Tracheal intubation event (event)|[694]

- Event Attributes Summary(see page 246)
- Event Modeling(see page 248)

3.8.5.1 Event Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 272379006 | Event (event)|[695]	
Domain Constraint[696]	<< 272379006 |Event (event)|[697]
Parent Domain	-
Proximal Primitive Constraint	<< 272379006 |Event (event)|[698]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 272379006 | Event (event)|[699]

693 http://snomed.info/id/242039002
694 http://snomed.info/id/405621004
695 http://snomed.info/id/272379006
696 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
697 http://snomed.info/id/272379006
698 http://snomed.info/id/272379006
699 http://snomed.info/id/272379006

Attribute[700]	Grouped[701]	Cardinality[702]	In Group Cardinality[703]	Range Constraint[704]
255234002 |After (attribute)|[705]	1	0..*	0..1	<< 272379006 |Event (event)|[706] OR << 404684003 |Clinical finding (finding)|[707] OR << 71388002 |Procedure (procedure)|[708]
47429007 |Associated with (attribute)|[709]	1	0..*	0..*	<< 105590001 |Substance (substance)|[710] OR << 260787004 |Physical object (physical object)|[711] OR << 272379006 |Event (event)|[712] OR << 404684003 |Clinical finding (finding)|[713] OR << 410607006 |Organism (organism)|[714] OR << 71388002 |Procedure (procedure)|[715] OR << 78621006 |Physical force (physical force)|[716]
288556008 |Before (attribute)|[717]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[718]
246075003 |Causative agent (attribute)|[719]	1	0..*	0..1	<< 105590001 |Substance (substance)|[720] OR << 260787004 |Physical object (physical object)|[721] OR << 373873005 |Pharmaceutical / biologic product (product)|[722] OR

700 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
701 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
702 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
703 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
704 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
705 http://snomed.info/id/255234002
706 http://snomed.info/id/272379006
707 http://snomed.info/id/404684003
708 http://snomed.info/id/71388002
709 http://snomed.info/id/47429007
710 http://snomed.info/id/105590001
711 http://snomed.info/id/260787004
712 http://snomed.info/id/272379006
713 http://snomed.info/id/404684003
714 http://snomed.info/id/410607006
715 http://snomed.info/id/71388002
716 http://snomed.info/id/78621006
717 http://snomed.info/id/288556008
718 http://snomed.info/id/71388002
719 http://snomed.info/id/246075003
720 http://snomed.info/id/105590001
721 http://snomed.info/id/260787004
722 http://snomed.info/id/373873005

				<< 410607006 |Organism (organism)|[723] OR << 78621006 |Physical force (physical force)|[724]
42752001 |Due to (attribute)|[725]	1	0..*	0..1	<< 272379006 |Event (event)|[726] OR << 404684003 |Clinical finding (finding)|[727] OR << 71388002 |Procedure (procedure)|[728]
371881003 |During (attribute)|[729]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[730]
246454002 |Occurrence (attribute)|[731]	1	0..*	0..1	<< 282032007 |Periods of life (qualifier value)|[732]
726633004 |Temporally related to (attribute)|[733]	1	0..*	0..*	<< 404684003 |Clinical finding (finding)|[734] OR << 71388002 |Procedure (procedure)|[735]

⚠ Authoring guidelines for the use of attributes in the Event hierarchy[736] are being established.

3.8.5.2 Event Modeling

Event attributes

[Under review at this time]

When modeling an event, be sure to model the event itself and not the *outcome* of an event. The *outcome* of an event would be a finding or a disorder.

The Event hierarchy should not precoordinate periods of life/occurrence within the event concept.

Causative agent

Although Pharmaceutical / biologic product (product) and its descendants are considered valid values for the Causative agent (attribute) by the MRCM, they are not currently used as values for this attribute in the International

723 http://snomed.info/id/410607006
724 http://snomed.info/id/78621006
725 http://snomed.info/id/42752001
726 http://snomed.info/id/272379006
727 http://snomed.info/id/404684003
728 http://snomed.info/id/71388002
729 http://snomed.info/id/371881003
730 http://snomed.info/id/71388002
731 http://snomed.info/id/246454002
732 http://snomed.info/id/282032007
733 http://snomed.info/id/726633004
734 http://snomed.info/id/404684003
735 http://snomed.info/id/71388002
736 https://confluence.ihtsdotools.org/display/DOCGLOSS/hierarchy

Release. The only exception is 787859002 |Vaccine product (medicinal product)| and its descendants, which *can* be used as valid values for this attribute.

Allowed ranges

The allowed ranges will not prevent some incorrect modeling. Some allowed attributes have not yet been used for modeling in the Event domain. The planned QI project will review the modeling to ensure consistency of use the allowed attributes.

Vaccine-related overdose

- For the January 2020 Release, vaccine-related overdose concepts in the Clinical Finding/Disorder hierarchy were inactivated. They were replaced with *excessive dose* concepts in the Event hierarchy.
- When authoring, determine whether the concept describes an overdose, a *disorder*, or the administration or ingestion of an excessive dose, an *event*.

3.8.6 Observable Entity

Definition	Examples
Information about a quality/property to be observed and how it will be observed	• 416540001 | Calcium deposit observable (observable entity)|[737] • 276885007 | Core body temperature (observable entity)|[738]

3.8.6.1 Observable Entity vs. Evaluation Procedure

The observable entity and evaluation procedure hierarchies have some of the same attributes. There is not and should not be a one-to-one correspondence between the two hierarchies.

At this time, SNOMED CT contains some concepts in the evaluation procedure hierarchy which logically belong in the observable entity hierarchy. This is a legacy problem that continues to cause confusion. These concepts will move to the observable entity hierarchy as part of the QI project in the future. In addition, if we identify existing duplicate concepts between the two hierarchies, this will also be corrected. Concepts will not be duplicated between the observable entity hierarchy and procedure hierarchy, and requests for such will not be added.
In response to requests for an observable entity concept when the procedure concept exists, create an observable entity concept and inactivate the procedure concept.

While some users have indicated they want to use a procedure concept for ordering a test and an observable concept for reporting the result, this is not an acceptable use case. An evaluation procedure being ordered implies that there is an expectation that a value, in association with the ordered procedure will be provided. Evaluation procedures, for all intents and purposes, are observables with another semantic tag. The nature of their top level parent (Evaluation procedure) implies that they require a value in order to be assessed. Thus they can be used equivalently with observables.

737 http://snomed.info/id/416540001
738 http://snomed.info/id/276885007

As for the progression of the completion of an assessment, that is related to the state diagram (i.e., status) of the progression of a procedure and should not be precoordinated, but handled by the information system in which orders are processed (it is dynamic, not static). The information system should be able to capture the status of a procedure (e.g., ordered, in process, completed). We would not expect the terminology to pre-coordinate this.

As an example, LOINC recognizes that there are three different aspects to an observable: 1) those that can serve as both an order and an observation (e.g. blood glucose level); 2) those that can be ordered but not directly resulted (e.g. urinalysis, which is a convenience order for multiple individual observations on urine); and 3) those that can only be resulted and not directly ordered (usually part of an automated system, such as computation of MCHC in hematology). LOINC assigns this aspect with an attribute value. It is not one of the six main LOINC parts typically visible to users, however it is included in the LOINC database.

3.8.6.2 Use of Observable Entities

Observables entities may be used to:

- Code elements on a checklist or assign values to elements.

  For example, *color of nail* is an observable entity. *Gray nails* is a finding.

- Code headers on a template

  For example, the observable entity, gender, may be used to code a section of a template titled gender. The user would choose masculine, feminine, transgender, etc. which would then constitute a finding such as 703117000 | Masculine gender (finding)|[739] .

Types of Observable Entities

There are four general types of observable entities for use in health care. Each has different representation requirements and patterns, i.e. the set of attributes will vary.

- **Quality.** A characteristic, feature, or property that is inherent in someone or something.

  For example, mass of a person, temperature of internal organs, concentration of sodium in plasma, angle of a joint

- **Disposition.** A characteristic or feature that is not always realized in full.

  For example, antibiotic susceptibility of a certain population

- **Function.** The ability of a person, some part of a person, or a thing to perform activities or realize processes.

  For example, ability to walk

- **Process.** A process or outcome of a process

  For example, secretion rate, heart rate, respiratory rate

Some areas of the observable entity hierarchy need clarification and remodeling. This includes upper level concepts as well as leaf nodes. Notably, the content currently included in the 246464006 |Function (observable entity) subhierarchy needs to be clarified and potentially remodeled. In addition, the content currently included in the 415178003 |Process (observable entity)| subhierarchy needs review for

739 http://snomed.info/id/703117000

inactivation and replacement in the 719982003 |Process (qualifier value)| hierarchy so these processes can be used as values of attributes to define observable entity concepts, e.g., via 704321009 |Characterizes (attribute)|.

3.8.6.3 Observable Entity Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 363787002 | Observable entity (observable entity)|[740]	
Domain Constraint[741]	<< 363787002 |Observable entity (observable entity)|[742]
Parent Domain	-
Proximal Primitive Constraint	<< 363787002 |Observable entity (observable entity)|[743]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 363787002 | Observable entity (observable entity)|[744]				
Attribute[745]	Grouped[746]	Cardinality[747]	In Group Cardinality[748]	Range Constraint[749]

740 http://snomed.info/id/363787002
741 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
742 http://snomed.info/id/363787002
743 http://snomed.info/id/363787002
744 http://snomed.info/id/363787002
745 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
746 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
747 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
748 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
749 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint

704321009 |Characterizes (attribute)|[750]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[751] OR << 719982003 |Process (qualifier value)|[752]
246093002 |Component (attribute)|[753]	1	0..*	0..1	<< 105590001 |Substance (substance)|[754] OR << 123037004 |Body structure (body structure)|[755] OR << 123038009 |Specimen (specimen)|[756] OR << 260787004 |Physical object (physical object)|[757] OR << 373873005 |Pharmaceutical / biologic product (product)|[758] OR << 410607006 |Organism (organism)|[759] OR << 419891008 |Record artifact (record artifact)|[760]
704327008 |Direct site (attribute)|[761]	1	0..*	0..1	<< 105590001 |Substance (substance)|[762] OR << 123037004 |Body structure (body structure)|[763] OR << 123038009 |Specimen (specimen)|[764] OR << 260787004 |Physical object (physical object)|[765] OR << 373873005 |Pharmaceutical / biologic product (product)|[766] OR << 410607006 |Organism (organism)|[767] OR << 419891008 |Record artifact (record artifact)|[768]

750 http://snomed.info/id/704321009
751 http://snomed.info/id/71388002
752 http://snomed.info/id/719982003
753 http://snomed.info/id/246093002
754 http://snomed.info/id/105590001
755 http://snomed.info/id/123037004
756 http://snomed.info/id/123038009
757 http://snomed.info/id/260787004
758 http://snomed.info/id/373873005
759 http://snomed.info/id/410607006
760 http://snomed.info/id/419891008
761 http://snomed.info/id/704327008
762 http://snomed.info/id/105590001
763 http://snomed.info/id/123037004
764 http://snomed.info/id/123038009
765 http://snomed.info/id/260787004
766 http://snomed.info/id/373873005
767 http://snomed.info/id/410607006
768 http://snomed.info/id/419891008

719722006 |Has realization (attribute)|[769]	1	0..*	0..1	<< 272379006 |Event (event)|[770] OR << 404684003 |Clinical finding (finding)|[771] OR << 71388002 |Procedure (procedure)|[772] OR << 719982003 |Process (qualifier value)|[773]
718497002 |Inherent location (attribute)|[774]	1	0..*	0..1	<< 105590001 |Substance (substance)|[775] OR << 123037004 |Body structure (body structure)|[776] OR << 123038009 |Specimen (specimen)|[777] OR << 260787004 |Physical object (physical object)|[778] OR << 373873005 |Pharmaceutical / biologic product (product)|[779] OR << 410607006 |Organism (organism)|[780] OR << 419891008 |Record artifact (record artifact)|[781]
704319004 |Inheres in (attribute)|[782]	1	0..*	0..1	<< 105590001 |Substance (substance)|[783] OR << 123037004 |Body structure (body structure)|[784] OR << 123038009 |Specimen (specimen)|[785] OR << 125676002 |Person (person)|[786] OR << 260787004 |Physical object (physical object)|[787] OR << 373873005 |Pharmaceutical / biologic product (product)|[788] OR << 410607006 |Organism (organism)|[789] OR << 419891008 |Record artifact (record artifact)|[790]

769 http://snomed.info/id/719722006
770 http://snomed.info/id/272379006
771 http://snomed.info/id/404684003
772 http://snomed.info/id/71388002
773 http://snomed.info/id/719982003
774 http://snomed.info/id/718497002
775 http://snomed.info/id/105590001
776 http://snomed.info/id/123037004
777 http://snomed.info/id/123038009
778 http://snomed.info/id/260787004
779 http://snomed.info/id/373873005
780 http://snomed.info/id/410607006
781 http://snomed.info/id/419891008
782 http://snomed.info/id/704319004
783 http://snomed.info/id/105590001
784 http://snomed.info/id/123037004
785 http://snomed.info/id/123038009
786 http://snomed.info/id/125676002
787 http://snomed.info/id/260787004
788 http://snomed.info/id/373873005
789 http://snomed.info/id/410607006
790 http://snomed.info/id/419891008

704326004 |Precondition (attribute)|[791]	1	0..*	0..1	<< 404684003 |Clinical finding (finding)|[792] OR << 703763000 |Precondition value (qualifier value)|[793] OR << 71388002 |Procedure (procedure)|[794]
405815000 |Procedure device (attribute)|[795]	1	0..*	0..1	<< 49062001 |Device (physical object)|[796]
1003735000 |Process acts on (attribute)|[797]	1	0..*	0..1	<< 105590001 |Substance (substance)|[798] OR << 123037004 |Body structure (body structure)|[799] OR << 373873005 |Pharmaceutical / biologic product (product)|[800]
704322002 |Process agent (attribute)|[801]	1	0..*	0..1	<< 105590001 |Substance (substance)|[802] OR << 123037004 |Body structure (body structure)|[803] OR << 260787004 |Physical object (physical object)|[804] OR << 373873005 |Pharmaceutical / biologic product (product)|[805] OR << 410607006 |Organism (organism)|[806]
704323007 |Process duration (attribute)|[807]	1	0..1	0..1	<< 7389001 |Time frame (qualifier value)|[808]
1003703000 |Process extends to (attribute)|[809]	1	0..*	0..1	<< 123037004 |Body structure (body structure)|[810]

791 http://snomed.info/id/704326004
792 http://snomed.info/id/404684003
793 http://snomed.info/id/703763000
794 http://snomed.info/id/71388002
795 http://snomed.info/id/405815000
796 http://snomed.info/id/49062001
797 http://snomed.info/id/1003735000
798 http://snomed.info/id/105590001
799 http://snomed.info/id/123037004
800 http://snomed.info/id/373873005
801 http://snomed.info/id/704322002
802 http://snomed.info/id/105590001
803 http://snomed.info/id/123037004
804 http://snomed.info/id/260787004
805 http://snomed.info/id/373873005
806 http://snomed.info/id/410607006
807 http://snomed.info/id/704323007
808 http://snomed.info/id/7389001
809 http://snomed.info/id/1003703000
810 http://snomed.info/id/123037004

704324001 |Process output (attribute)|[811]	1	0..*	0..1	<< 105590001 |Substance (substance)|[812] OR << 719982003 |Process (qualifier value)|[813]
370130000 |Property (attribute)|[814]	1	0..1	0..1	<< 118598001 |Property (qualifier value)|[815]
704325000 |Relative to (attribute)|[816]	1	0..*	0..1	<< 105590001 |Substance (substance)|[817] OR << 123037004 |Body structure (body structure)|[818] OR << 123038009 |Specimen (specimen)|[819] OR << 260787004 |Physical object (physical object)|[820] OR << 373873005 |Pharmaceutical / biologic product (product)|[821] OR << 410607006 |Organism (organism)|[822] OR << 419891008 |Record artifact (record artifact)|[823]
719715003 |Relative to part of (attribute)|[824]	1	0..*	0..1	<< 105590001 |Substance (substance)|[825] OR << 123037004 |Body structure (body structure)|[826] OR << 123038009 |Specimen (specimen)|[827] OR << 260787004 |Physical object (physical object)|[828] OR << 373873005 |Pharmaceutical / biologic product (product)|[829] OR << 410607006 |Organism (organism)|[830] OR << 419891008 |Record artifact (record artifact)|[831]

811 http://snomed.info/id/704324001
812 http://snomed.info/id/105590001
813 http://snomed.info/id/719982003
814 http://snomed.info/id/370130000
815 http://snomed.info/id/118598001
816 http://snomed.info/id/704325000
817 http://snomed.info/id/105590001
818 http://snomed.info/id/123037004
819 http://snomed.info/id/123038009
820 http://snomed.info/id/260787004
821 http://snomed.info/id/373873005
822 http://snomed.info/id/410607006
823 http://snomed.info/id/419891008
824 http://snomed.info/id/719715003
825 http://snomed.info/id/105590001
826 http://snomed.info/id/123037004
827 http://snomed.info/id/123038009
828 http://snomed.info/id/260787004
829 http://snomed.info/id/373873005
830 http://snomed.info/id/410607006
831 http://snomed.info/id/419891008

370132008 |Scale type (attribute)|[832]	1	0..1	0..1	<< 117362005 |Nominal value (qualifier value)|[833] OR << 117364006 |Narrative value (qualifier value)|[834] OR << 117444000 |Text value (qualifier value)|[835] OR << 26716007 |Qualitative (qualifier value)|[836] OR < 398195001 |Measurement scales (qualifier value)|[837]
246501002 |Technique (attribute)|[838]	1	0..*	0..1	<< 254291000 |Staging and scales (staging scale)|[839] OR << 272394005 |Technique (qualifier value)|[840]
370134009 |Time aspect (attribute)|[841]	1	0..1	0..1	<< 7389001 |Time frame (qualifier value)|[842]
704320005 |Towards (attribute)|[843]	1	0..*	0..1	<< 105590001 |Substance (substance)|[844] OR << 123037004 |Body structure (body structure)|[845] OR << 123038009 |Specimen (specimen)|[846] OR << 260787004 |Physical object (physical object)|[847] OR << 373873005 |Pharmaceutical / biologic product (product)|[848] OR << 410607006 |Organism (organism)|[849] OR << 419891008 |Record artifact (record artifact)|[850]

832 http://snomed.info/id/370132008
833 http://snomed.info/id/117362005
834 http://snomed.info/id/117364006
835 http://snomed.info/id/117444000
836 http://snomed.info/id/26716007
837 http://snomed.info/id/398195001
838 http://snomed.info/id/246501002
839 http://snomed.info/id/254291000
840 http://snomed.info/id/272394005
841 http://snomed.info/id/370134009
842 http://snomed.info/id/7389001
843 http://snomed.info/id/704320005
844 http://snomed.info/id/105590001
845 http://snomed.info/id/123037004
846 http://snomed.info/id/123038009
847 http://snomed.info/id/260787004
848 http://snomed.info/id/373873005
849 http://snomed.info/id/410607006
850 http://snomed.info/id/419891008

246514001 |Units (attribute)|[851]	1	0..1	0..1	< 767524001 |Unit of measure (qualifier value)|[852]
424226004 |Using device (attribute)|[853]	1	0..*	0..1	<< 49062001 |Device (physical object)|[854]

3.8.6.4 Observable Entity Defining Attributes

All attributes with a range constraint for <<|Pharmaceutical / biologic product (product)|

Where the MRCM allows Pharmaceutical / biologic product (product) and its descendants as valid values for Observable entity (observable entity), the Pharmaceutical / biologic product (product) subhierarchy is not currently used for values with these attributes in the International Release except for 787859002 | Vaccine product (medicinal product)| and its descendants, which *can* be used as valid values for this attribute.

Characterizes

This attribute specifies the process which the property describes, and on which the property (of this observable) depends. The process can be very general (e.g. excretion).

For example,

- Mass concentration ratio of silver to creatinine in 24-hour urine (observable entity) has 704321009 | Characterizes (attribute)|[855] of excretion process
- 789098002 |Estimated quantity of intake of potassium in 24 hours (observable entity)| has a 704321009 |Characterizes (attribute)| of administration of substance

Component

This attribute is used to specify the numerator of a relational property types, e.g. ratio, concentration.

For example,

- Arbitrary concentration of Varicella-Zoster virus (observable entity) has the 246093002 | Component (attribute)|[856] of Human herpesvirus 3

Direct site

This attribute is used to specify the entity on which the observation is directly made. It may also be used when the observation is indirect, i.e. when a direct observation cannot be done.

For example,

- 415974002 | Core body temperature measured at tympanic membrane (observable entity)|[857] has the 704327008 | Direct site (attribute)|[858] of 42859004 |Tympanic membrane structure (body structure)|

851 http://snomed.info/id/246514001
852 http://snomed.info/id/767524001
853 http://snomed.info/id/424226004
854 http://snomed.info/id/49062001
855 http://snomed.info/id/704321009
856 http://snomed.info/id/246093002
857 http://snomed.info/id/415974002
858 http://snomed.info/id/704327008

Has realization

This attribute is used to specify the process or activity that is the consequence of realization of the function.

For example,

- 282097004 | Ability to walk (observable entity)|[859] 719722006 | Has realization (attribute)|[860] of 870595007 |Walking (qualifier value)|

Inherent location

This attribute is used to specify a body site or other location of the independent continuant in which the property exists.

For example,

- DNA taxon of Mycobacterium from bronchial secretions (observable entity) has 718497002 | Inherent location (attribute)|[861] of bronchus

Inheres in

This attribute specifies the independent continuant in which the quality exists and on which the dependent quality (of this observable) depends.

For example,

- 307047009 |Core body temperature measured in rectum (observable entity)| has 704319004 |Inheres in (attribute)| of 278826002 |Body internal region (body structure)|

Precondition

This attribute is used to specify body state, timing, challenges, or other situations that must be true of the entity to be observed.

For example,

- Plasma creatinine concentration 7 days post challenge (observable entity) has a Precondition of 7 days post challenge
- 163033001 | Lying blood pressure (observable entity)|[862] has a 704326004 | Precondition (attribute)|[863] of 102538003 |Recumbent body position (finding)|

Procedure device

This attribute is used to model devices associated with a procedure. This attribute is used to define high-level, general concepts that aggregate procedures according to the device involved.

Process acts on

This attribute is used to describe that a process specifically acts on some entity, e.g. by transporting that entity in or out of the body, i.e. Rate of intake of protein, Rate of excretion of creatinine.

For example,

859 http://snomed.info/id/282097004
860 http://snomed.info/id/719722006
861 http://snomed.info/id/718497002
862 http://snomed.info/id/163033001
863 http://snomed.info/id/704326004

- 789350001 |Estimated quantity of intake of iron in 24 hours (observable entity)| has a 1003735000 | Process acts on (attribute)|[864] of iron

Process agent

This attribute is used to specify the continuant (e.g. body structure or organism) that is causally active in the process on which the property depends. It is used to refine the meaning of the process named as the value of 704321009 | Characterizes (attribute)|[865] , or it may simply repeat the meaning that is already there.

For example,

- Substance rate of secretion of somatotropin by pituitary following clonidine per os (observable entity) has the 704322002 | Process agent (attribute)|[866] of 56329008 |Pituitary structure (body structure)|.

Process duration

This attribute specifies the duration of the process characterized by the observable property type.

For example,

- Mass rate of excretion of cortisone in 24 hour urine (observable entity) has the 704323007 | Process duration (attribute)|[867] of 123027009 |24 hours (qualifier value)|

Process extends to

This attribute specifies that the process which the property characterizes has led to the inclusion of a previously not included structure.

For example,

The concept |Presence of direct invasion by primary malignant neoplasm of prostate to seminal vesicle (observable entity)| has a 1003703000 |Process extends to (attribute)| of |Seminal vesicle structure (body structure)|

Process output

This attribute is used to specify the substance or process produced by the process characterized by the observable property type.

For example,

- Substance rate of excretion of pregnanediol in micromoles per day (observable entity) has a 704324001 | Process output (attribute)|[868] of 28268006 |Pregnanediol (substance)|

Property

This attribute is used to specify the type of feature (i.e. quality, disposition, function, or process characteristic) to be observed. Its values are abstract types of quality (length, odor, concentration) or abstract types of process features (rate, speed).

For example,

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864 http://snomed.info/id/1003735000
865 http://snomed.info/id/704321009
866 http://snomed.info/id/704322002
867 http://snomed.info/id/704323007
868 http://snomed.info/id/704324001

- Blood glucose mass concentration (observable entity) has the 370130000 | Property (attribute)|[869] of 118539007 |Mass concentration (property) (qualifier value)|

Mass vs Weight

The Property (qualifier value) hierarchy contains the following:

- 118538004 |Mass, a measure of quantity of matter (property) (qualifier value)|
- 726527001 |Weight (property) (qualifier value)|

Very rarely is the physics definition of *weight* used. When the term *weight* is used, it is most often referring to *mass*, as further demonstrated by the units of measure i.e., grams, kilograms, etc. Unless units specific to the physics definition of weight are specified using Newtons, assume that mass is implied.

To summarize, always use the *mass* qualifier value unless a concept is requested with Newton units that specifically refer to weight.

Relative to

This attribute is used to specify the denominator of a relational property type, e.g. a ratio or proportion.

For example,

- Urine alpha aminobutyrate to creatinine ratio (observable entity) has 704325000 | Relative to (attribute)|[870] 15373003 |Creatinine (substance)|
- Neutrophils per 100 leukocytes in blood (observable entity) has 704325000 | Relative to (attribute)|[871] 702962009 |Population of all leukocytes in portion of fluid (body structure)|

Relative to part of

This attribute is used to specify the denominator of a relative relational property, such as a ratio of ratios.

For example,

- Relative substance concentration of cerebrospinal fluid IgM to plasma IgM (observable entity) has 719715003 | Relative to part of (attribute)|[872] of 50863008 |Plasma (substance)|

Scale Type

This attribute is used to specify the scale of the result of an observation or a diagnostic test (i.e., quantitative, qualitative, semi-quantitative).

- When defining observable entities for the international release, the | Scale type (attribute)|[873] will not be used. Extensions are permitted to add specific subtypes of observable entities that include the | Scale type (attribute)|[874] , if desired.
- In instances where Observable entity content from SNOMED CT extensions that contain a SCALE TYPE relationship is promoted to the International release, the SCALE TYPE relationship will not be inactivated.

869 http://snomed.info/id/370130000
870 http://snomed.info/id/704325000
871 http://snomed.info/id/704325000
872 http://snomed.info/id/719715003
873 http://snomed.org/fictid#
874 http://snomed.org/fictid#

Technique

This attribute is used to specify the systematic method of an observation.

For example,

- Presence of Brucella abortus antibody in serum by latex agglutination (observable entity) has the 246501002 | Technique (attribute)|[875] of 703448004 |Latex agglutination test technique (qualifier value)|

Time Aspect

This attribute is used to specify the timing of an observation.

For example,

- Substance concentration of acetone in urine (observable entity) has the 370134009 | Time aspect (attribute)|[876] of 123029007 |Single point in time (qualifier value)|

Towards

This attribute is used to specify a disposition, what the disposition is towards, i.e. a specific triggering agent, or more generally, participant in the realization of the disposition.

For example,

- Quantitative susceptibility of Pseudomonas aeruginosa to amikacin in microbial isolate by disk diffusion (observable entity) has 704320005 | Towards (attribute)|[877] of 387266001 |Amikacin (substance)|

Units

This attribute is used to specify the units used in assigning a value to an observation.

For example,

- Basophils per 100 leukocytes (observable entity) has the 246514001 | Units (attribute)|[878] of 415067009 |Percentage unit (qualifier value)|

Using device

This attribute is used to specify the instrument or equipment utilized to execute an action. Using device is appropriate when the device is actually used to carry out the action that is the focus of the procedure.

For example,

- 415921007 | Temperature of forehead using skin strip thermometer (observable entity)|[879] has 424226004 | Using device (attribute)|[880] of 448916003 |Skin strip thermometer (physical object)|

875 http://snomed.info/id/246501002
876 http://snomed.info/id/370134009
877 http://snomed.info/id/704320005
878 http://snomed.info/id/246514001
879 http://snomed.info/id/415921007
880 http://snomed.info/id/424226004

Examples without concept IDs

There are examples on this page that do not have a concept ID. These examples are included for members who may be modeling observables within their extension.

3.8.6.5 Observable Entity Naming Conventions

Test Observable Entity Naming Conventions

Naming conventions for the fully specified name (FSN) for observable entities and for naming evaluation procedures or observable entities that are submitted with names from the IFCC-IUPAC NPU systems are as follows:

General naming pattern: Property, Component, Direct Site

- First: Property
  - Property (the property type of the observable) is named first, when possible.
  - Modifier: Scale Method.
    - Scale Method refines the Property, and, therefore, precedes the action in the naming order. (Scale Method, Property)
    - Naming pattern: (Scale Method, Property), Component, Direct Site
- Second: Component
  - Property is named first, followed by the entity that is the value of Component, when possible.
- Third: Direct Site
  - Modifier: Time aspect. Time aspect provides information about the direct site and precedes it in the naming order. (Time aspect, Direct Site)

For example,

- 416125006 |Concentration of hemoglobin in erythrocyte (observable entity)|[881]

Modeling: Screening measurements

Measurements done by screening should be specified with *by screening method* added at the end of the description.

Serology and *serologic test* are ambiguous terms and should not be included in FSNs. These terms can be included in the descriptions for antibody observable or evaluation concepts but cannot be included in the preferred term. Existing content will be fixed in a future release.

3.8.6.6 Observable Entity Modeling

When observable entity concepts have been given a value, they behave like clinical findings, with respect to the *concept model* for context.

When observable entity concepts have *not* been given a value, they behave like procedures, with respect to the *concept model* for context.

881 http://snomed.info/id/416125006

Modeling

The observable entity model has been implemented in limited content areas in SNOMED CT thus far. Most of the content in the hierarchy is primitive.

- Over 165 observable entity concepts have been modeled describing physiological measurements (body temperature, respiratory rate, heart rate, blood pressure). Most of these are sufficiently defined using the attributes. |Vital sign (observable entity)| has been inactivated since it could not be universally defined.
- Additional concepts using observable entity attributes have been defined since the January 2020 release. The majority of the changes are related to nutritional intake (e.g., food intake, vitamin intake, fasting pattern) observable entity concepts.

Susceptibility observables should be modeled in accordance with the template specified here[882].

- Body temperature(see page 263)
- Mass vs Weight(see page 263)
- Neoplasm Observables(see page 264)
- Nutritional intake observable entities(see page 266)
- Observable Entity and Microbiology Test Results(see page 267)
- Observable Entity Templates(see page 270)
- Relationship between Observable Entities and NPU codes(see page 271)
- Representing LOINC Terms with the SNOMED CT Observable Entity Model(see page 271)

Body temperature

Core body temperature is the temperature in the deep tissues and internal organs, including the brain. The gold standard site for measuring core body temperature is the pulmonary artery. Other sites for measuring core body temperature include the nasopharynx, esophagus, bladder, gastrointestinal tract, and vagina. Some peripheral sites are commonly used to estimate core body temperature but are not a true representation of core body temperature on their own, e.g., axillary region, inguinal region, sublingual space. *Body surface temperature* is measured at several sites, e.g., skin, foot, spine.

For example,

698831002 |Core body temperature measured in nasopharynx (observable entity)|

415882003 |Estimated core body temperature measured in axillary region (observable entity)|

364518005 |Temperature of foot (observable entity)|

Mass vs Weight

The Property (qualifier value) hierarchy contains the following:

- 118538004 |Mass, a measure of quantity of matter (property) (qualifier value)|
- 726527001 |Weight (property) (qualifier value)|

Very rarely is the physics definition of *weight* used. When the term *weight* is used, it is most often referring to *mass*, as further demonstrated by the units of measure i.e., grams, kilograms, etc. Unless units specific to the physics definition of weight are specified using Newtons, assume that mass is implied.

To summarize, always use the *mass* qualifier value unless a concept is requested with Newton units that specifically refer to weight.

882 https://confluence.ihtsdotools.org/x/VzjoBg

Neoplasm Observables

Observable entity concepts representing histopathology examination observables of neoplasms are being modeled according to a series of templates.

Please see the templates listed here: https://confluence.ihtsdotools.org/x/SonUAw. See the Community Content[883] area for more information about the project.

Concepts containing a *primary* malignant neoplasm from the observable entity subhierarchy employ the 704321009 |Characterizes (attribute)| with the target qualifier value of 1234914003 |Malignant proliferation of primary neoplasm (qualifier value)| in order to define *primary* (which matches the target value of the Pathological process (attribute) used by concepts in the Disorder hierarchy).

For example,

1136681000004107 |Anatomic location of excised primary malignant neoplasm (observable entity)| applies the Characterizes (attribute) with a target of Malignant proliferation of primary neoplasm (qualifier value).

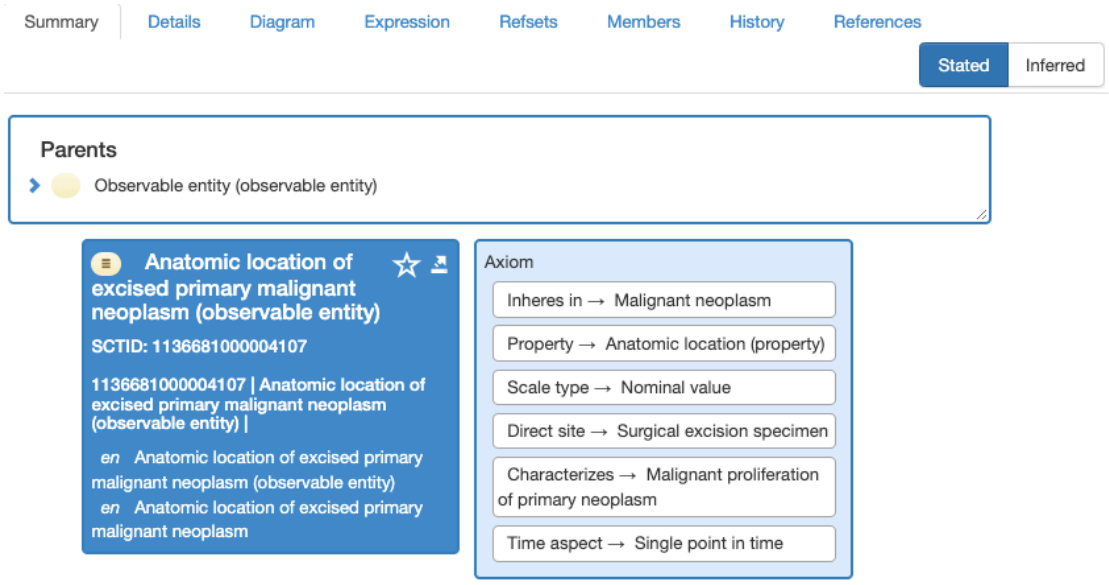

Figure 1: Stated view of 1136681000004107 |Anatomic location of excised primary malignant neoplasm (observable entity)|

883 https://confluence.ihtsdotools.org/x/VHXoBg

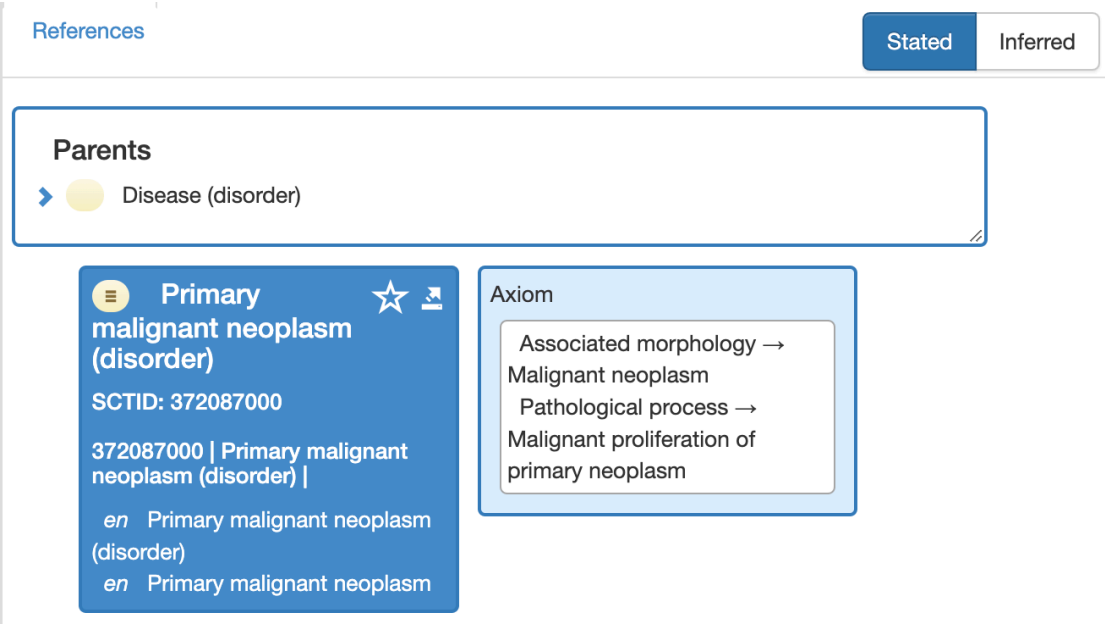

Figure 1: Stated view of 372087000 |Primary malignant neoplasm (disorder)|

Concepts containing a *metastatic* malignant neoplasm from the observable entity subhierarchy do not use 704321009 |Characterizes (attribute)|, but instead are defined by the specific *metastatic* morphologic abnormality. For example, 444384007 |Number of regional lymph nodes containing metastatic neoplasm in excised specimen (observable entity)| has the attribute 246093002 |Component (attribute)| with a target value of 14799000 |Neoplasm, metastatic (morphologic abnormality)|.

Colorectum

The terms *colorectal* and *colorectum*, commonly used by pathologists, are included in descriptions for concepts referring to neoplasms modeled with 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)|. 1285733009 |Structure of cecum and/or colon and/or rectum (body structure)| is needed because neoplasms are the same from the cecum to rectum and are considered as a group in cancer synoptic reporting protocols. Note, there is no consensus concerning the definition of *colon* in the literature and between different domains.

Concepts containing a *metastatic* malignant neoplasm from the observable entity subhierarchy do not use 704321009 |Characterizes (attribute)|, but instead are defined by the specific *metastatic* morphologic abnormality. For example, 444384007 |Number of regional lymph nodes containing metastatic neoplasm in excised specimen (observable entity)| has the attribute 246093002 |Component (attribute)| with a target value of 14799000 |Neoplasm, metastatic (morphologic abnormality)|.

Concepts containing a *metastatic* malignant neoplasm from the observable entity subhierarchy do not use 704321009 |Characterizes (attribute)|, but instead are defined by the specific *metastatic* morphologic abnormality. For example, 444384007 |Number of regional lymph nodes containing metastatic neoplasm in

excised specimen (observable entity)| has the attribute 246093002 |Component (attribute)| with a target value of 14799000 |Neoplasm, metastatic (morphologic abnormality)|.

Nutritional intake observable entities

Naming conventions for estimated and measured intake or nutrient administration, in aggregate or as a portion of intake via a specified route (ie, oral, gastroenteral [enteral nutrition], parenteral nutrition, and via intravenous fluids), is as follows:

FSN: [technique] quantity of intake of [substance] via [route] in [timeframe] (observable entity)

SYN: [technique] quantity of intake of [substance] via [route] in [timeframe]

See the specific template here[884].

For example,

789106008 | Estimated quantity of intake of phosphorous in 24 hours (observable entity)|[885]

FSN: Estimated quantity of intake of phosphorous in 24 hours (observable entity)

PT: Estimated quantity of intake of phosphorous in 24 hours

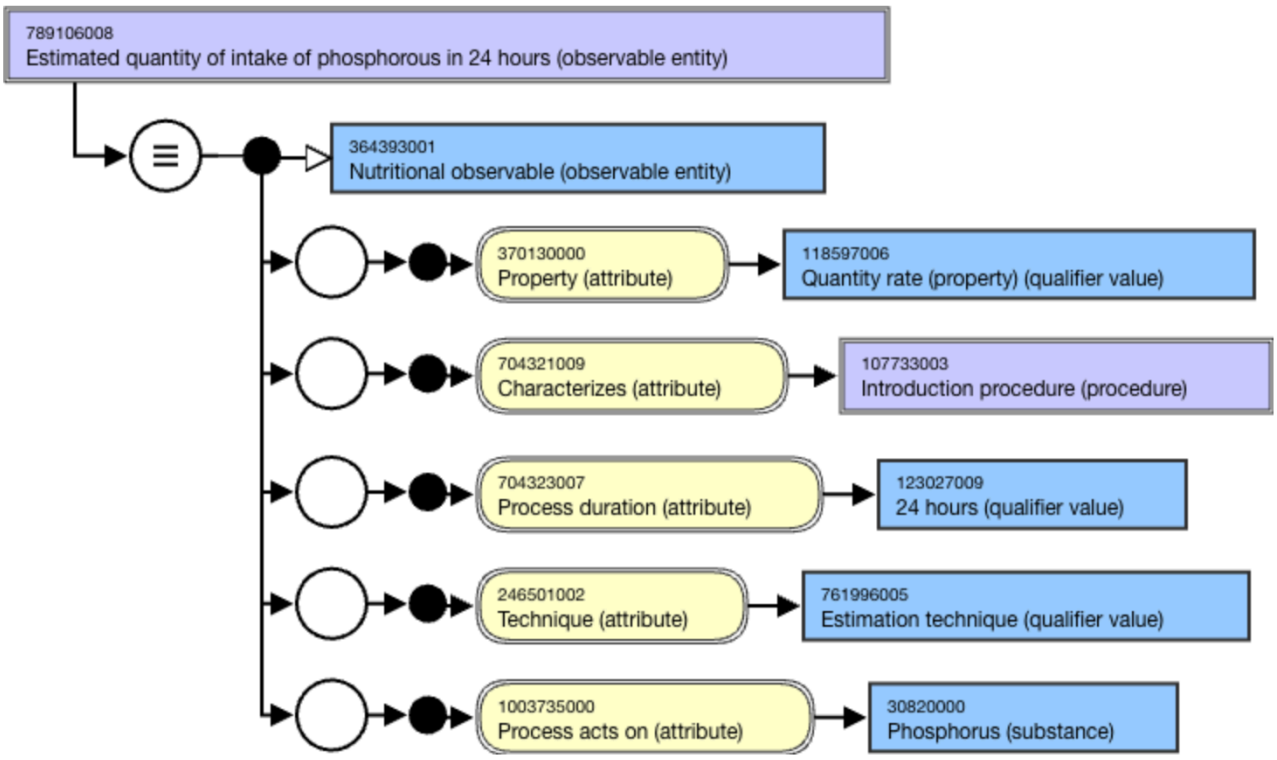

Figure 1: Stated view of 789106008 |Estimated quantity of intake of phosphorous in 24 hours (observable entity)|

884 https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=87041725
885 http://snomed.info/id/789106008

Dietary

"Dietary" is considered ambiguous and should not be included in SNOMED CT. Existing content that includes "dietary" will be considered for inactivation.

Observable Entity and Microbiology Test Results

When microbiology laboratory results are encoded, it is important to be aware of the context provided by the observation, i.e. the test performed and, therefore, the implied meaning of the result value, i.e. the organism.

For example, the combination of *Logical Observation Identifiers Names and Codes (LOINC)* for the lab test and *SNOMED CT* for the organism, provides a unique and specific meaning:

- LOINC provides microbiology reporting codes with attributes including the *property* through the use of *PRID* (presence or identity) and the *scale* through the use of *NOM* (nominal or categorical response that does not have a natural ordering) as the result value (typically the name of organism).
- Use of organism concepts in combination with such LOINC codes implies that a specific organism is seen, detected, identified, isolated, or present.

Organism

On its own, an organism concept can only indicate the definition of that organism. Its detection or presence can only be implied when it is paired with other information that may come from the electronic health application and/or from the LOINC observation.

Organism X or organism Y

Use organism X or organism Y when a laboratory report indicates a single isolate is assumed, but the lab is unable (for any reason) to differentiate the result instance.

For example,

- 703015006 | Human coxsackievirus or human echovirus (finding)|[886]

Organism X, not organism Y

Use organism X, not organism Y when a laboratory report indicates a class of organisms described by the exclusion of specific Linnaean or non-Linnaean classes. These concepts are found in the organism hierarchy (based on reasonable use cases to avoid a combinatorial explosion). They are a primitive super class, in between the species or species subtype.

For example,

- 115407004 | Haemophilus influenzae, not b (organism)|[887]

Exception

The common term *yeast* can refer to two separate classes: 1) a morphologic form of a dimorphic fungus; or 2) an organism in kingdom Fungi that is truly a yeast. Therefore, while the super class *yeast* is represented as an organism, “X, not organism Y” type concept is represented in the clinical finding hierarchy (as descendant of 769070007 |Yeast detected (finding)|) since one potential meaning of use is a diagnostic morphologic form of an organism rather than an organism itself.

886 http://snomed.info/id/703015006
887 http://snomed.info/id/115407004

For example,

- 769071006 | Yeast not Candida albicans detected (finding)|[888]

Genus X, not species Y and not species Z

Use Genus X, not species Y and not species Z when a laboratory report indicates a species of Genus X and confirms that it is not species Y, nor species Z. E.g. Bacillus species, not Bacillus anthracis and not Bacillus cereus (organism).

Use this naming convention only with Genus, species, and subspecies levels of the hierarchy.

Untypable organisms

Laboratory reports and journal articles may include an organism that could not be serotyped, e.g. E. *coli, untypable*. The requests for such concepts are declined due to ambiguity. Instead, use the closest taxonomic level in the hierarchy.

Presumptive values

Laboratory findings may be reported with a status of preliminary, presumptive, provisional, etc. These typically cover reportable or notifiable lab values. The status of a report is different from the result; it is part of the electronic health application model/message. The requests for such concepts are declined as they are ambiguous and subject to limitless combinations.

> **Concepts with presumptive values**
>
> Existing concepts with presumptive values are undergoing review for inactivation.

Mixed Organism

Some laboratories report findings indicating a mixed population of bacteria from several classes, e.g. *mixed anaerobic Gram negative bacilli*. The request for such a concept is added as a *clinical finding.* The actual organism is unknown, however there is a result, although more general.

Reporting Negative and Positive Results

Laboratories perform and report on specific tests to identify the absence, as well as the presence, of a particular pathogenic organism. Laboratories typically report negative result values, such as *X not seen*, *X not detected*, X *not isolated*, and *no X seen (or identified or isolated)* and positive results as X *seen*, X *detected*, and X *isolated*. The following tables includes the acceptable modeling for negative and positive results.

Microbiology Tests: Reporting of Negative and Positive Values with Examples			
Lab test type (Observation)	Result value	Example lab test (e.g. SNOMED CT and/or LOINC term)	Example result value

888 http://snomed.info/id/769071006

Microbiology Tests: Reporting of Negative and Positive Values with Examples			
General culture (where implied scale = nominal)	*No X isolated* (finding) *X* (organism)	61594008 |Microbial culture (procedure)| 11475-1 |Microorganism identified in Unspecified specimen by Culture	**Valid value** 168204005 |Salmonella not isolated (finding)|[889] 27268008 |Genus Salmonella (organism)|[890] **Invalid value** 264887000 |Not isolated (qualifier value)| 46651001 |Isolated (qualifier value)|
Organism Specific culture	*Not isolated* (qualifier value) *Isolated* (qualifier value)	122206002 |Bordetella pertussis culture (procedure)| 48741-3 |Bordetella pertussis; Nasopharynx; Culture	**Valid value** 264887000 |Not isolated (qualifier value)|[891] 46651001 |Isolated (qualifier value)|[892] **Invalid value** Bordetella pertussis not isolated Bordetella pertussis isolated
General microscopic testing (where implied scale = Nominal)	*No X seen* (finding) *X* (organism)	609009000 |Microscopic examination of bacterial smear of urine specimen (procedure)| 25145-4 |Bacteria [Presence] in Urine sediment by Light microscopy	**Valid value** 27268008 |Genus Salmonella (organism)|[893] **Invalid value** 47492008 |Not seen (qualifier value)|

889 http://snomed.info/id/168204005
890 http://snomed.info/id/27268008
891 http://snomed.info/id/264887000
892 http://snomed.info/id/46651001
893 http://snomed.info/id/27268008

Microbiology Tests: Reporting of Negative and Positive Values with Examples			
Specific microscopic testing	*Not seen* (qualifier value) *Present* (qualifier value)	408215009 |Cryptosporidium microscopy (procedure)|	**Valid value** 47492008 |Not seen (qualifier value)|[894] 52101004 |Present (qualifier value)|[895] **Invalid value** No Cryptosporidium seen Cryptosporidium seen
Serologic, DNA or other organism specific test	*Not detected* (qualifier value) *Detected* (qualifier value) Rationale: Almost all of these tests are organism-specific	871555000 |Detection of ribonucleic acid of Severe acute respiratory syndrome coronavirus 2 (observable entity)| 95406-5 |SARS-CoV-2 (COVID-19) RNA [Presence] in Nose by NAA with probe detection	**Valid value** 260415000 |Not detected (qualifier value)|[896] 260373001 |Detected (qualifier value)|[897] **Invalid value** No Severe acute respiratory syndrome coronavirus 2 detected Severe acute respiratory syndrome coronavirus 2 detected

Observable Entity Templates

Templates are available for modeling quality observables and for process observables:

- Simple template for quality observables[898]
- Simple template for process observables[899]
  - Nutritional intake observables[900]
- Susceptibility observables[901]
  - The Susceptibility template is a disposition observable; there is no *simple* template at this time.

894 http://snomed.info/id/47492008
895 http://snomed.info/id/52101004
896 http://snomed.info/id/260415000
897 http://snomed.info/id/260373001
898 https://confluence.ihtsdotools.org/display/SCTEMPLATES/Simple+template+for+Quality+Observable
899 https://confluence.ihtsdotools.org/x/2J3CBg
900 https://confluence.ihtsdotools.org/x/vSYwBQ
901 https://confluence.ihtsdotools.org/x/-DXFBQ

Relationship between Observable Entities and NPU codes

Nomenclature, Properties, and Units (NPU) is a coding system and terminology for identification and communication of examination results from clinical laboratories. Please see their website for more information: NPU terminology[902].

Logically there is a relationship between NPU and SNOMED CT observable entities. A pilot project examined overlaps and possible alignment; further work may be done. However, there is no formally maintained SNOMED CT documentation on this alignment.

Representing LOINC Terms with the SNOMED CT Observable Entity Model

Logical Observation Identifiers Names and Codes (LOINC) terms are defined using the Observable Entity model in *SNOMED CT* as produced in the LOINC - SNOMED CT Cooperation Project releases.

The project release documentation contains information about how LOINC terms and parts are aligned with *SNOMED CT* concepts using the model.

For more information

SNOMED CT July 2017 LOINC - SNOMED CT Cooperative package Production release - RF2 Release notes[903]

3.8.7 Organism

Definition	Examples
Organisms of significance to human medicine	• 3265006 | Genus Candida (organism) |[904] • 710877000 | Beta lactam resistant bacteria (organism) |[905]

Organism concepts

Organism concepts are used:

- In modeling cause of disease
- To document the cause of reportable or notifiable diseases
- In evidence-based infectious disease protocols, e.g. in clinical decision-support systems

3.8.7.1 Organisms with qualifiers

Intrinsic qualifiers

902 https://www.npu-terminology.org/
903 https://confluence.ihtsdotools.org/display/RMT/SNOMED+CT+July+2017+LOINC+-+SNOMED+CT+Cooperative+package+Production+release+-+RF2+Release+notes
904 http://snomed.info/id/3265006
905 http://snomed.info/id/710877000

If a qualifier is an intrinsic part of an organism, it belongs in the organism hierarchy and is modeled accordingly. *Intrinsic* should be interpreted as a characteristic that is inherent in the organism (e.g. Gram-positive), as opposed to a context-dependent characteristic (e.g. some uses of *intracellular*).

When modeling organisms with qualifiers, the qualifier should be placed in front of the organism name.

Morphology qualifiers

For example, a non-Linnaean class of bacteria described by morphology

- 8745002 | Gram-positive bacterium (organism)|[906]
- 416983001 | Helical Gram-negative bacillus (organism)|[907]

Physiology qualifiers

For example, a non-Linnaean class of bacteria described by physiology

- 59343002 | Anaerobic bacteria (organism)|[908]
- 417454003 | Non-motile Salmonella (organism)|[909]

Resistance / susceptibility qualifiers

For example, A non-Linnaean class of bacteria described by antimicrobial susceptibility

- 712662001 | Carbapenem resistant Enterobacteriaceae (organism)|[910]
- 417943000 | Methicillin susceptible Staphylococcus aureus (organism)|[911]

Modeling with resistance-type qualifiers

Organisms with resistance-type qualifiers, i.e. where the qualifiers refer to the resistance phenotype and the organisms that are defined by the mechanism underlying the resistance phenotype, appear in the literature and are sometimes used interchangeably. However, in creating new concepts, these terms should be distinguished as they are separate concepts. For resistance-type qualifiers, use the antimicrobial agent as opposed to the enzyme that the organism is producing against the said antimicrobial agent.
For example,

- *Carbapenem resistant enterobacteriaceae* and *carbapenemase-producing enterobacteriaceae* share a significant overlap, but the former refers to the resistance phenotype, regardless of the mechanism of resistance. The presence of gene and carbapememase production, as a resistance mechanism, usually results in clinically relevant levels of carbapenem resistance. However, it is possible to have only reduced susceptibility.

Growth morphology

Growth morphology is not an *always and necessarily true* characteristic of an organism and therefore should not be considered an intrinsic characteristic. The terms representing growth morphology such as *Branching Gram-positive*

906 http://snomed.info/id/8745002
907 http://snomed.info/id/416983001
908 http://snomed.info/id/59343002
909 http://snomed.info/id/417454003
910 http://snomed.info/id/712662001
911 http://snomed.info/id/417943000

bacillus present or *Gram-positive cocci in chains present* are usually used for reporting a visual finding that is a characteristic of a sample. These terms should be represented as findings.

For example, 1231428004 |Beaded branching Gram-positive bacilli present (finding)|

3.8.7.2 Validity

A number of qualifiers might be valid (e.g. aerobic microaerophilic, motile curved gram-negative bacteria). To determine the sequence, the decision-making process is stepwise as follows:

- Determined on a case-by-case basis
- Highly dependent on fitting in with the model limitations
- Based on *Bergey's Manual of Systematic Bacteriology* as the primary reference

When requesting a new qualifier, an acceptable reference must be provided. Concepts with valid qualifiers are added to the International Release.

3.8.7.3 Organism groupings

Only authoritative taxonomic groupings are added to the SNOMED CT International Release. When requesting new organism concepts, authoritative references must be provided. Acceptance is determined on a case-by-case basis by authors. These concepts may evolve over time as the names evolve.

Complex or Group

The terms "complex" and "group" are often used in scientific papers. Laboratories then reflect the words they see in those papers in their local descriptions. However, the terms used in scientific papers are not authoritative taxonomic groupings; rather, they are just concepts used for ease of publication and grouping sets of organisms that are similar in certain functions or structure.
Implementers must be aware these types of concepts may evolve over time. As the sophistication of microbiology labs increases, the "members" of each complex may change and the complex concepts actually become obsolete. For example, this has occurred for some of the Centers for Disease Control and Prevention (CDC) groups where a number of these concepts have actually been given names and the CDC group name is archaic.
When requesting a new group or complex, an acceptable authoritative reference must be provided. The reference should clearly specify the list of species and subspecies associated with the complex/group.
Existing *complex* or *group* concepts, with grouper concepts separate from the genus, but with the same meaning as the genus, will be inactivated in the SNOMED CT International Release.
Descriptions with *group* or *complex* as synonyms of the genus, will be deprecated from the SNOMED CT International Release (The genus concept should be used for these concepts).

Microorganisms

Microorganism is a common grouping name for organisms, but it does not align with Linnaean classification. Microorganisms are organisms that can only be seen using microscopy. Four major classes could reasonably be assigned to microorganism at the highest levels. Viruses, prions, bacteria and archaea are all microscopic. Fungi are both microscopic and macroscopic and this is also true for animals. Finally, there are examples of organisms (e.g. Phylum Nemata) that are macroscopic as adults but diagnostic life-cycle stages such as eggs and larvae are microscopic. Assigning and maintaining all subtypes to this seemingly familiar organism group is problematic and would be time and resource intensive. This concept has been deprecated and will not be added to the organism hierarchy.

3.8.7.4 Biotype, Serotype, Serogroup

Requests for new concepts are evaluated on a case-by-case basis.

It is important to understand the meaning from the requestor and determine how it can be modeled.

These concepts may evolve over time as the names evolve.

3.8.7.5 X-like Organism

"X-like" organism is a term construction used in the medical lexicon that is outside the classic Linnaean taxonomy. "X-like" organisms are identified by their similarity to some other organism. There is no single category or use of X-like organism terms; the meaning of these terms is context-dependent and open to interpretation when no context is provided. For many of these terms, the meaning will change with time. In some cases, this leads to a chain of terms that remains in colloquial use but loses value and place in the scientific literature. In addition, while reporting X-like organisms is clinically significant—unlike "untypeable" concepts—they cannot have a specific parent. These concepts are added:

- only if clear context is provided by the requester; and
- under the highest level concepts in the "organism" hierarchy i.e. direct parents would be Virus, Bacteria, Fungus.

3.8.7.6 Provisional serotypes

Provisional serotypes, i.e. serotypes that have been defined but not given a number in the antigenic schema, are considered for addition on an ad hoc basis and only if it can be confirmed that this is a reproducible assignment not being duplicated by multiple organizations.

3.8.7.7 Multidrug-resistant, extensively drug-resistant, pan drug-resistant bacteria

DRAFT UNDER REVIEW: CONTENT TO BE FINALIZED

SNOMED International adopted the recommendations of a joint initiative of the European Centre for Disease Prevention and Control (ECDC) and the CDC for the characterization of the different patterns of resistance found in healthcare-associated, antimicrobial resistant bacteria. A panel of international experts convened and drafted a proposal which provides clear consensus definitions. Please refer to the following article for details: Magiorakos, A. Srinivasan, A. Multidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria: an international expert proposal for interim standard definitions for acquired resistance. *Clinical Microbiol Infect* 2012; 18: 268-281.

3.8.7.8 Organism Naming Conventions

Fully Specified Name

The fully specified name (FSN) of organism concepts, names classes that are officially recognized Linnaean taxonomic classes (other than species), and include a designation of *rank*. They include, but are not limited to Phylum, Order, Suborder, Class, Family, Genus, and subspecies.

Properly constructed FSNs contain terms indicating the taxonomic rank + the recognized name of that rank + semantic tag.

For example,

- 106544002 | Family Enterobacteriaceae (organism)[912]

Rank

The naming convention is not applied to concepts that only refer to a subgroup of a rank.

For example,

- Vancomycin resistant Enterococcus (organism) is correct in capitalizing Enterococcus. It refers to a subclass of the genus, Enterococcus species that are resistant. Enterococcus is a scientific name of an organism class; therefore, the first letter is capitalized.
- *Vancomycin resistant Genus Enterococcus* is incorrect. It refers to the rank only, Genus Enterococcus.

Official names of organisms may include abbreviations such as “subsp.” and “subgen.” (Domain Bacteria and Kingdom Plantae). Official names of organisms may also include parentheses e.g. “Cypraea (Cypraea) tigris” (Kingdom Animalia) and “Bacillus (subgen. Bacillus Cohn 1872, 174) subtilis” (Domain Bacteria).

- The FSN of organisms should include the expanded word for rank i.e. “subgenus” or “subspecies” and not an abbreviation of same.
- The FSN should not include parentheses.

For example,

- Genus Pleione subgenus Scopulorum (organism)
- Genus Cypraea subgenus Cypraea tigris (organism)
- Staphylococcus succinus subspecies casei (organism)

Exception

When the same Scientific Name is used in two different hierarchies (two different kinds of organisms), use the authority of the scientific name in the FSN to distinguish the concepts. The name authority is typically found in the authoritative source for the organism name.

For example,

- Genus Edwardsiella Andres, 1883 (organism)
- Genus Edwardsiella Ewing and McWhorter, 1965 (organism)

912 http://snomed.info/id/106544002

Preferred Term

The Preferred Term is the official scientific name. It may include abbreviations and/or parentheses. The preferred term usually does not include the taxonomic rank designation except for the following cases:

- Official names of organisms may include abbreviated taxonomic rank such as “subg.“ "subgen." or “subsp.”.
- In rare cases, two Linnaean taxon ranks in the same hierarchy may have the same name. For example, in Kingdom Bacteria, "Thermodesulfobacteria" is an applicable term at both Phylum and Class levels. In this case, the taxon rank is included in the preferred term to prevent any ambiguity.

For example,

- Cypraea (Cypraea) tigris
- Pleione subg. Scopulorum
- Bacillus (subgen. Bacillus Cohn 1872, 174) subtilis
- Staphylococcus succinus subsp. casei

Exceptions

- If a common name exists for an organism in primary references, then it could be used as the Preferred Term for the organism.

  For example,
  388618001 |Family Felidae (organism)|, PT: cats
  388626009 |Genus Felis (organism)|, PT: small cats
- If a common name is shared between more than one organism, the preferred term should adhere to the following format: Scientific Name with annotated common name to prevent confusion. A dash may be used to separate the two names.

  For example,
  1697006 |Genus Megapodius (organism)| and 107060000 |Family Megapodiidae (organism)| share the common name “Megapodes”. The Preferred term for the two concepts is as follows:
  1697006 |Genus Megapodius (organism)| PT: Megapodius - megapodes
  107060000 |Family Megapodiidae (organism)| PT: Megapodiidae - megapodes
- An organism's common name might be the same as the scientific name for another organism. Example: *Gorilla* is the scientific name for 389217005 |Genus Gorilla (organism)|, but it is the common name for 8807009 |Gorilla gorilla (organism)|. In these cases, the latter concept's preferred term should be the scientific name with annotated common name to prevent confusion, Example: For 8807009 |Gorilla gorilla (organism)|, the preferred term is “Gorilla gorilla - gorilla"
- When the same Scientific Name is used in two different hierarchies (two different kinds of organisms), use the Scientific Name with annotated common name as PT to prevent confusion. A dash may be used to separate the two names. Use the common name from the authoritative source. If a common name is not listed in the authoritative source, use the NCBI BLAST name as common name in the PT. If a common name is not in either the authoritative source or in the NCBI BLAST names, consult the literature or other resources for a distinguishing name to use in the PT.

  For example,
  The genus of bacteria Edwardsiella does not have a common name listed in the authoritative source. Therefore, use the NCBI BLAST name "enterobacteria" in the PT. For the genus of animals Edwardsiella, use the common name "sea anemones" from the authoritative source.
  Genus Edwardsiella - Enterobacteria
  Genus Edwardsiella - sea anemones

- Occasionally we may need to add a word to the common name specified in the resources to make the common name more explicit. Example: Loxosceles reclusa has a common name of *brown recluse* in ITIS, which is one of the SNOMED primary references. To make the naming more explicit, the word *spider* has been added to the preferred term:

  FSN: 23312003 |Loxosceles reclusus (organism)|
  PT: Brown recluse spider
- When there are multiple names listed as common name for an organism in primary references, additional references should be consulted to locate the most commonly used term.
- High level taxonomic terms often refer to groups of organisms. The preferred terms need to reflect that grouping.

  For example,
  "Order Columbiformes" represent all Genera of Doves and pigeons, so the preferred term for 107097005 |Order Columbiformes (organism)| is: Doves and pigeons.

Qualifiers in organism names

When modeling organisms with qualifiers, the qualifier should be placed in front of the organism name.

Organism class variants

The description of organism classes that are subspecies subtypes and variants may include terms such as serogroup, serotype, biotype, variant, biovar, serovar, and pathovar.

For example,

- 698206009 | Brucella suis biovar 4 (organism)|[913]

The subspecies types and variants should be included in the FSN, PT and other descriptions as per terming in authoritative resource where one exists (example: see sub-sections for Salmonella serotype nomenclature as well as Streptococcus pneumoniae below). In the absence of such resources, associated scientific literature is consulted for the most common and accurate representation. Inclusion of the subspecies types and variants accurately is to avoid ambiguity when the same number or letter is used to refer to different organism variants.

For example,

Without mentioning the specific variant (serogroup vs. serotype) and the nomenclature system (Danish vs. American), "Streptococcus pneumoniae 48" can refer to the following:

- Streptococcus pneumoniae Danish serotype 48 (which is equvalent to Streptococcus pneumoniae American serotype 82)
- Streptococcus pneumoniae American serotype 48 (which is equivalent to Streptococcus pneumoniae Danish serotype 7B)
- Streptococcus pneumoniae serogroup 48

Abbreviations (var, var., sv, sv., bv, bv., pv, pv.) must not be used in the FSN.

Capitalization of organism names and binomial format

Official scientific names for organisms should be capitalized. The designation of rank does not require capitalization.

For example,

913 http://snomed.info/id/698206009

- 426813007 | Order Acidobacteriales (organism)|[914] has case significance of “Initial character case insensitive”

There is an exception to the above guidelines where the binomial format for an organism species includes capitalization of the first word, i.e., the genus name, but the species name begins with a lower-case letter.

For example,

- 24224000 | Brucella abortus (organism)|[915]

If the species name includes any other word, they are not capitalized unless they are proper nouns, or parts of proper nouns.

For example,

- 31989009 |Murray Valley encephalitis virus (organism)|

Salmonella serotype nomenclature

Salmonella serotypes have a quadrinomial format of Genus species subspecies Serotype where the serotype name is capitalized.

For example,

- A synonym for 114683003 | Salmonella Doel (organism)|[916] is Salmonella enterica subsp. enterica ser. Doel

Additional descriptions, without the species and subspecies names, are in common usage for Salmonella serotypes.

For example,

- 656008 | Salmonella Os (organism)|[917]

In SNOMED CT, the serotype name in the description should be capitalized.

> **Salmonella Serotypes**
>
> Salmonella serotypes, without the species and subspecies names, should not be confused with binomial species names of other organisms.

Streptococcus pneumoniae

Streptococcus pneumoniae is a human pathogen whose virulence is based on its protective polysaccharide capsule. Study of the polysaccharide capsule has identified multiple serogroups and serotypes. Serotypes are defined by the chemical structure and immunologic properties of their polysaccharide; each serogroup contains one or more serotypes that elicit the same antibody response.

There are two serotype naming systems, one in the U.S. and one in Denmark. The Danish system is nearly universally accepted and preferred. For details, please refer to See Geno K A, Gilbert G L, Song J Y, Skovsted I C, Klugman K P, Jones C, Konradsen H B, Nahm M H. Pneumococcal capsules and their types: past, present, and future. Clinical Microbiology Reviews 2015; 28(3):871-899. [PMID: 26085553[918]]).

914 http://snomed.info/id/426813007
915 http://snomed.info/id/24224000
916 http://snomed.info/id/114683003
917 http://snomed.info/id/656008
918 https://www.ncbi.nlm.nih.gov/pubmed/26085553

Streptococcus pneumoniae concepts

A review of Streptococcus pneumoniae serotypes in SNOMED CT showed lack of specificity, as well as inconsistency, in the naming of Streptococcus pneumoniae serotypes. Guidelines for creating concepts containing Streptococcus pneumoniae serotypes were formulated. They are as follows:

FSN and preferred term (PT) descriptions should follow the Danish naming system. When an American synonym exists, it should be added. A synonym (SYN) that matches the FSN, but does not contain the naming system can also be added.

For example,

698149000 | Streptococcus pneumoniae serotype 48 (organism)|[919] is renamed as follows:

- FSN: Streptococcus pneumoniae Danish serotype 48 (organism)
- PT: Streptococcus pneumoniae Danish serotype 48
- SYN: Streptococcus pneumoniae American serotype 82
- SYN: Streptococcus pneumoniae serotype 48

The guidelines for creating new concepts containing Streptococcus pneumoniae serotypes also apply to concepts in other *SNOMED CT* hierarchies, such substances and procedures.

For example,

120683007 | Streptococcus pneumoniae serotype 7F antibody (substance)|[920] is renamed as follows:

- FSN: Antibody to Streptococcus pneumoniae Danish serotype 7F (substance)
- PT: Streptococcus pneumoniae Danish serotype 7F Ab
- SYN: Antibody to Streptococcus pneumoniae Danish serotype 7F
- SYN: Anti-Streptococcus pneumoniae Danish serotype 7F antibody
- SYN: Streptococcus pneumoniae Danish serotype 7F antibody
- SYN: Antibody to Streptococcus pneumoniae American serotype 51

Legacy Streptococcus pneumoniae concepts

FSNs that adhered to one of the naming systems were kept, but changes were made to the descriptions, based on the above guidelines. Any resulting duplicates were deprecated.

FSNs that did not adhere to one of the naming system were inactivated as ambiguous. They were replaced with newly created concepts, based on the above guidelines.

Missing serotype concepts were added.

Influenza virus nomenclature

Follow the latest names for genus and species according to the taxonomy authority. Although the genus and species names for influenza viruses are similar, they each follow a distinct pattern, which should be used in SNOMED CT. Also, the name of the virus should always be capitalized.

For species, the word *virus* is included as a separate word and follows the letter designation.

For example,

- 407482004 | Influenza C virus (organism)|[921]

919 http://snomed.info/id/698149000
920 http://snomed.info/id/120683007
921 http://snomed.info/id/407482004

- 710661004 | Immunoglobulin M antibody to Influenza B virus (substance)|[922]
- 10674911000119108 | Otitis media caused by Influenza A virus (disorder)|[923]

For genus, *virus* is included in the genus name and is not a separate word.

For example,

- 407481006 | Genus Gammainfluenzavirus (organism)|[924]
- 407477006 | Genus Alphainfluenzavirus (organism)|[925]

The disorder *influenza* need not be capitalized.

For example,

- 16311000119108 | Pneumonia caused by influenza (disorder)|[926]
- 309789002 | Encephalitis caused by influenza (disorder)|[927]

US/GB spelling variants for taxonomic concepts

Taxonomic resources (e.g. Integrated Taxonomic Information System or ITIS, List of Prokaryotic names with Standing in Nomenclature or LPSN) use the official scientific name for organisms. Similarly, in SNOMED CT, the official scientific name should be used in FSNs and PTs. **For descriptions representing common names, if the spelling in a country or region is different, the preferred spelling should be added in the language RefSet extension as a synonym.**

Use of X species

In the context of the Linnaean organism hierarchy, there is no difference between *Salmonella species* and simply *Salmonella*, the genus. Terms with *X species*, such as Salmonella species, are routinely used in laboratory reporting. They may provide additional information, other than the place of the organism in the Linnaean hierarchy. However, the intended connotation may vary from lab to lab and from organism to organism.

Since the organism concept represents a class of organisms, it cannot also represent what was, was not, or what will be done to identify the organism. Neither can it represent other information about the result. If there is additional information to report, it should be in a separate statement or comment (e.g. *further species identification pending* or *sent to reference laboratory for further identification* or *further identification to be done if clinically* indicated).

> **X species**
>
> Addition of *X* species as a description to genus *X* is allowed and is done per request.

Microorganism name changes

Microorganism taxonomic names may change, often due to scientific advances. This may result in:

- Finding an organism in a particular taxonomic group (e.g. Genus) that is unrelated, on a molecular basis, to other members of the group.
- Reassessing the taxonomic group originally established, based on phenotypic characteristics.
- Proposing to reassign the organism to a different existing or new taxonomic group.

922 http://snomed.info/id/710661004
923 http://snomed.info/id/10674911000119108
924 http://snomed.info/id/407481006
925 http://snomed.info/id/407477006
926 http://snomed.info/id/16311000119108
927 http://snomed.info/id/309789002

On a case by case basis, requests for name changes are based on the following use cases:

The name of an organism changes. This scenario is also applicable when an organism name changes on multiple occasions over time.

- Change the FSN for affected concepts, but not the concept ID, by creating a new FSN and description. Inactivate the old FSN with an inactivation value of *Outdated*.
- Retain the old name as a synonym.

A single species is reclassified as multiple species. This scenario is applicable if the change in classification happens at a single point in time and is reflected as such in the authoritative resources.

- Create the new concepts.
- Inactivate the original concept as *ambiguous.*
- Set a *possibly equivalent to* relationship between the old concept and the new concepts.

Multiple species are reclassified as one. This scenario is applicable if the change in classification happens at a single point in time and is reflected as such in the authoritative resources.

- Create a new concept.
- Inactivate the existing concepts as *outdated* with *replaced by* relationships to the new concept.

Organism life stages

Concepts in the organism hierarchy represent *fully realized* organisms. An organism's *life cycle stage* is a characteristic of a given taxon. It represents different stages of life e.g. egg, larva, and adult.

Organism stages themselves are characteristics common to members of a given taxon.

SNOMED CT allows for the representation of an organism in a specific life cycle stage.

For example,

- 337915000 | Homo sapiens (organism)|[928] are organisms. Homo sapiens include humans, in general, as well as children.
- Childhood is a *life cycle stage*, however it is not an organism.

Similarly,

- An egg of a particular nematode, e.g. 42625000 | Strongyloides stercoralis (organism)|[929] is an organism. It is alive and can pass through other stages appropriate to its species.

  However, the *egg stage* of Strongyloides stercoralis is not an organism. Many diagnostic test results, identify organisms 'participating' in particular life cycle stages.

For example, the results of a 83033005 | Fecal analysis (procedure)|[930] may identify the presence of 609326000 | Larva of Strongyloides stercoralis (organism)|[931] and 699572004 | Egg of Strongyloides stercoralis (organism)|[932].

Organism concepts

928 http://snomed.info/id/337915000
929 http://snomed.info/id/42625000
930 http://snomed.info/id/83033005
931 http://snomed.info/id/609326000
932 http://snomed.info/id/699572004

Concepts in the organism hierarchy should not represent organism *structures* (e.g. fungal hyphae). In addition, the word "*stage*" should be excluded from concepts representing life cycle of an organism (e.g. larval **stage** of a nematode parasite). This does not preclude representations of organisms 'participating' in a specific stage of life e.g. 609061000 |Larva of genus Ascaris (organism)|.

Naming patterns

FSN pattern: (Life cycle stage) of (Taxon including rank, if required) (organism)

For example,

- 609043009 | Adult of phylum Nemata (organism)|[933]
- 699572004 | Egg of Strongyloides stercoralis (organism)|[934]

The name of the rank is included with the first letter lower case, except at the species and subspecies levels, where the Linnaean binomial and trinomial are specified.

PT pattern: (Taxon including rank, if required) (life cycle stage)

For example,

- Phylum Nemata adult
- Strongyloides stercoralis egg

Cestode larvae

A number of *cestode larvae* have historically been referred to using Linnaean binomial names that are completely different from corresponding adult (or egg) names.

For example,

- 47399003 | Larva of Taenia saginata (organism)|[935] , a human tapeworm, is usually called Cysticercus bovis.

PT pattern: Linnaean binomial of larva OR (Taxon including rank if required) (life cycle stage)

For example,

- Cysticercus bovis
- Cysticercus cellulosae
- Class Cestoda larva

Although rare, a subtype of cestode larva may appear to be a Linnaean trinomial name. This, then, is the PT:

- Diphyllobothrium latum sparganum

Other acceptable synonyms

Some organisms and stages are referred to in an *adjectival* form (e.g. Ascarid egg) or by common name (e.g. adult nematode). When used (especially when described as part of a request), these terms may be included as additional synonyms.

933 http://snomed.info/id/609043009
934 http://snomed.info/id/699572004
935 http://snomed.info/id/47399003

Homotypic and heterotypic synonyms

Homotypic synonyms (also referred to as objective or nomenclatural or obligate synonyms), sometimes indicated by a triple bar ≣, are based on the exact same type specimen. These synonyms are published in the scientific literature following the formal nomenclatural rules (that is, they are declared through a *nomenclatural act*).

Heterotypic synonyms (also referred to as subjective or taxonomic synonyms), sometimes indicated by "=", are based on different type specimens. These synonyms rely on the opinions of taxonomists rather than on the formal nomenclatural rules.

In SNOMED CT, homotypic synonyms can be added as descriptions on concepts as per primary references and the various International Codes of Nomenclature. Additional synonyms are expected to be referenced in current literature. Heterotypic synonyms can be added to aid search and analysis; they would only be considered for addition if requested and are supported by a primary resource, e.g. LPSN. They should not be added if adding them would generate confusion.

Dual nomenclature of pleomorphic fungi

According to the *International Code of Nomenclature for algae, fungi, and plants* (IAPT), as of 1 January 2013, the historical system of permitting separate names for anamorphs and telemorphs of fungi with a pleomorphic lifecycle was ended, and one fungus can only have one name. All legitimate names proposed for a species, regardless of what stage they are typified by, can serve as the correct name for that species. It has been recognized that there could be many names that might merit formal retention or rejection, and the problem of choosing one name among many remains to be examined for many species. Therefore, latest updates in the credible resources and/or scientific articles should be consulted for the most current name.

Resources for organism naming

SNOMED International utilizes various resources when reviewing changes to the organism hierarchy. They include:

Bacteria

- List of Prokaryotic names with Standing in Nomenclature (LPSN)
- International Committee on Systematics of Prokaryotes (ICSP)
- International Journal of Systematic and Evolutionary Microbiology
- DSMZ-Prokaryotic Nomenclature Up-to-date

Fungi

- MycoBank Database
- Index Fungorum

Viruses

- International Committee on Taxonomy of Viruses (ICTV)

Parasites

- National Center for Biotechnology Information (NCBI) Taxonomy. Although not an authoritative source, NCBI Taxonomy provides useful links to other sources; it is used by Unified Medical Language System (UMLS) as a QA source.

General

- Catalogue of Life (https://www.catalogueoflife.org/). This is the result of cooperation between ITIS (https://www.itis.gov) and Species 2000 (https://www.sp2000.org/). Please note, Catalogue of Life may not be up to date for all areas. For bacteria, fungus, and virus, consult resources noted above as primary references.
- International Code of Zoological Nomenclature (ICZN)
- International Code of Nomenclature for algae, fungi, and plants (IAPT)

3.8.8 Pharmaceutical and Biologic Product

Definition
A top-level hierarchy to clearly distinguish drug products (products) from their chemical constituents (substances)

3.8.8.1 Table of Contents

For implementation guidance regarding national extensions, please see SNOMED CT Drug Model for National Extensions[936].

This section provides editorial guidance for 373873005 |Pharmaceutical / biologic product (product)| subhierarchies, notably 763158003 |Medicinal product (product)|, and the supporting subhierarchy of 766940004 |Role (role)| from the Qualifier value (qualifier value) hierarchy. Other supporting subhierarchies from Qualifier value (qualifier value) are also explained in this section of the guide.

The |Pharmaceutical / biologic product (product)| hierarchy is comprised of multiple smaller hierarchies. It contains the following semantic tags:

- (medicinal product)
- (clinical drug)
- (medicinal product form)
- (product)
- (physical object) - only 1 concept

The following subhierarchies will be retained as primitive subhierarchies until use cases and/or detailed requirements are known. Requests for addition of new concepts or modification of existing concepts will be evaluated on a case-by-case basis.

- 410652009 |Blood product (product)|
- 356497001 |Bone cements (product)|

936 http://snomed.org/ndem

- 409248003 |Bone graft material (product)|
- 411976009 |Bone morphogenic protein graft (product)|
- 116178008 |Dialysis fluid (product)|
- 373783004 |Dietary product (product)|*
- 410969008 |Sterile maggots (product)|

**Editorial guidelines and related content updates for <<373783004 |Dietary product (product)| are managed by the Nutrition Project Group.*

The following subhierarchies will be retained "as is" until use cases and/or detailed requirements are known. Requests for addition of new concepts will be rejected. Requests for modification of existing concepts will be evaluated on a case-by-case basis.

- 411115002 |Drug-device combination product (product)|*
- 349365008 |Herbal medicine (product)|
- 349363001 |Homeopathic medicine (product)|
- 411126008 |Patch test product (product)|

**Development of editorial guidelines and related content updates for <<411115002 |Drug-device combination product (product)| will be done in conjunction with the Device Project.*

3.8.8.2 Pharmaceutical and Biologic Product and Dose Form Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 373873005 | Pharmaceutical / biologic product (product)|[937]	
Domain Constraint[938]	<< 373873005 |Pharmaceutical / biologic product (product)|[939]
Parent Domain	-
Proximal Primitive Constraint	<< 373873005 |Pharmaceutical / biologic product (product)|[940]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 373873005 | Pharmaceutical / biologic product (product)|[941]

937 http://snomed.info/id/373873005
938 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
939 http://snomed.info/id/373873005
940 http://snomed.info/id/373873005
941 http://snomed.info/id/373873005

Attribute[942]	Grouped[943]	Cardinality[944]	In Group Cardinality[945]	Range Constraint[946]
1142140007 |Count of active ingredient (attribute)|[947]	0	0..1	0..0	int(>#0..)
1142141006 |Count of base and modification pair (attribute)|[948]	0	0..1	0..0	int(>#0..)
1142139005 |Count of base of active ingredient (attribute)|[949]	0	0..1	0..0	int(>#0..)
127489000 |Has active ingredient (attribute)|[950]	1	0..*	0..1	<< 105590001 |Substance (substance)|[951]
732943007 |Has basis of strength substance (attribute)|[952]	1	0..*	0..1	< 105590001 |Substance (substance)|[953]
733722007 |Has concentration strength denominator unit (attribute)|[954]	1	0..*	0..1	< 767524001 |Unit of measure (qualifier value)|[955]
1142137007 |Has concentration strength denominator value (attribute)|[956]	1	0..*	0..1	dec(>#0..)
733725009 |Has concentration strength numerator unit (attribute)|[957]	1	0..*	0..1	< 767524001 |Unit of measure (qualifier value)|[958]
1142138002 |Has concentration strength numerator value (attribute)|[959]	1	0..*	0..1	dec(>#0..)

942 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
943 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
944 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
945 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
946 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
947 http://snomed.info/id/1142140007
948 http://snomed.info/id/1142141006
949 http://snomed.info/id/1142139005
950 http://snomed.info/id/127489000
951 http://snomed.info/id/105590001
952 http://snomed.info/id/732943007
953 http://snomed.info/id/105590001
954 http://snomed.info/id/733722007
955 http://snomed.info/id/767524001
956 http://snomed.info/id/1142137007
957 http://snomed.info/id/733725009
958 http://snomed.info/id/767524001
959 http://snomed.info/id/1142138002

762951001 |Has ingredient (attribute)|[960]	1	0..*	0..1	<< 105590001 |Substance (substance)|[961]
860779006 |Has ingredient characteristic (attribute)|[962]	1	0..*	0..*	<< 362981000 |Qualifier value (qualifier value)|[963]
1149366004 |Has ingredient qualitative strength (attribute)|[964]	1	0..*	0..1	< 1149484003 |Ingredient qualitative strength (qualifier value)|[965]
411116001 |Has manufactured dose form (attribute)|[966]	0	0..1	0..0	<< 736542009 |Pharmaceutical dose form (dose form)|[967]
762949000 |Has precise active ingredient (attribute)|[968]	1	0..*	0..1	<< 105590001 |Substance (substance)|[969]
732947008 |Has presentation strength denominator unit (attribute)|[970]	1	0..*	0..1	< 767524001 |Unit of measure (qualifier value)|[971]
1142136003 |Has presentation strength denominator value (attribute)|[972]	1	0..*	0..1	dec(>#0..)
732945000 |Has presentation strength numerator unit (attribute)|[973]	1	0..*	0..1	< 767524001 |Unit of measure (qualifier value)|[974]
1142135004 |Has presentation strength numerator value (attribute)|[975]	1	0..*	0..1	dec(>#0..)
860781008 |Has product characteristic (attribute)|[976]	0	0..*	0..0	<< 362981000 |Qualifier value (qualifier value)|[977]

960 http://snomed.info/id/762951001
961 http://snomed.info/id/105590001
962 http://snomed.info/id/860779006
963 http://snomed.info/id/362981000
964 http://snomed.info/id/1149366004
965 http://snomed.info/id/1149484003
966 http://snomed.info/id/411116001
967 http://snomed.info/id/736542009
968 http://snomed.info/id/762949000
969 http://snomed.info/id/105590001
970 http://snomed.info/id/732947008
971 http://snomed.info/id/767524001
972 http://snomed.info/id/1142136003
973 http://snomed.info/id/732945000
974 http://snomed.info/id/767524001
975 http://snomed.info/id/1142135004
976 http://snomed.info/id/860781008
977 http://snomed.info/id/362981000

774158006 |Has product name (attribute)|[978]	0	0..1	0..0	<< 774167006 |Product name (product name)|[979]
774159003 |Has supplier (attribute)|[980]	0	0..1	0..0	<< 774164004 |Supplier (supplier)|[981]
1149367008 |Has target population (attribute)|[982]	0	0..1	0..0	< 27821000087106 |Product target population (qualifier value)|[983]
763032000 |Has unit of presentation (attribute)|[984]	0	0..1	0..0	<< 732935002 |Unit of presentation (unit of presentation)|[985]
766939001 |Plays role (attribute)|[986]	0	0..*	0..0	<< 766940004 |Role (role)|[987]
1148793005 |Unit of presentation size quantity (attribute)|[988]	0	0..1	0..0	dec(>#0..)
320091000221107 |Unit of presentation size unit (attribute)|[989]	0	0..1	0..0	<< 767524001 |Unit of measure (qualifier value)|[990]

HRCM 2023-12-01

Domain Information for 781405001 | Medicinal product package (product)|[991]	
Domain Constraint[992]	<< 781405001 |Medicinal product package (product)|[993]
Parent Domain	373873005 |Pharmaceutical / biologic product (product)|[994]
Proximal Primitive Constraint	<< 781405001 |Medicinal product package (product)|[995]

978 http://snomed.info/id/774158006
979 http://snomed.info/id/774167006
980 http://snomed.info/id/774159003
981 http://snomed.info/id/774164004
982 http://snomed.info/id/1149367008
983 http://snomed.info/id/27821000087106
984 http://snomed.info/id/763032000
985 http://snomed.info/id/732935002
986 http://snomed.info/id/766939001
987 http://snomed.info/id/766940004
988 http://snomed.info/id/1148793005
989 http://snomed.info/id/320091000221107
990 http://snomed.info/id/767524001
991 http://snomed.info/id/781405001
992 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
993 http://snomed.info/id/781405001
994 http://snomed.info/id/373873005
995 http://snomed.info/id/781405001

Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 781405001 | Medicinal product package (product) |[996]

Attribute[997]	Grouped[998]	Cardinality[999]	In Group Cardinality[1000]	Range Constraint[1001]
774160008 |Contains clinical drug (attribute)|[1002]	1	1..*	1..1	<< 763158003 |Medicinal product (product)|[1003]
1142143009 |Count of clinical drug type (attribute)|[1004]	0	1..1	0..0	int(>#0..)
1142142004 |Has pack size (attribute)|[1005]	1	0..*	0..1	dec(>#0..)
774163005 |Has pack size unit (attribute)|[1006]	1	0..*	0..1	<< 767524001 |Unit of measure (qualifier value)|[1007]

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Domain Information for 736542009 | Pharmaceutical dose form (dose form) |[1008]

Domain Constraint[1009]	<< 736542009 |Pharmaceutical dose form (dose form)|[1010]
Parent Domain	-

996 http://snomed.info/id/781405001
997 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
998 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
999 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1000 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1001 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1002 http://snomed.info/id/774160008
1003 http://snomed.info/id/763158003
1004 http://snomed.info/id/1142143009
1005 http://snomed.info/id/1142142004
1006 http://snomed.info/id/774163005
1007 http://snomed.info/id/767524001
1008 http://snomed.info/id/736542009
1009 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1010 http://snomed.info/id/736542009

Proximal Primitive Constraint	<< 736542009 |Pharmaceutical dose form (dose form)|[1011]
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 736542009 | Pharmaceutical dose form (dose form)|[1012]

Attribute[1013]	Grouped[1014]	Cardinality[1015]	In Group Cardinality[1016]	Range Constraint[1017]
736476002 |Has basic dose form (attribute)|[1018]	0	0..1	0..0	< 736478001 |Basic dose form (basic dose form)|[1019]
736472000 |Has dose form administration method (attribute)|[1020]	0	0..*	0..0	< 736665006 |Dose form administration method (administration method)|[1021]
736474004 |Has dose form intended site (attribute)|[1022]	0	0..*	0..0	< 736479009 |Dose form intended site (intended site)|[1023]
736475003 |Has dose form release characteristic (attribute)|[1024]	0	0..1	0..0	< 736480007 |Dose form release characteristic (release characteristic)|[1025]
736473005 |Has dose form transformation (attribute)|[1026]	0	0..*	0..0	< 736477006 |Dose form transformation (transformation)|[1027]

1011 http://snomed.info/id/736542009
1012 http://snomed.info/id/736542009
1013 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1014 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1015 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1016 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1017 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1018 http://snomed.info/id/736476002
1019 http://snomed.info/id/736478001
1020 http://snomed.info/id/736472000
1021 http://snomed.info/id/736665006
1022 http://snomed.info/id/736474004
1023 http://snomed.info/id/736479009
1024 http://snomed.info/id/736475003
1025 http://snomed.info/id/736480007
1026 http://snomed.info/id/736473005
1027 http://snomed.info/id/736477006

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Domain Information for 736478001 | Basic dose form (basic dose form)|[1028]	
Domain Constraint[1029]	<< 736478001 |Basic dose form (basic dose form)|[1030]
Parent Domain	-
Proximal Primitive Constraint	<< 736478001 |Basic dose form (basic dose form)|[1031]
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 736478001 | Basic dose form (basic dose form)|[1032]				
Attribute[1033]	Grouped[1034]	Cardinality[1035]	In Group Cardinality[1036]	Range Constraint[1037]
736518005 |Has state of matter (attribute)|[1038]	0	1..1	0..0	< 736471007 |State of matter (state of matter)|[1039]

3.8.8.3 Medicinal Product

The grouper 763158003 |Medicinal product (product)|, a stated descendant of |Pharmaceutical / biologic product (product)|, was created to support top-level hierarchy changes in the future but avoids removing, renaming, or repurposing the existing |Pharmaceutical / biologic product (product)| concept. See the full Medicinal Product Model Specification at http://snomed.org/mpm.

1028 http://snomed.info/id/736478001
1029 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1030 http://snomed.info/id/736478001
1031 http://snomed.info/id/736478001
1032 http://snomed.info/id/736478001
1033 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1034 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1035 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1036 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1037 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1038 http://snomed.info/id/736518005
1039 http://snomed.info/id/736471007

General Assumptions and Requirements

Assumption or Requirement
The top level concepts in the hierarchy will primarily be sufficiently defined grouper concepts.
Any requirement to align to external standards or registries will be explicitly documented. Concept model will be compatible with ISO's Identification of Medicinal Products (IDMP) standards (where appropriate).
Concepts shall be sufficiently defined using proximal primitive modeling methodology unless explicitly noted as an exception in the editorial guidelines.
Concept model supports neither universal restrictions nor nesting.
Content in the |Medicinal product| hierarchy in the International Release is not intended to: • support prescribing use cases, but may be sufficient to do so for some implementations. • eliminate the need for a national extension.

Out of Scope

- Age ranges (e.g., adult, pediatric, infant, junior, adolescent)
    - *Exception: Vaccine products MP-only concepts maybe modeled with Has target population (attribute) that specifies a target population.*
- Adjuvants
- Allergy immunotherapy products
    - *Should be represented in a national extension because of the manufacturer-specific variability regarding standardization and expression of strength.*
- Ayurvedic medicine
- Brand names
- Color (e.g., color of tablet, capsule, or solution)
- Composite products
- Excipients
- Flavors
- Investigational products/Products under development but not marketed in any member country
    - *Exceptions may be made on a case-by-case basis (e.g., adding investigational products that are being widely used in pandemic).*
- Medicinal product (MP) and Medicinal product form (MPF) concepts without Clinical drug (CD) descendants
    - *There are historical concepts that do not have descendant CDs; this is not a pattern that will continue moving forward (e.g., MPs and MPFs are not created unless needed to support classification of a CD).*
- Packs
- Products intended only for non-human use
- Products no longer marketed or available for sale
    - *Existing concepts representing products that are no longer marketed or available for sale will be retained as active concepts in the International Release. Requests for new content will be considered for inclusion on a case-by-case basis.*
- Relevant omissions (e.g., sugar-free, preservative-free)
- Routes of administration not explicitly represented
- Sterility

- Tall man lettering
    - *Descriptions that include tall man lettering [partial capitalization of drug names to distinguish from similar sounding drugs] should be authored in a national or local extension.*
- Traditional medicine products

International Unit in Clinical Drugs Descriptions

International Unit as a description is arbitrary, and to be understood, each product requires reference to a particular bioefficacy specification for that entity. Therefore, *international* is neither a meaningful nor comparable description at Clinical Drug level. International unit will be represented as *unit* in Clinical Drug descriptions. Abbreviations will not be used.

For example,

- 1237145006 |Product containing precisely octocog alfa 1000 unit/1 vial powder for conventional release solution for injection (clinical drug)|

Clinical drug

The Clinical Drug "containing precisely" (CD-precise) concept is an abstract representation of the precise active ingredient, basis of strength substance (BoSS), strength, and manufactured dose form of a drug product. It implies that the drug product must contain only the precise active ingredient(s) specified in the FSN.

- Clinical Drug with Discrete Dose Form(see page 294)
- Clinical Drug with Continuous Dose Form(see page 305)

The guidance below applies to both discrete and continuous dose forms.

Descriptions

Align FSN and PT naming and case sensitivity with the concepts selected as attribute values.

For multiple-ingredient drug products, the BoSS must be in alphabetical order and separated by the word “and”.

The following units of measure should not be abbreviated in any descriptions; always spell out:

- microequivalent
- microliter
- microgram
- microliter (with GB spelling microlitre)
- million unit
- nanogram
- picogram
- unit

Synonyms matching the FSN are not required.

Product strength "not equal to"

Concepts with product strength that is "not equal to" are modeled as primitive, with attributes added as described in the corresponding subpages, except that strength numerator attributes will not be added. The appropriate Medicinal Product Form-only (MPF-only) concept will infer as a parent.

Product strength numerator values

Expression of product strength in metric units is preferred.

To avoid semantically equivalent concepts, product strength for metric units are normalized as follows:

- Use milligram if value is <1000; if ≥ then convert to gram
- Use microgram if value is <1000; if ≥ then convert to milligram
- Use nanogram if value is <1000; if ≥ then convert to microgram
- Use picogram if value is <1000; if ≥ then convert to nanogram

To avoid semantically equivalent concepts, product strength for units are normalized as follows:

- Use million unit if value is ≥1000000 unit

The following units are not allowed unless specifically noted as an exception:

- 408165007 |Mega u (qualifier value)|

Repeating decimals are rounded to three decimal places (with 5 and above rounded up and 4 and below rounded down).

Precise active ingredient

The *Precise Active Ingredient* (PAI) cannot be modeled as a substance hydrate or solvate unless the BoSS is expressed as a substance hydrate or solvate.

Concepts containing pancreatic enzymes are modeled based on the discrete enzymes; because of variability between real clinical drugs, synonyms representing a total amount in a particular product will not be included in the International Release.

Clinical Drug with Discrete Dose Form

Overview
CD-precise concepts representing discrete dose form (e.g. tablets, capsules, pessaries, suppositories, sachets, ampules or vials containing solid dose forms such as powders or granules, and metered dose delivery products such as inhalers and spray) are modeled using *presentation* strength attributes; concentration strength attributes are not allowed for these concepts in the International Release.

For example,

- Product containing precisely abacavir 300 milligram/1 each conventional release oral tablet (clinical drug)
- Product containing precisely abacavir 600 milligram and lamivudine 300 milligram/1 each conventional release oral tablet (clinical drug)
- Product containing precisely afatinib (as afatinib dimaleate) 30 milligram/1 each conventional release oral tablet (clinical drug)
- Product containing precisely aztreonam 500 milligram/1 vial powder for conventional release solution for injection (clinical drug)
- Product containing precisely flucloxacillin (as flucloxacillin sodium) 250 milligram/1 vial powder for conventional release solution for injection (clinical drug)
- Product containing precisely budesonide 200 microgram/1 actuation conventional release powder for inhalation (clinical drug)

Exception

Pre-filled pens or cartridges are discrete dose forms as they can be counted. In the International edition of SNOMED CT, clinical drugs presenting in pre-filled pens or cartridges are modeled with normalized *concentration strength*.

Example of pre-filled pen:

- One pre-filled pen for injection contains 2 mg semaglutide in a 1.5 ml solution
- FSN: 782102009 |Product containing precisely semaglutide 1.34 milligram/1 milliliter conventional release solution for injection (clinical drug)|

When the manufacturer describes their product characteristics to indicate that two separate ingredients are present in their formulation, then both ingredients must be modeled separately.

For example,

- The summary of product characteristics for a manufactured product for a sachet of 100mg sodium valproate prolonged-release granules contains Sodium valproate 66.66mg and Valproic acid 29.03mg that must be separately modeled as |Product containing precisely sodium valproate 66.66 milligram and valproic acid 29.03 milligram/1 sachet prolonged-release oral granules (clinical drug)|

When a product has a metered delivery, the strength is "per actuation" not as a concentration.

For example,

- 1263426000 |Product containing precisely xylometazoline hydrochloride 140 microgram/1 actuation conventional release nasal spray (clinical drug)|

Lyophilized dose forms are out of scope for the international edition of SNOMED CT.

Modeling

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(clinical drug)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)| • Exceptions: • Concepts with product strength that is "not equal to" (e.g. with product strength expressed as a range, greater than, or less than) will have definition status 900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|.
Attribute: **Has manufactured dose form**	Range: <736542009 |Pharmaceutical dose form (dose form) • While the allowed range for this attribute is broader, the CD-precise discrete dose form concepts should only use <736542009 | Pharmaceutical dose form (dose form)|, excluding grouper concepts based on intended site (e.g. 740596000 |Cutaneous dose form (dose form)|, 385268001 |Oral dose form (dose form)|) Cardinality: 1..1 Powder and granules for oral suspension, solution, etc. may be modeled using concentration strength and the administrable dose form (e.g. 1145409004 |Product containing precisely amoxicillin 25 milligram/1 milliliter and clavulanic acid (as clavulanate potassium) 6.25 milligram/1 milliliter conventional release oral suspension (clinical drug)|)

Attribute: **Has unit of presentation**	Range: <732935002 |Unit of presentation (unit of presentation)| Cardinality: 1..1
Attribute: **Count of base of active ingredient (attribute)**	Concrete Type: Integer Range: >#0.. Cardinality: 1..1
Relationship group	**One relationship group containing one instance of each of the following attributes is required for each precise active ingredient.**
• **Has precise active ingredient**	Range: <105590001 |Substance (substance)| excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..1 per relationship group Note: • The PAI cannot be modeled as a substance hydrate or solvate unless the BoSS is expressed as a hydrate or solvate. • Concepts containing pancreatic enzymes are modeled based on the discrete enzymes; because of variability between real clinical drugs, synonyms representing a total amount in a particular product will not be included in the International Release.
• **Has basis of strength substance**	Range: <105590001 |Substance (substance)| excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..1 per relationship group
• **Has presentation strength numerator value**	Concrete Type: Decimal Range: >#0.. Cardinality: 1..1 per relationship group
• **Has presentation strength numerator unit**	Range: <767524001 |Unit of measure (qualifier value)| Cardinality: 1..1 per relationship group

• **Has presentation strength denominator value**	Concrete Type: Decimal Range: >#0.. Cardinality: 1..1 per relationship group For this pattern, the attribute value is 1. Note: the denominator strength value is required for concepts in the International Release even if the value = 1 because including denominators for only some concepts negatively affects the classification results.
• **Has presentation strength denominator unit**	• Range: <767524001 |Unit of measure (qualifier value)| • While the allowed range for this attribute is broader, the CD-precise concepts representing discrete dose forms should only use <732935002 |Unit of presentation (unit of presentation). • Cardinality: 1..1 per relationship group

Naming

FSN	Use one of the following patterns for the FSN. **Where Precise active ingredient = BoSS and Unit of presentation = discrete solid dose form (e.g. capsule, lozenge, pessary, suppository, tablet):** • Product containing precisely <BoSS FSN> <Presentation strength numerator value FSN> <Presentation strength numerator unit FSN>/ <Presentation strength denominator value FSN> each <Manufactured dose form FSN> (clinical drug) For example, • Product containing precisely abacavir 300 milligram/1 each conventional release oral tablet (clinical drug) • Product containing precisely abacavir 600 milligram and lamivudine 300 milligram/1 each conventional release oral tablet (clinical drug) • Product containing precisely atropine sulfate 600 microgram/1 each conventional release oral tablet (clinical drug) • Product containing precisely codeine sulfate 15 milligram/1 each conventional release oral tablet (clinical drug) **Where Precise active ingredient is not = BoSS and Unit of presentation = discrete solid dose form (e.g. capsule, lozenge, pessary, suppository, tablet):** • Product containing precisely <BoSS FSN> (as <Precise active ingredient FSN>) <Presentation strength numerator value FSN> <Presentation strength numerator unit FSN>/<Presentation strength denominator value FSN> each <Manufactured dose form FSN> (clinical drug) For example, • Product containing precisely doxazosin (as doxazosin mesilate) 4 milligram/1 each conventional release oral tablet (clinical drug) • Product containing precisely disopyramide (as disopyramide phosphate) 150 milligram/1 each prolonged-release oral tablet (clinical drug) **Where Precise active ingredient = BoSS and Unit of presentation = other discrete dose form (e.g. actuation, vial, sachet)** • Product containing precisely <BoSS FSN> <Presentation strength numerator value FSN> <Presentation strength numerator unit FSN>/ Presentation strength denominator value FSN> <Presentation strength denominator unit FSN> Manufactured dose form FSN> (clinical drug) For example,

- Product containing precisely aztreonam 500 milligram/1 vial powder for conventional release solution for injection (clinical drug)
- Product containing precisely budesonide 200 microgram/1 actuation conventional release powder for inhalation (clinical drug)

Where Precise active ingredient is not = BoSS and Unit of presentation = other discrete dose form (e.g. actuation, vial, sachet)

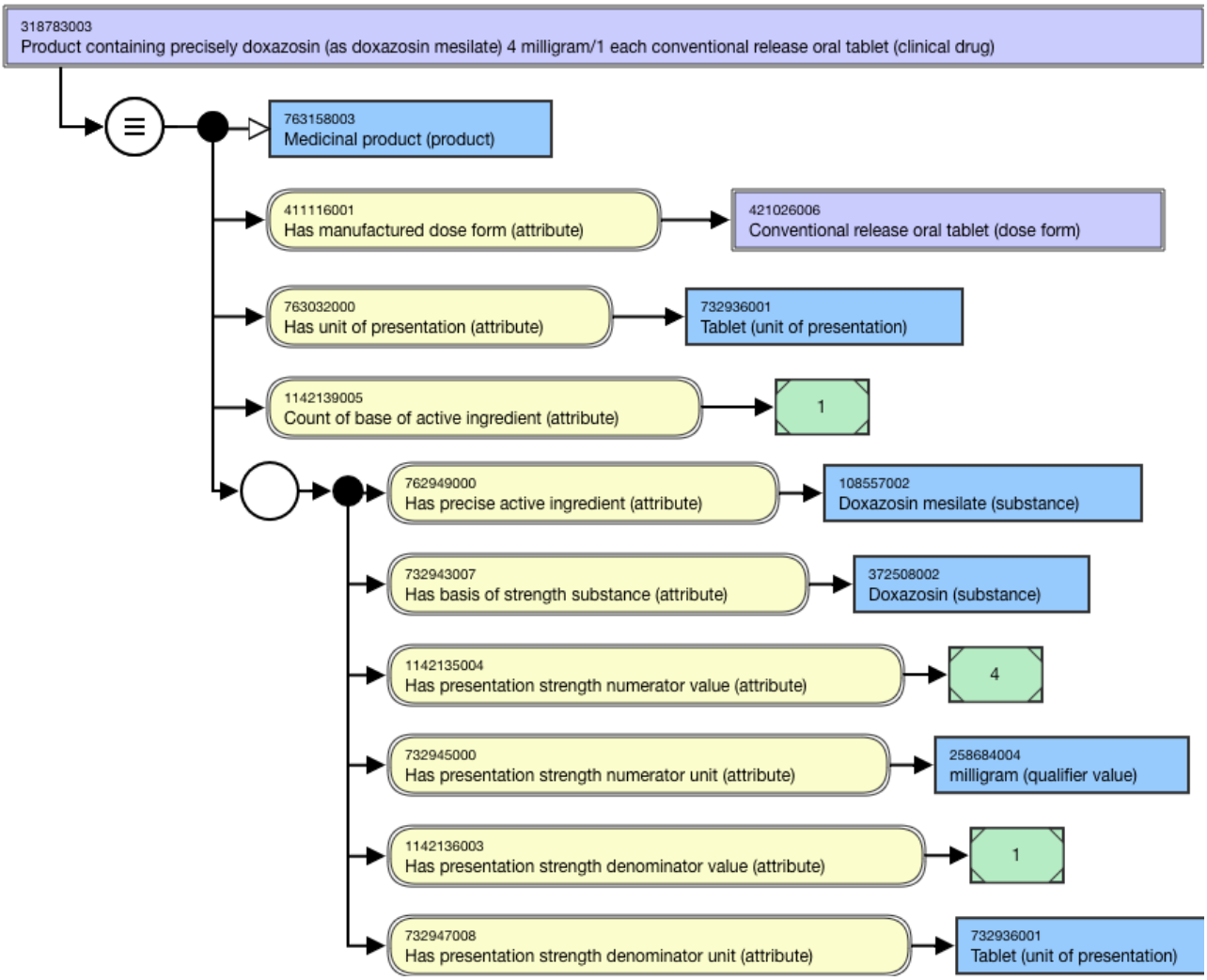
- Product containing precisely <BoSS FSN> (as <Precise active ingredient FSN>) <Presentation strength numerator value FSN> <Presentation strength numerator unit FSN>/<Presentation strength denominator value FSN> <Presentation strength denominator unit FSN> Manufactured dose form FSN> (clinical drug)

  For example,

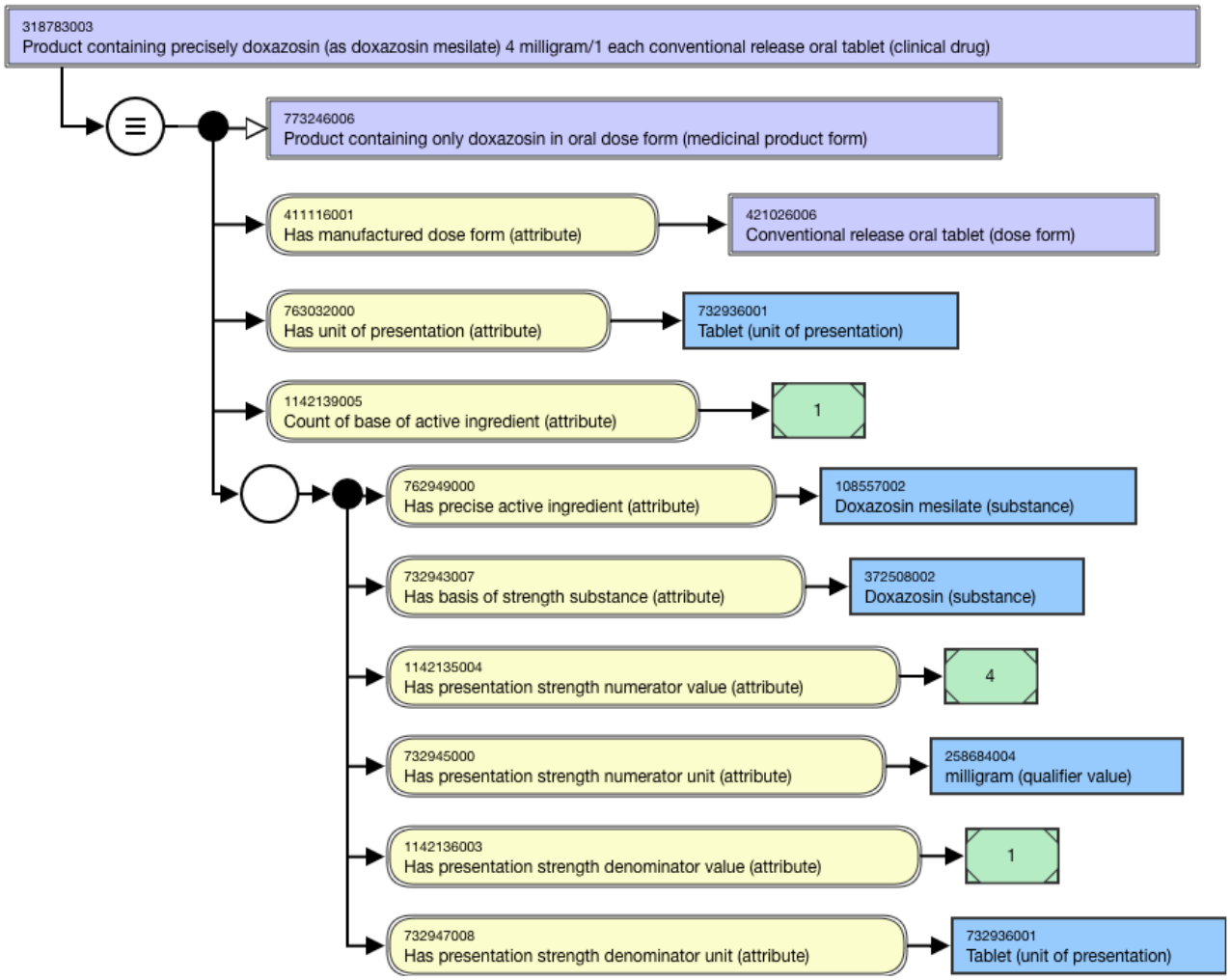
  - Product containing precisely flucloxacillin (as flucloxacillin sodium) 250 milligram/1 vial powder for conventional release solution for injection (clinical drug)
  - Product containing precisely buserelin (as buserelin acetate) 100 microgram/1 actuation conventional release nasal spray (clinical drug)

Preferred Term	Use one of the following patterns for the PT. **Where BoSS = Precise active ingredient:** • <BoSS PT> <Presentation strength numerator value PT> <Presentation strength numerator unit PT> <Manufactured dose form PT> <Has unit of presentation PT> For example, • Abacavir 300 mg oral tablet • Abacavir 600 mg and lamivudine 300 mg oral tablet • Atropine sulfate 600 microgram oral tablet • Codeine sulfate 15 mg oral tablet • Aztreonam 500 mg powder for solution for injection vial • Budesonide 200 microgram/actuation powder for inhalation • Buserelin (as buserelin acetate) 100 microgram/actuation nasal spray • Ivacaftor 25 mg oral granules sachet **Where BoSS is not = Precise active ingredient:** • <BoSS PT> (as <Precise active ingredient PT>) <Presentation strength numerator value PT> <Presentation strength numerator unit PT> <Manufactured dose form PT> <Has unit of presentation PT> For example, • US PT: Doxazosin (as doxazosin mesylate) 4 mg oral tablet • GB PT: Doxazosin (as doxazosin mesylate) 4 mg oral tablet • US/GB PT: Disopyramide (as disopyramide phosphate) 150 mg prolonged-release oral tablet • US PT: Floxacillin (as floxacillin sodium) 250 mg powder for solution for injection vial • GB PT: Flucloxacillin (as flucloxacillin sodium) 250 mg powder for solution for injection vial
Synonyms	Synonyms matching the FSN are not required.

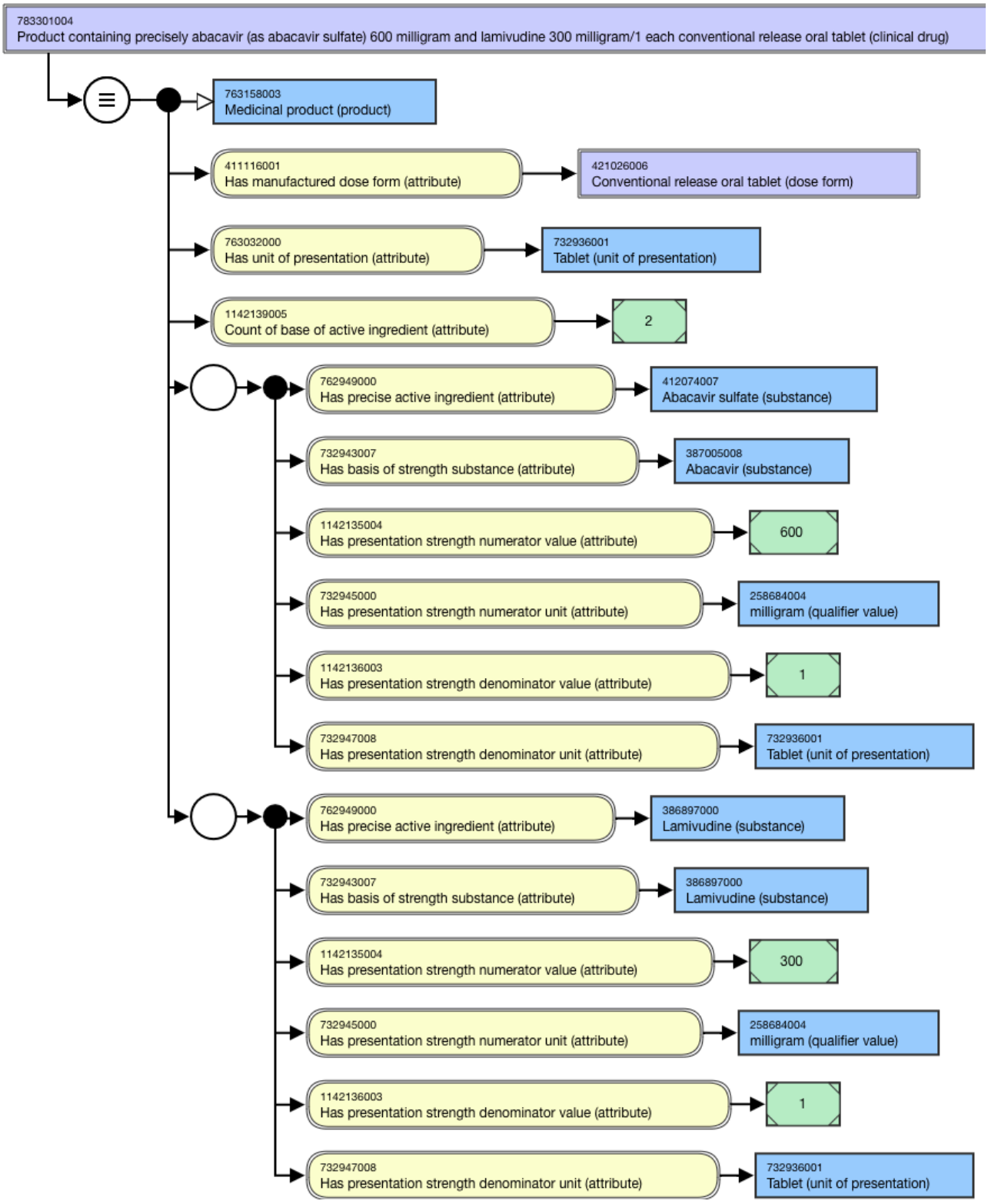
Exemplars
The following illustrates the **stated** view for 318783003 |Product containing precisely doxazosin (as doxazosin mesilate) 4 milligram/1 each conventional release oral tablet (clinical drug)|:



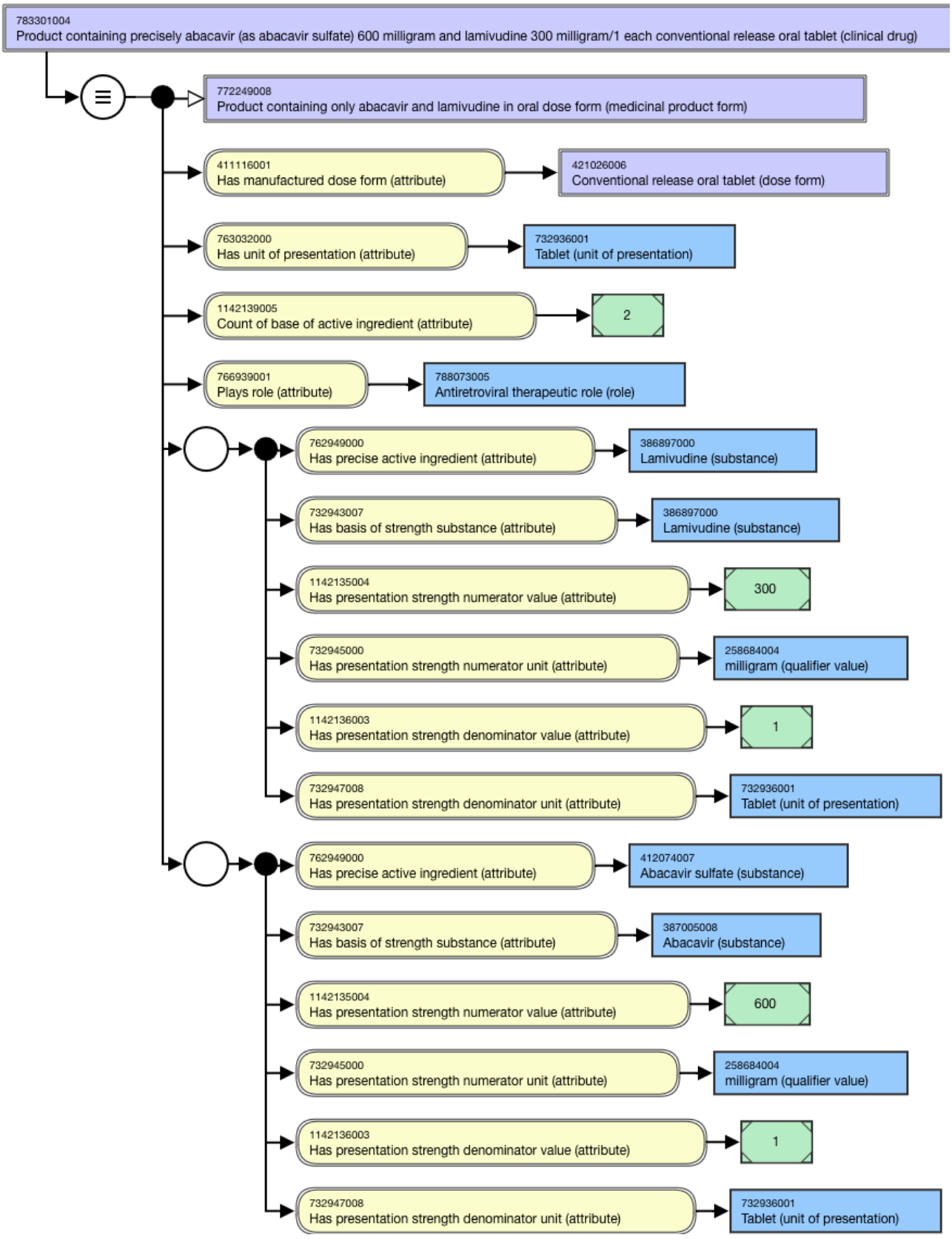
The following illustrates the **inferred** view for 318783003 |Product containing precisely doxazosin (as doxazosin mesilate) 4 milligram/1 each conventional release oral tablet (clinical drug)|:



The following illustrates the **stated** view for 783301004 |Product containing precisely abacavir (as abacavir sulfate) 600 milligram and lamivudine 300 milligram/1 each conventional release oral tablet (clinical drug)|:



The following illustrates the **inferred** view for 783301004 |Product containing precisely abacavir (as abacavir sulfate) 600 milligram and lamivudine 300 milligram/1 each conventional release oral tablet (clinical drug)|:


783301004
Product containing precisely abacavir (as abacavir sulfate) 600 milligram and lamivudine 300 milligram/1 each conventional release oral tablet (clinical drug)
772249008
Product containing only abacavir and lamivudine in oral dose form (medicinal product form)
411116001
Has manufactured dose form (attribute)
421026006
Conventional release oral tablet (dose form)
763032000
Has unit of presentation (attribute)
732936001
Tablet (unit of presentation)
1142139005
Count of base of active ingredient (attribute)
2
766939001
Plays role (attribute)
788073005
Antiretroviral therapeutic role (role)
762949000
Has precise active ingredient (attribute)
386897000
Lamivudine (substance)
732943007
Has basis of strength substance (attribute)
386897000
Lamivudine (substance)
1142135004
Has presentation strength numerator value (attribute)
300
732945000
Has presentation strength numerator unit (attribute)
258684004
milligram (qualifier value)
1142136003
Has presentation strength denominator value (attribute)
1
732947008
Has presentation strength denominator unit (attribute)
732936001
Tablet (unit of presentation)
762949000
Has precise active ingredient (attribute)
412074007
Abacavir sulfate (substance)
732943007
Has basis of strength substance (attribute)
387005008
Abacavir (substance)
1142135004
Has presentation strength numerator value (attribute)
600
732945000
Has presentation strength numerator unit (attribute)
258684004
milligram (qualifier value)
1142136003
Has presentation strength denominator value (attribute)
1
732947008
Has presentation strength denominator unit (attribute)
732936001
Tablet (unit of presentation)

Clinical Drug with Continuous Dose Form

Overview
CD-precise concepts representing continuous dose form (e.g., solutions, suspensions, creams, ointments, patches) are modeled using concentration strength attributes; presentation strength attributes are not allowed for these concepts in the International Release.

For example,

- Product containing precisely zidovudine 10 milligram/1 milliliter conventional release oral solution (clinical drug)
- Product containing precisely amikacin (as amikacin sulfate) 250 milligram/1 milliliter conventional release solution for injection (clinical drug)
- Product containing precisely clotrimazole 10 milligram/1 gram conventional release cutaneous cream (clinical drug)
- Product containing precisely mupirocin (as mupirocin calcium) 20 milligram/1 gram conventional release nasal ointment (clinical drug)
- Product containing precisely buprenorphine 70 microgram/1 hour prolonged-release transdermal patch (clinical drug)

For solids and semi-solids, a concentration strength will be mass/mass (w/w) – usually mg/g.*
For liquids, a concentration strength will be mass/volume (w/v) – usually mg/mL.*

**Requests for new concepts that conflict with the above require a clear justification for the variance.*

Modeling

Stated parent concept	763158003 |Medicinal product (product)|
Semantic tag	(clinical drug)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)| Exceptions: • Concepts with product strength that is "not equal to" (e.g. with product strength expressed as a range, greater than, or less than) will have definition status 900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|

Attribute: **Has manufactured dose form**	Range: 736542009 |Pharmaceutical dose form (dose form)| • While the allowed range for this attribute is broader, the CD-precise continuous dose from concepts should only use <736542009 | Pharmaceutical dose form (dose form), excluding grouper concepts based on intended site (e.g. 740596000 |Cutaneous dose form (dose form)|, 385268001 |Oral dose form (dose form)|). Cardinality: 1..1 Powder and granules for oral suspension, solution, etc., may be modeled using concentration strength and the administrable dose form (e.g. 1145409004 |Product containing precisely amoxicillin 25 milligram/1 milliliter and clavulanic acid (as clavulanate potassium) 6.25 milligram/1 milliliter conventional release oral suspension (clinical drug)|)
Attribute: **Count of base of active ingredient (attribute)**	Concrete Type: Integer Range: >#0.. Cardinality: 1..1
Relationship group	**One relationship group containing one instance of each of the following attributes is required for each precise active ingredient.**
• **Has precise active ingredient**	Range: <105590001 |Substance (substance) excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..1 per relationship group • The Precise Active Ingredient (PAI) cannot be modeled as a substance hydrate or solvate unless the BoSS is expressed as a hydrate or solvate. • Concepts containing pancreatic enzymes will be modeled based on the discrete enzymes; because of variability between real clinical drugs, synonyms representing a total amount in a particular product will not be included in the International Release.
• **Has basis of strength substance**	Range: <105590001 |Substance (substance) excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..1 per relationship group

• **Has concentration strength numerator value**	Concrete Type: Decimal Range: >#0.. Cardinality: 1..1 per relationship group
• **Has concentration strength numerator unit**	Range: <767524001 |Unit of measure (qualifier value)| Cardinality: 1..1 per relationship group
• **Has concentration strength denominator value**	Concrete Type: Decimal Range: >#0.. Cardinality: 1..1 per relationship group For this pattern, the attribute value must be 1. Note: the denominator strength value is required for concepts in the International Release even though the value = 1, because including denominators for only some concepts negatively affects the classification results.
• **Has concentration strength denominator unit**	Range: <767524001 |Unit of measure (qualifier value)| Cardinality: 1..1 per relationship group For Clinical drug concepts with: • liquid dose form: the denominator unit should be 258773002 | Milliliter (qualifier value)|. • semi-solid dose form: the denominator unit should be 258682000 | gram (qualifier value)|[1040] for weight/weight concentration and 258773002 |Milliliter (qualifier value)| for weight/volume concentration. Representing semi-solid dose forms in weight/weight concentration is preferred.

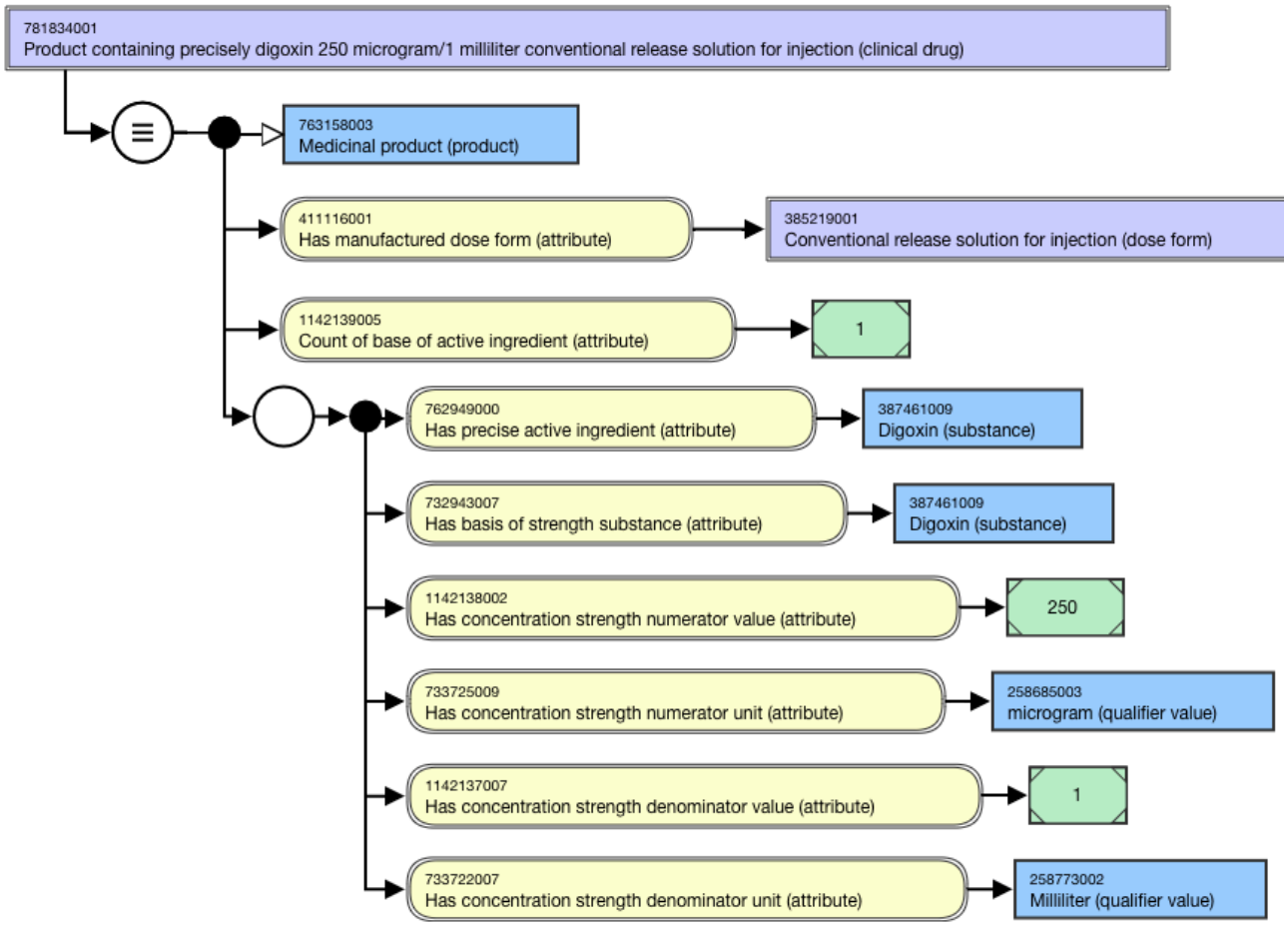
Naming

1040 http://snomed.info/id/258682000

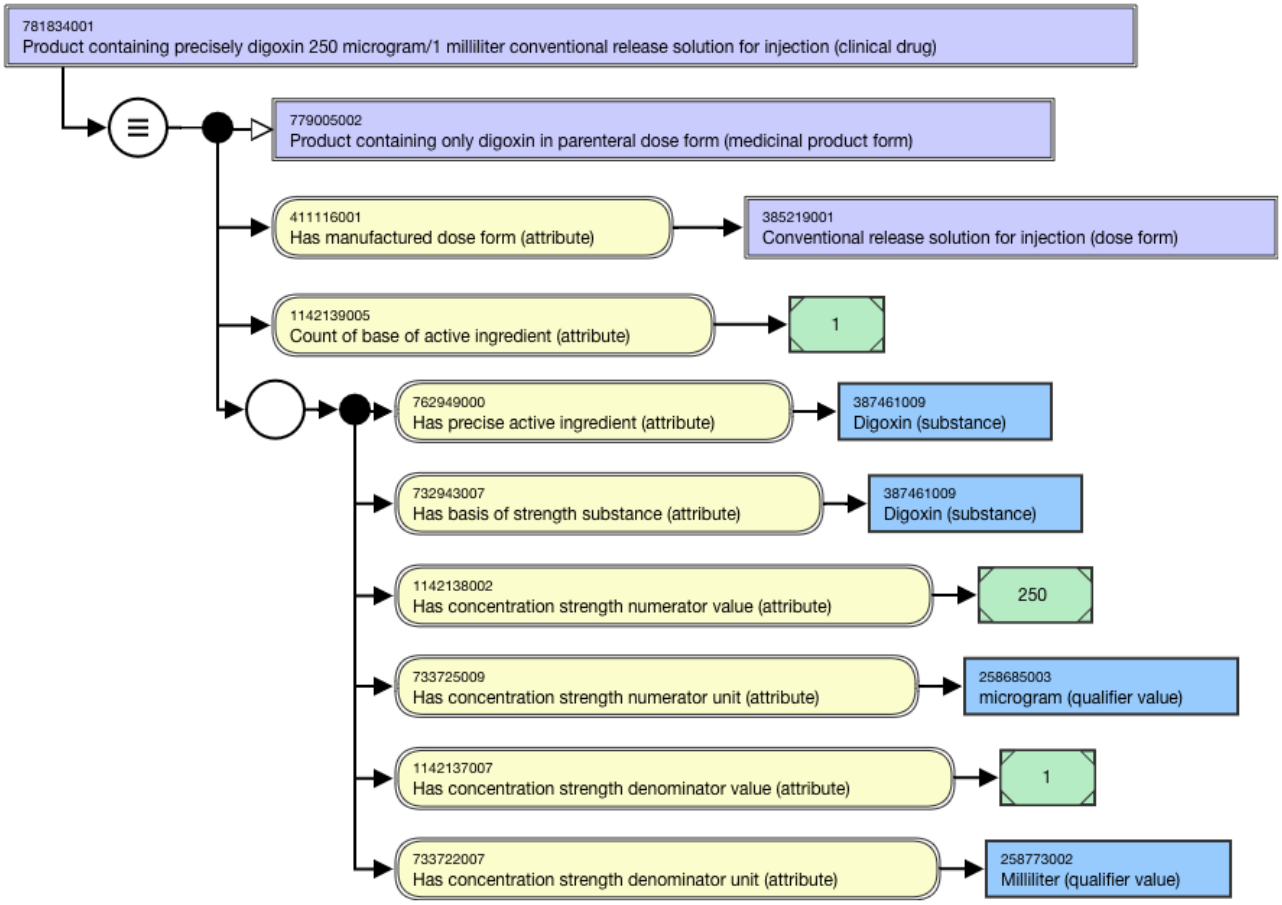
FSN	Use one of the following patterns for the FSN. **Where Precise active ingredient = BoSS:** • Product containing precisely <BoSS FSN> <Concentration strength numerator value FSN> <Concentration strength numerator unit FSN>/<Concentration strength denominator value FSN> <Concentration strength denominator unit FSN> <Manufactured dose form FSN> (clinical drug) For example, • Product containing precisely amitriptyline hydrochloride 5 milligram/1 milliliter conventional release oral solution (clinical drug) • Product containing precisely buprenorphine 70 microgram/1 hour prolonged-release transdermal patch (clinical drug) • Product containing precisely clotrimazole 10 milligram/1 gram conventional release cutaneous cream (clinical drug) • Product containing precisely zidovudine 10 milligram/1 milliliter conventional release oral solution (clinical drug) • Product containing precisely lopinavir 80 milligram/1 milliliter and ritonavir 20 milligram/1 milliliter conventional release oral solution (clinical drug) **Where Precise active ingredient is not = BoSS:** • Product containing precisely <BoSS FSN> (as <Precise active ingredient FSN>) <Concentration strength numerator value FSN> <Concentration strength numerator unit FSN>/<Concentration strength denominator value FSN> <Concentration strength denominator unit FSN> <Manufactured dose form FSN> (clinical drug) For example, • Product containing precisely amikacin (as amikacin sulfate) 250 milligram/1 milliliter conventional release solution for injection (clinical drug) • Product containing precisely mupirocin (as mupirocin calcium) 20 milligram/1 gram conventional release nasal ointment (clinical drug)

Preferred Term	Use one of the following patterns for the PT. **Where Single ingredient with BoSS = Precise active ingredient:** • <BoSS PT> <Concentration strength numerator value PT> <Concentration strength numerator unit PT>/<Concentration strength denominator value PT> <Concentration strength denominator unit PT> <Manufactured dose form PT> For example, • Amitriptyline hydrochloride 5 mg/mL oral solution • Buprenorphine 70 microgram/hour prolonged-release transdermal patch • Clotrimazole 10 mg/g cutaneous cream • Zidovudine 10 mg/mL oral solution • Lopinavir 80 mg/mL and ritonavir 20 mg/mL oral solution **Where Single ingredient with BoSS is not = Precise active ingredient:** • <BoSS PT> (as <Precise active ingredient PT>) <Concentration strength numerator value PT> <Concentration strength numerator unit PT>/<Concentration strength denominator value PT> <Concentration strength denominator unit PT> <Manufactured dose form PT> For example, • Amikacin (as amikacin sulfate) 250 mg/mL solution for injection • Mupirocin (as mupirocin calcium) 20 mg/g nasal ointment
Synonyms	Synonyms converting metric units to percent or parts per millions may be included for medical gas concepts (e.g. Helium 79% and oxygen 21% gas for inhalation, Helium 790,000 ppm and oxygen 210,000 ppm gas for inhalation).

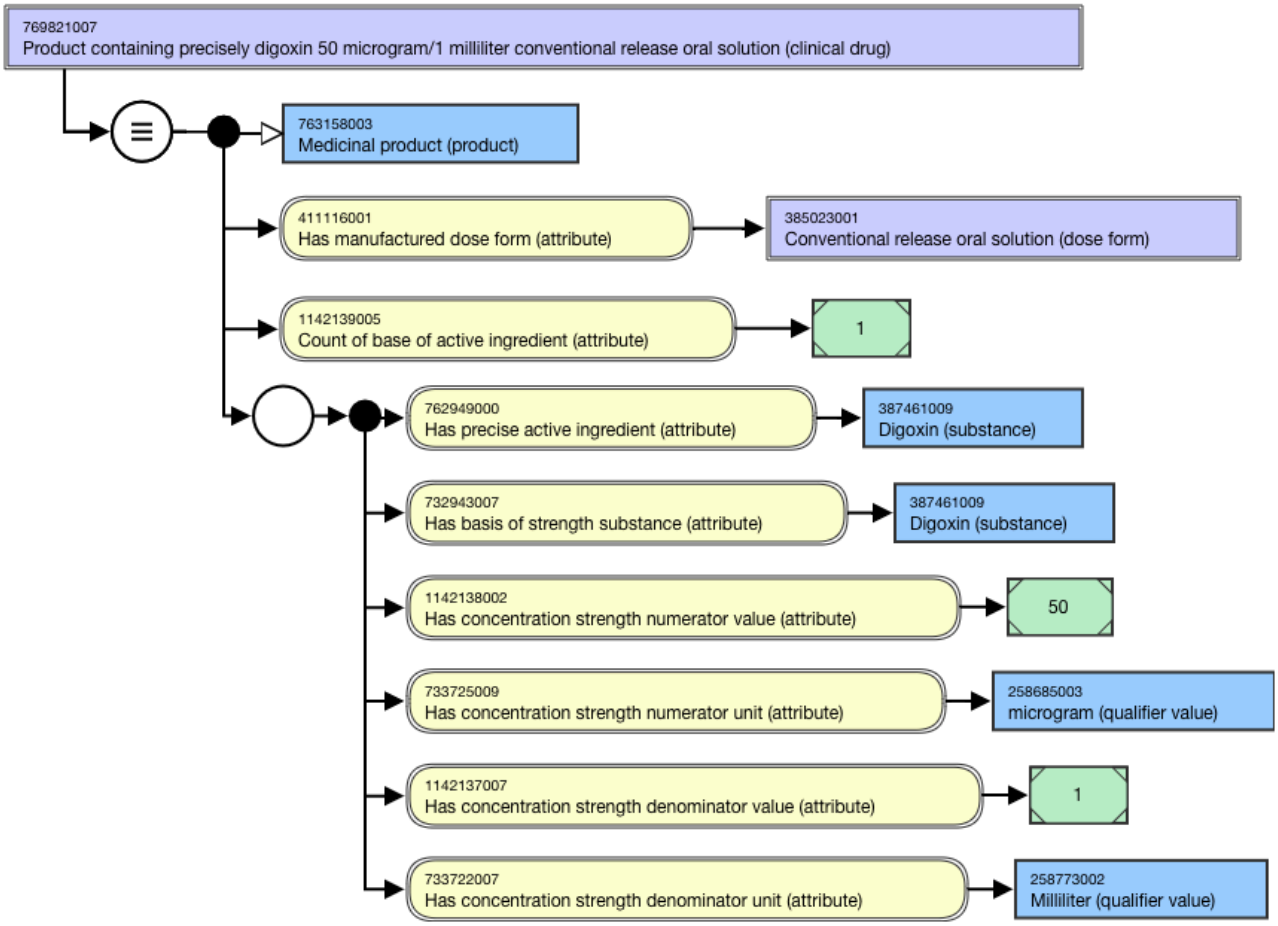
Exemplars
The following illustrates the **stated** view for 781834001 |Product containing precisely digoxin 250 microgram/1 milliliter conventional release solution for injection (clinical drug)|:



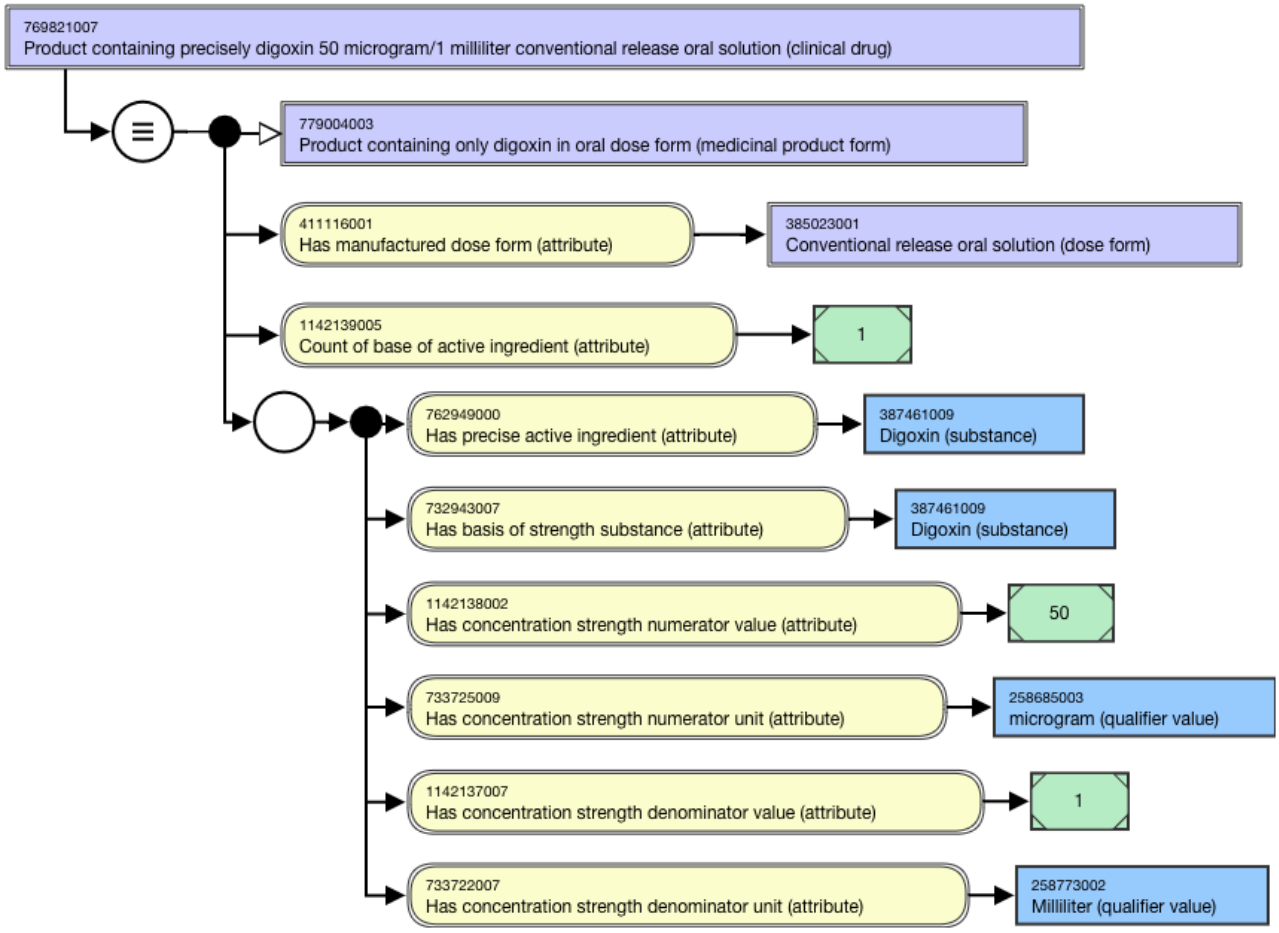
The following illustrates the **inferred** view for 781834001 |Product containing precisely digoxin 250 microgram/1 milliliter conventional release solution for injection (clinical drug)|:



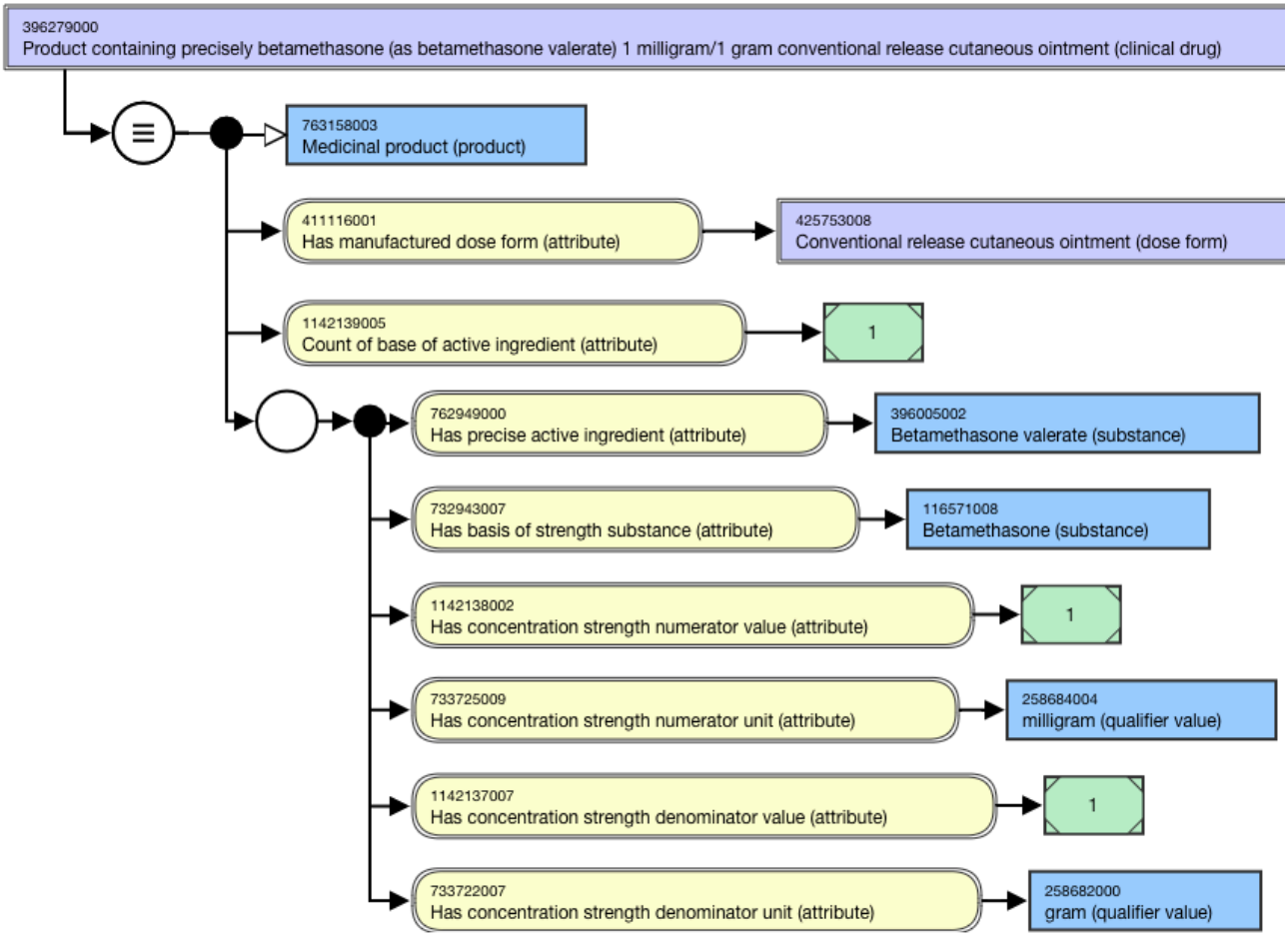
The following illustrates the **stated** view for 769821007 |Product containing precisely digoxin 50 microgram/1 milliliter conventional release oral solution (clinical drug)|:



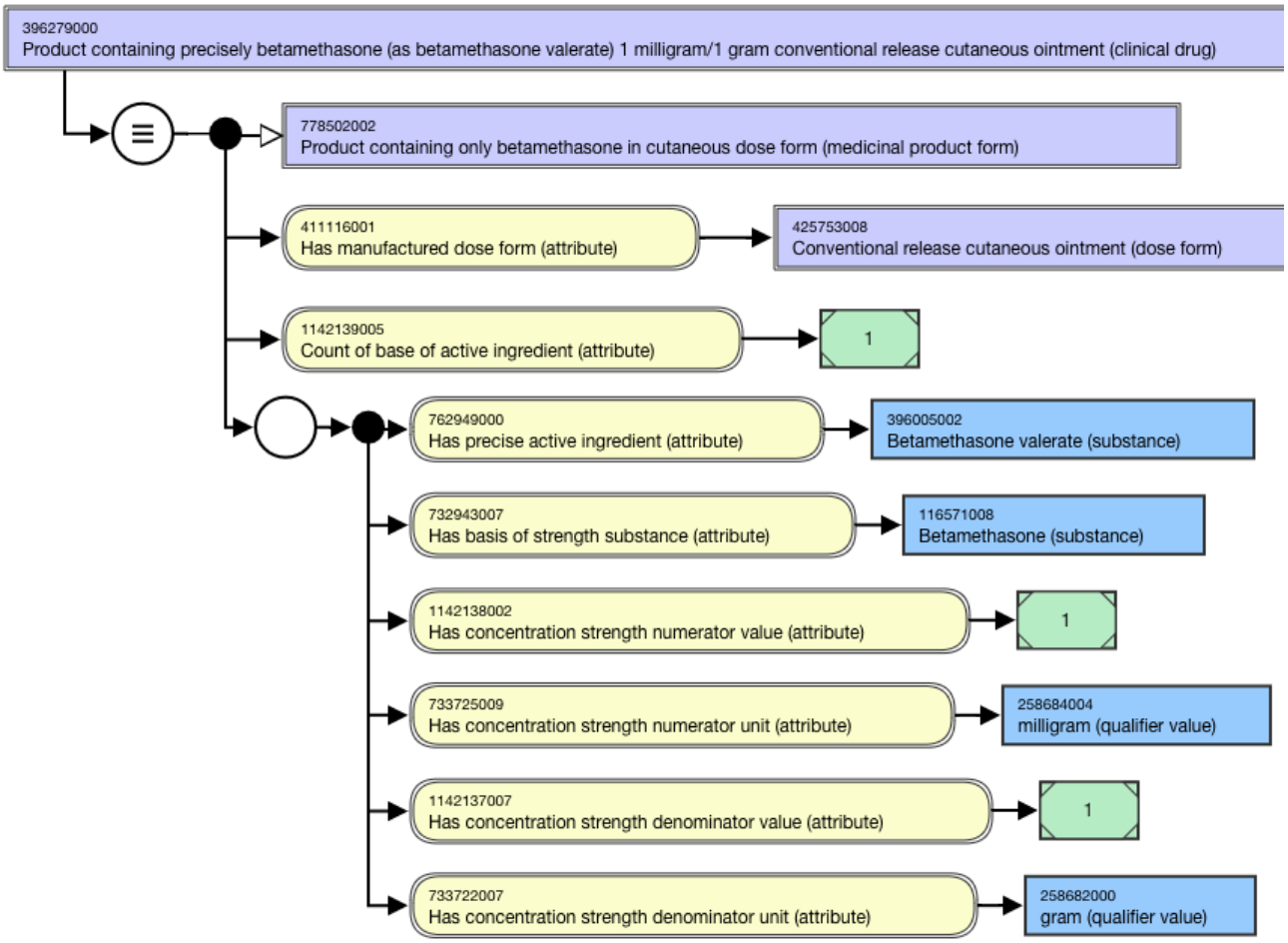
The following illustrates the **inferred** view for 769821007 |Product containing precisely digoxin 50 microgram/1 milliliter conventional release oral solution (clinical drug)|:



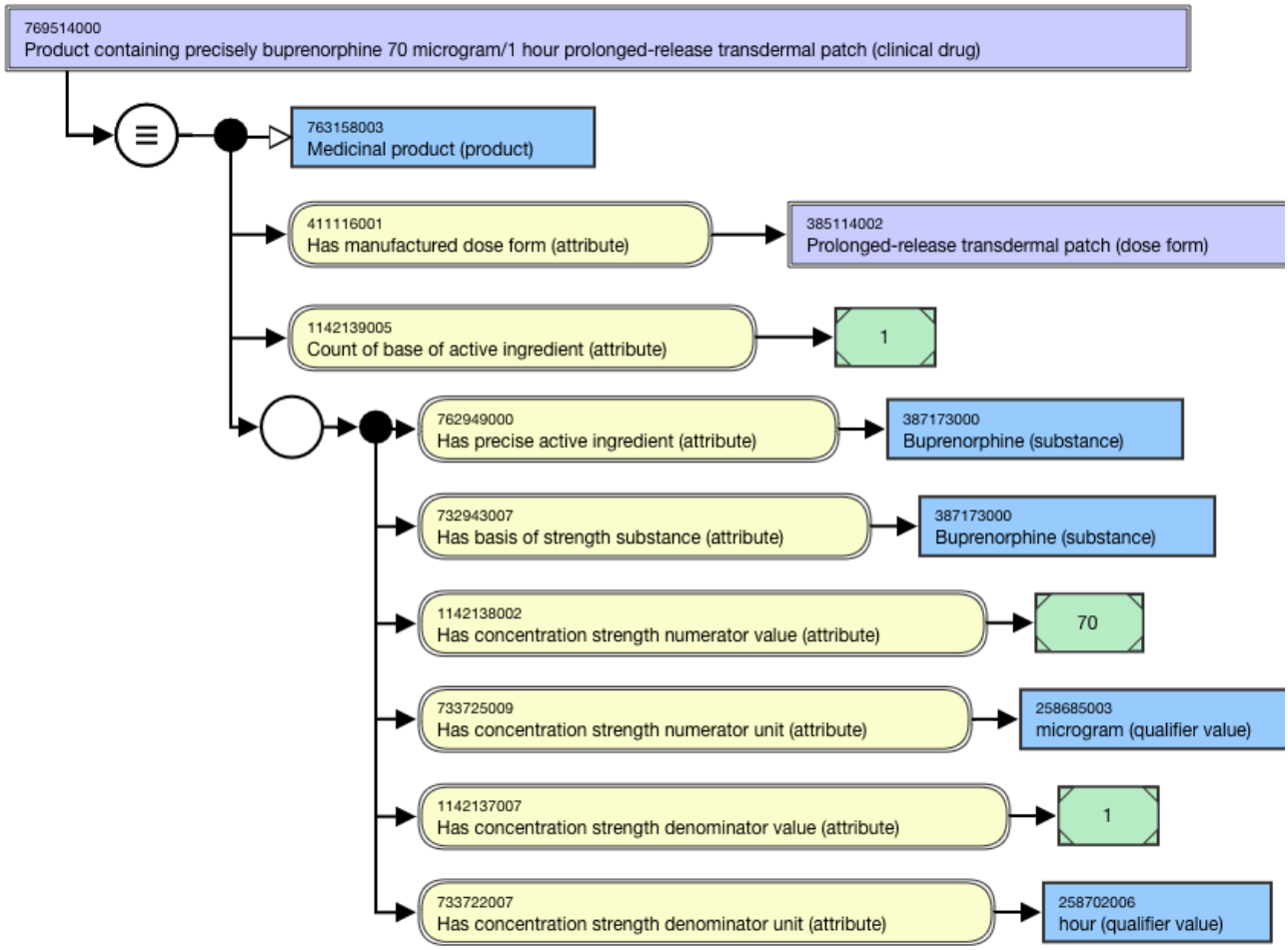
The following illustrates the **stated** view for 396279000 |Product containing precisely betamethasone (as betamethasone valerate) 1 milligram/1 gram conventional release cutaneous ointment (clinical drug)|:



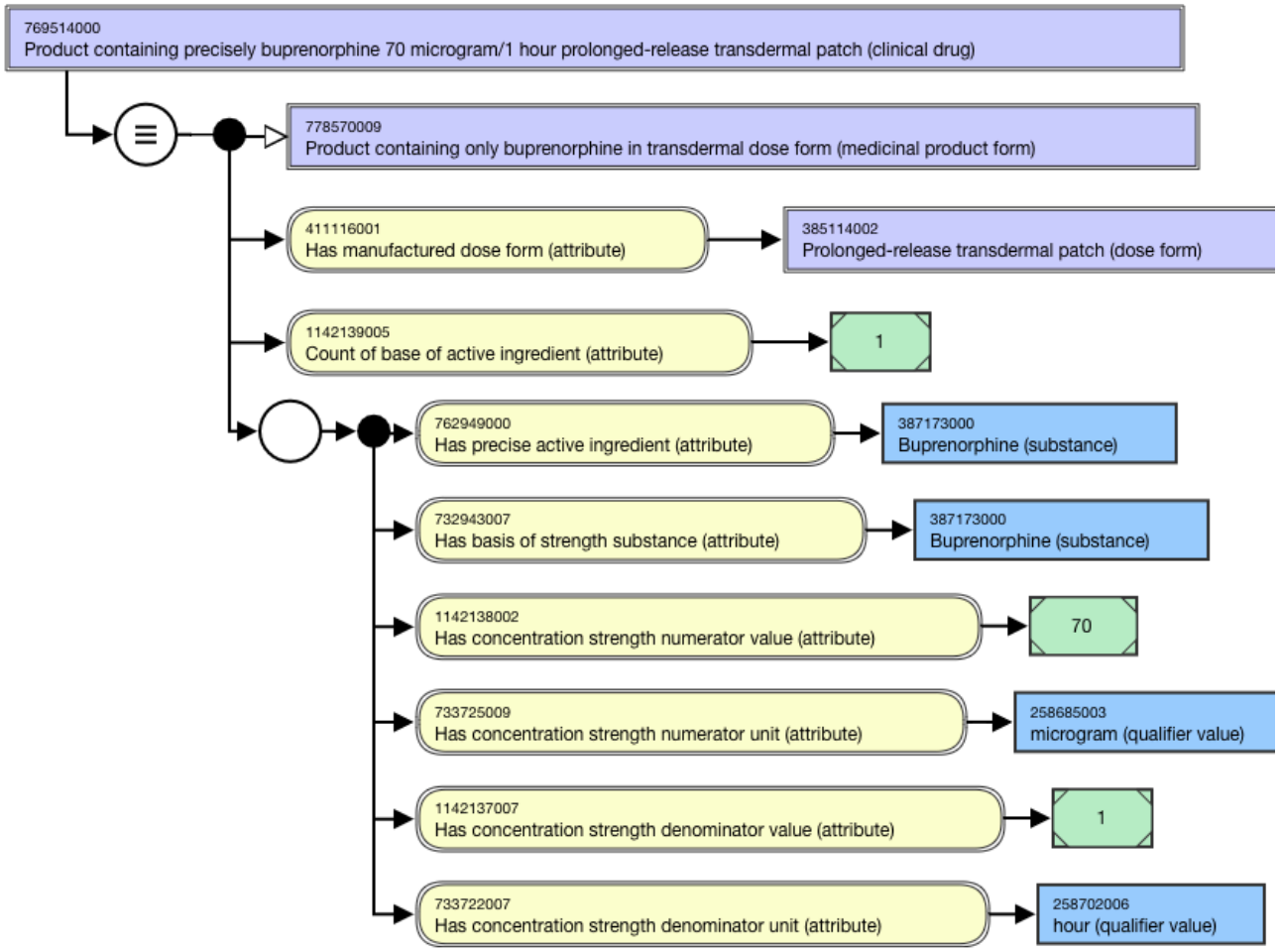
The following illustrates the **inferred** view for 396279000 |Product containing precisely betamethasone (as betamethasone valerate) 1 milligram/1 gram conventional release cutaneous ointment (clinical drug)|:



The following illustrates the **stated** view for 769514000 |Product containing precisely buprenorphine 70 microgram/ 1 hour prolonged-release transdermal patch (clinical drug)|:



The following illustrates the **inferred** view for 769514000 |Product containing precisely buprenorphine 70 microgram/1 hour prolonged-release transdermal patch (clinical drug)|:



Medicinal Product and Medicinal Product Forms

- Medicinal Product Form containing only(see page 318)
- Medicinal Product Form containing(see page 323)
- Medicinal Product containing(see page 326)
- Medicinal Product containing only Concept(see page 330)

In the International Release, the | Has active ingredient (attribute)|[1041] value should represent the base ingredient, not a modification, unless explicitly identified as an exception below.

Exceptions	Examples
Benzylpenicillin	1234765004 |Product containing only benzathine benzylpenicillin in parenteral dose form (medicinal product form)| 323404007 |Product containing benzathine benzylpenicillin (medicinal product)|

1041 http://snomed.org/fictid#

Chemical element with multiple modification	422232005 |Calcium lactate gluconate (substance)| 715220007 |Tenofovir alafenamide (substance)|
Chloral hydrate	778711000 |Product containing only chloral hydrate in oral dose form (medicinal product form)| 386735001 |Product containing chloral hydrate in oral dose form (medicinal product form)| 775158004 |Product containing only chloral hydrate (medicinal product)|
Liposome or lipid complex substances	426490000 |Vincristine liposome (substance)| 425953004 |Amphotericin B lipid complex (substance)| 768664009 |Amphotericin B phospholipid complex (substance)| 427544000 |Amphotericin B cholesteryl sulfate complex (substance)|
Pegylated substance	385544005 |Pegfilgrastim (substance)| 770965008 |Pegvaliase (substance)|
Radiopharmaceutical	783865003 |Product containing only cyanocobalamin (58-Co) (medicinal product)| 783867006 |Product containing only cyanocobalamin (58-Co) in oral dose form (medicinal product form)| 783856005 |Product containing sodium iodide (131-I) in parenteral dose form (medicinal product form)| 783854008 |Product containing sodium iodide (131-I) (medicinal product)|
Silver sulfadiazine	864009007 |Product containing only silver sulfadiazine in cutaneous dose form (medicinal product form)| 771756000 |Product containing silver sulfadiazine in cutaneous dose form (medicinal product form)|

Medicinal Product Form containing only

Overview
The |Product containing only x in y dose form (medicinal product form)| is an abstract representation of the active ingredient(s) and dose form intended site for a medicinal product. The medicinal product must contain only the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN.

Example:

- Product containing only axitinib in oral dose form (medicinal product form)
- Product containing only abacavir and lamivudine in oral dose form (medicinal product form)

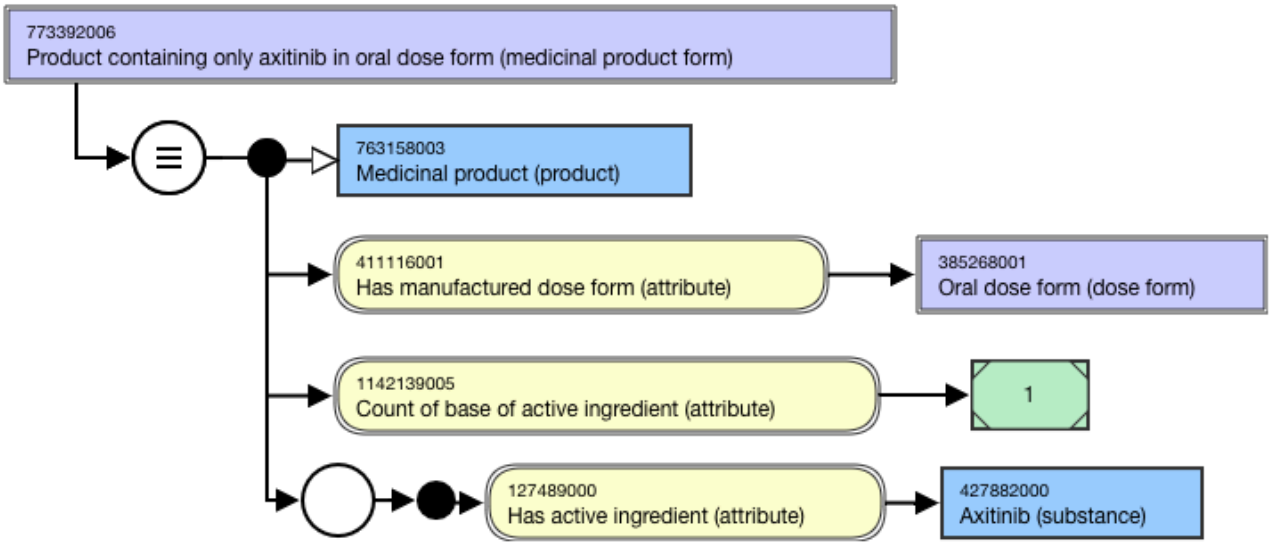
Modeling

Stated parent concept	763158003 |Medicinal product (product)|
Semantic tag	(medicinal product form)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has active ingredient**	Range: <105590001|Substance (substance)|, excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..* There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date.
Attribute: **Has manufactured dose form**	Range: 736542009 |Pharmaceutical dose form (dose form) - descendants that are groupers representing intended site only (e.g. 385268001 |Oral dose form (dose form)|, 385287007 | Parenteral dose form (dose form)|) Cardinality: 1..1 Exceptions: • 385217004 |Conventional release gas for inhalation (dose form)| may be used as manufactured dose form for Medicinal product form concepts. • 785898006 |Conventional release solution for irrigation (dose form)| does not have 736474004 |Has dose form intended site (attribute)| but can be used as a target for manufactured dose form for Medicinal product form concepts.
Attribute: **Count of base of active ingredient**	Concrete Type: Integer Range: >#0.. Cardinality: 1..1

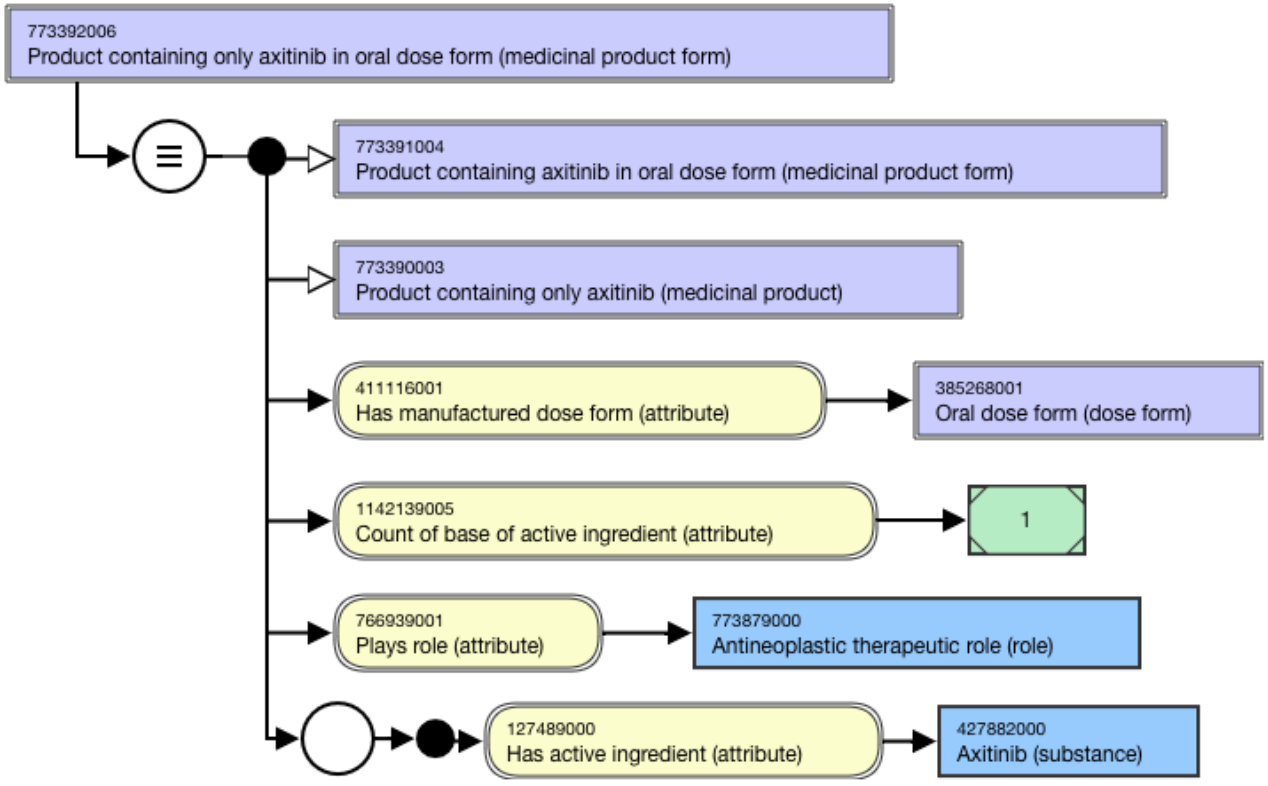
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concepts that are selected as the attribute value, excluding the semantic tag. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • Product containing only <Active ingredient FSN> in <Manufactured dose form FSN> (medicinal product form) • Product containing only <Active ingredient FSN> and <Active ingredient> in <Manufactured dose form FSN>(medicinal product form) • Product containing only <Active ingredient FSN> and <Active ingredient FSN> and <Active ingredient FSN> in <Manufactured dose form FSN> (medicinal product form) Creation of MPF-only concepts for all possible combinations of active ingredients contained in multiple ingredient products is not recommended at this time (no specific use case has been identified). For example, a product containing three active ingredients would only require creation of one MPF-only concept. If any of the active ingredients is available as a single ingredient product, or as part of another multiple ingredient concept, then appropriate concepts would be created for those products. For example, • Product containing only axitinib in oral dose form (medicinal product form) • Product containing only abacavir and lamivudine in oral dose form (medicinal product form) • Product containing only abacavir and lamivudine and zidovudine in oral dose form (medicinal product form)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • <Active ingredient PT> only product in <Manufactured dose form PT> • <Active ingredient PT>- and <Active ingredient PT> only product in <Manufactured dose form PT> • <Active ingredient PT>- and <Active ingredient PT>- and <Active ingredient PT> only product in <Manufactured dose form PT> For example, • Axitinib only product in oral dose form • Abacavir and lamivudine only product in oral dose form • Abacavir and lamivudine and zidovudine only product in oral dose form
Synonym	Synonyms matching the FSN are not required.

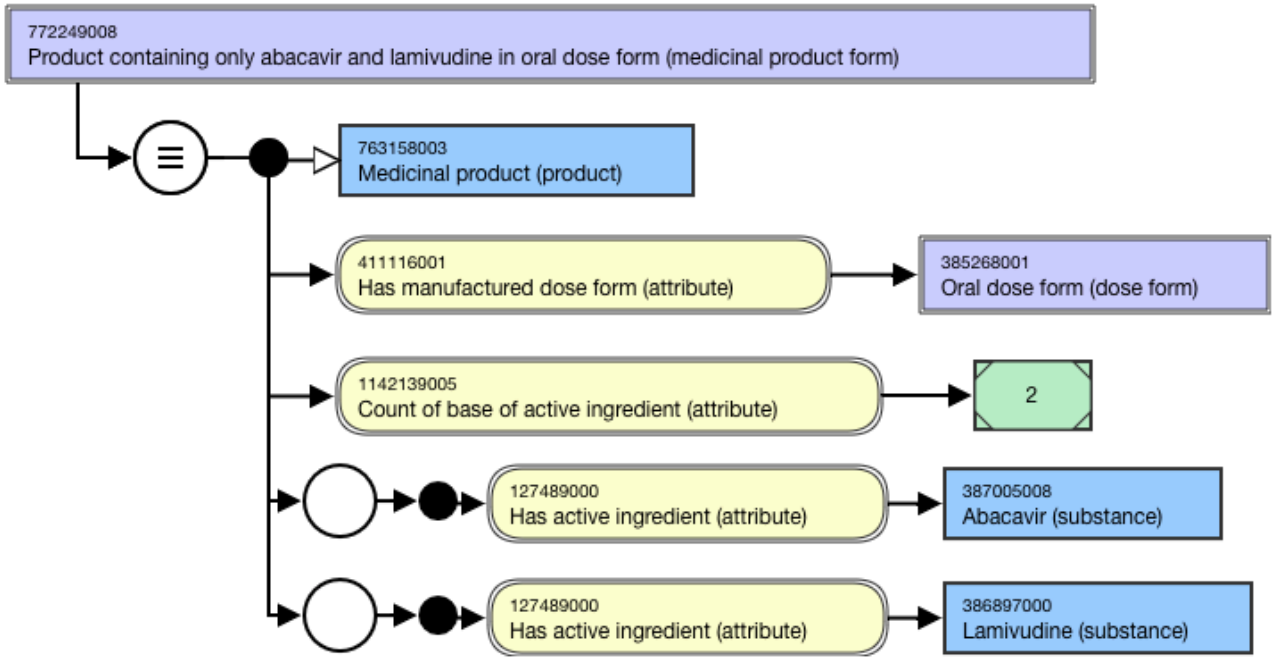
Exemplars
The following illustrates the **stated** view for 773392006 |Product containing only axitinib in oral dose form (medicinal product form)|:



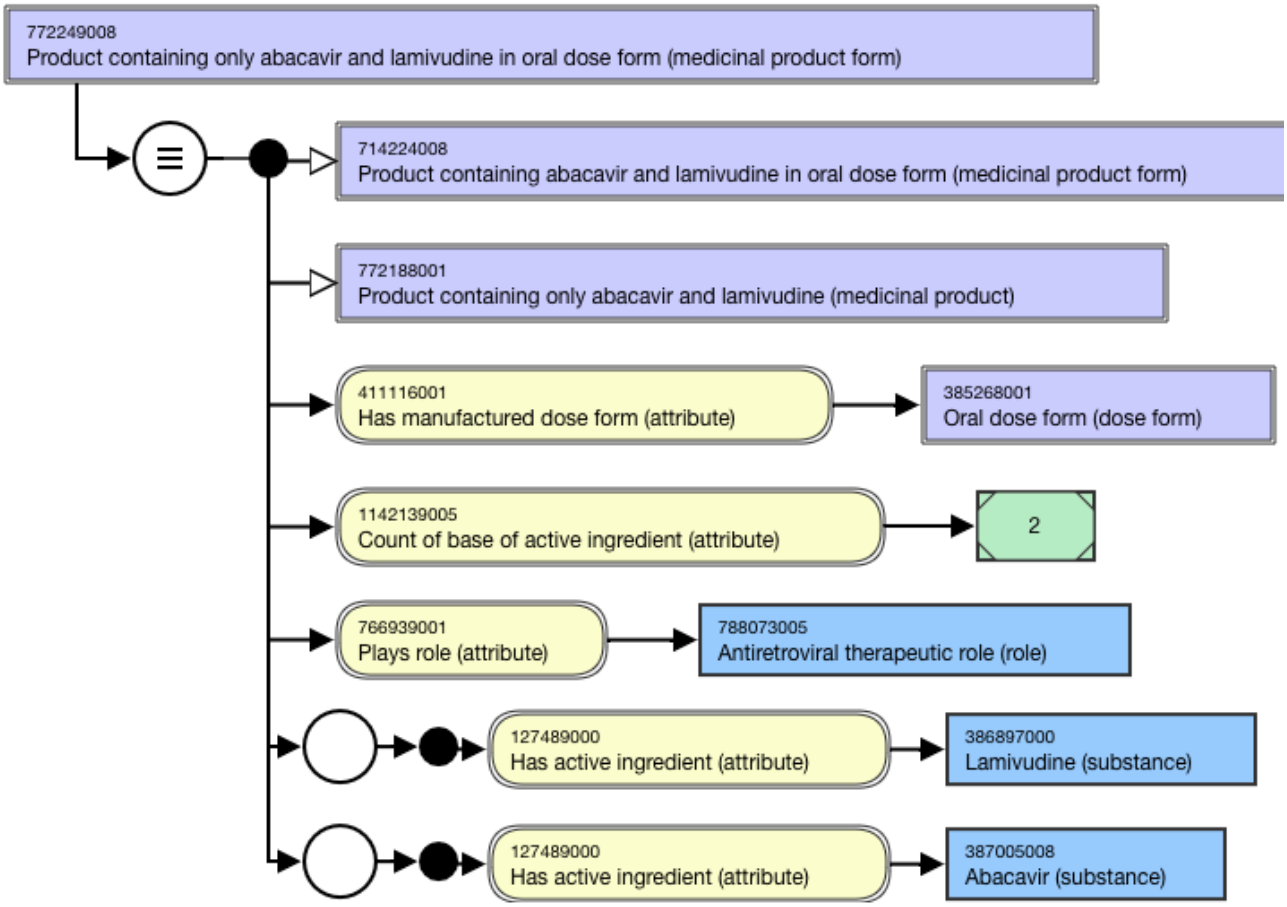
The following illustrates the **inferred** view for 773392006 |Product containing only axitinib in oral dose form (medicinal product form)|:



The following illustrates the **stated** view for 772249008 |Product containing only abacavir and lamivudine in oral dose form (medicinal product form)|:



The following illustrates the **inferred** view for 772249008 |Product containing only abacavir and lamivudine in oral dose form (medicinal product form)|:



Medicinal Product Form containing

Overview
The |Product containing x in y dose form (medicinal product form)| concept is an abstract representation of active ingredient(s) and dose form intended site for a medicinal product. The medicinal product must contain the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN or may contain additional active ingredient(s) as well.

For example,

- Product containing axitinib in oral dose form (medicinal product form)
- Product containing abacavir and lamivudine in oral dose form (medicinal product form)

Modeling

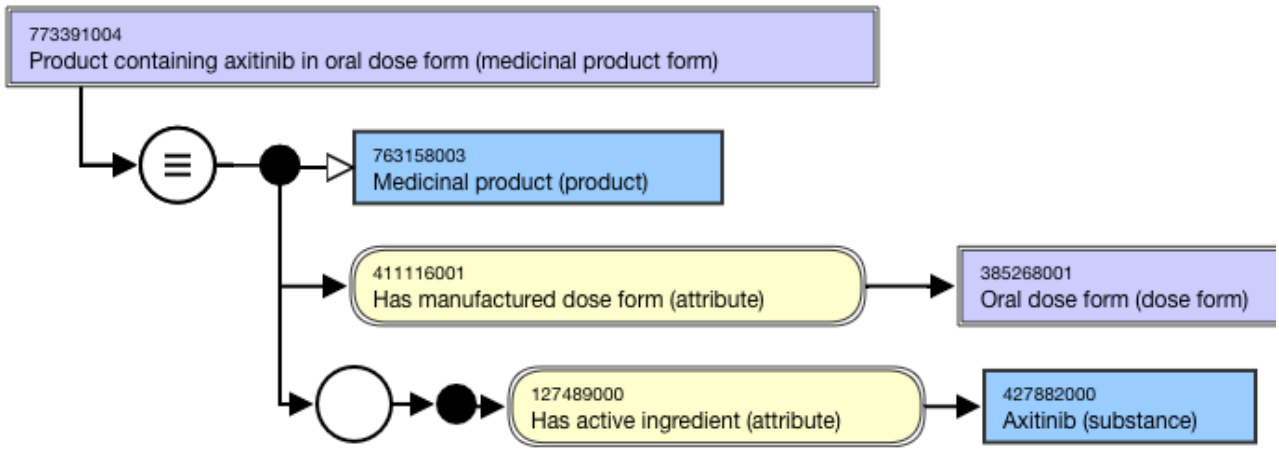
Stated parent	763158003 |Medicinal product (product)
Semantic tag	(medicinal product form)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has active ingredient**	Range: <105590001 |Substance (substance)|, excluding concepts representing structural groupers, dispositions, or roles Cardinality: 1..* There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date.
Attribute: **Has manufactured dose form**	Range: 736542009 |Pharmaceutical dose form (dose form) - descendants that are groupers representing intended site only (e.g. 385268001 |Oral dose form (dose form)|, 385287007 |Parenteral dose form (dose form)|) Cardinality: 1..1 Exceptions: • 385217004 |Conventional release gas for inhalation (dose form)| may be used as manufactured dose form for Medicinal product form concepts. • 785898006 |Conventional release solution for irrigation (dose form)| does not have 736474004 |Has dose form intended site (attribute)| but can be used as a target for manufactured dose form for Medicinal product form concepts.

Naming Guidelines

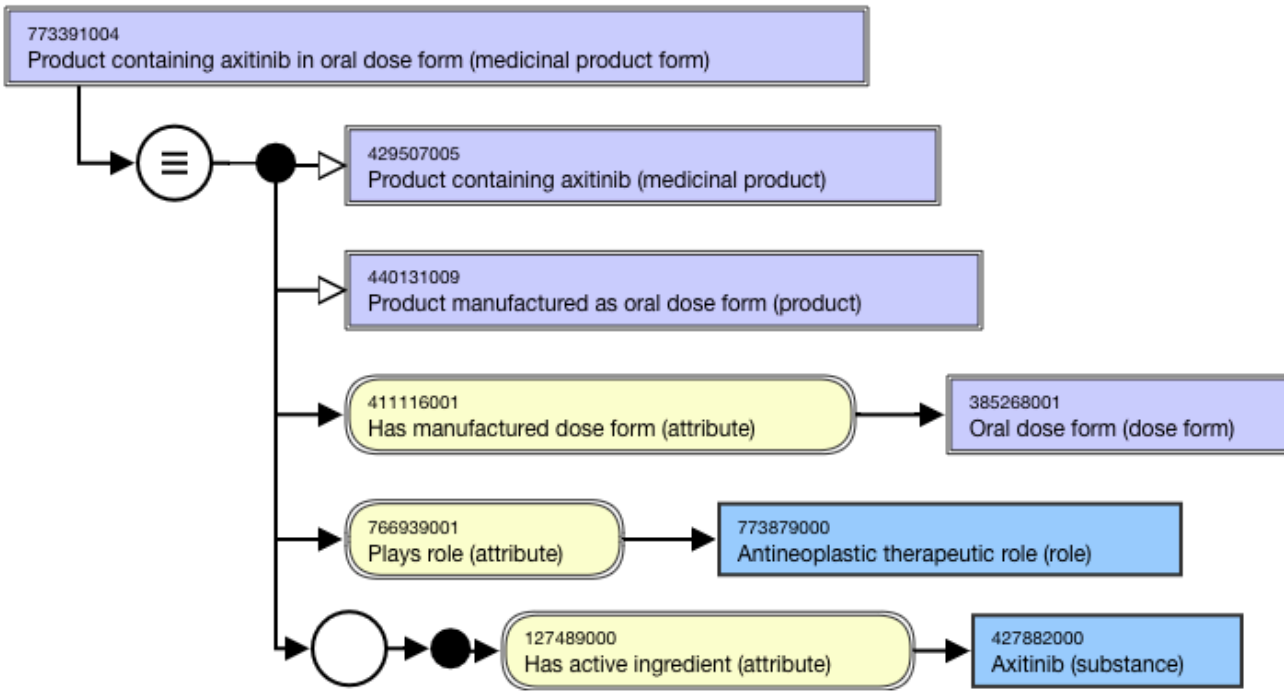
FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concepts that are selected as the attribute value, excluding the semantic tag. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • Product containing <Active ingredient FSN> in <Manufactured dose form FSN> (medicinal product form) • Product containing <Active ingredient FSN> and <Active ingredient FSN> in <Manufactured dose form FSN> (medicinal product form) • Product containing <Active ingredient FSN> and <Active ingredient FSN> and <Active ingredient FSN> in <Manufactured dose form FSN> (medicinal product form) Creation of MPF-containing concepts for all possible combinations of active ingredients contained in multiple ingredient products is not recommended at this time (no specific use case has been identified). For example, a product containing three active ingredients would only require creation of one MPF-containing concept. If any of the active ingredients is available as a single ingredient product, or as part of another multiple ingredient concept, then appropriate concepts would be created for those products. For example, • Product containing axitinib in oral dose form (medicinal product form) • Product containing abacavir and lamivudine in oral dose form (medicinal product form) • Product containing abacavir and lamivudine and zidovudine in oral dose form (medicinal product form)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • <Active ingredient PT>-containing product in <Manufactured dose form PT> • <Active ingredient PT>- and <Active ingredient PT>-containing product in <Manufactured dose form PT> • <Active ingredient PT>- and <Active ingredient PT>- and <Active ingredient PT>-containing product in <Manufactured dose form PT> For example, • Axitinib-containing product in oral dose form • Abacavir- and lamivudine-containing product in oral dose form • Abacavir- and lamivudine- and zidovudine-containing product in oral dose form
Synonym	Synonyms matching the FSN are not required.

Exemplars

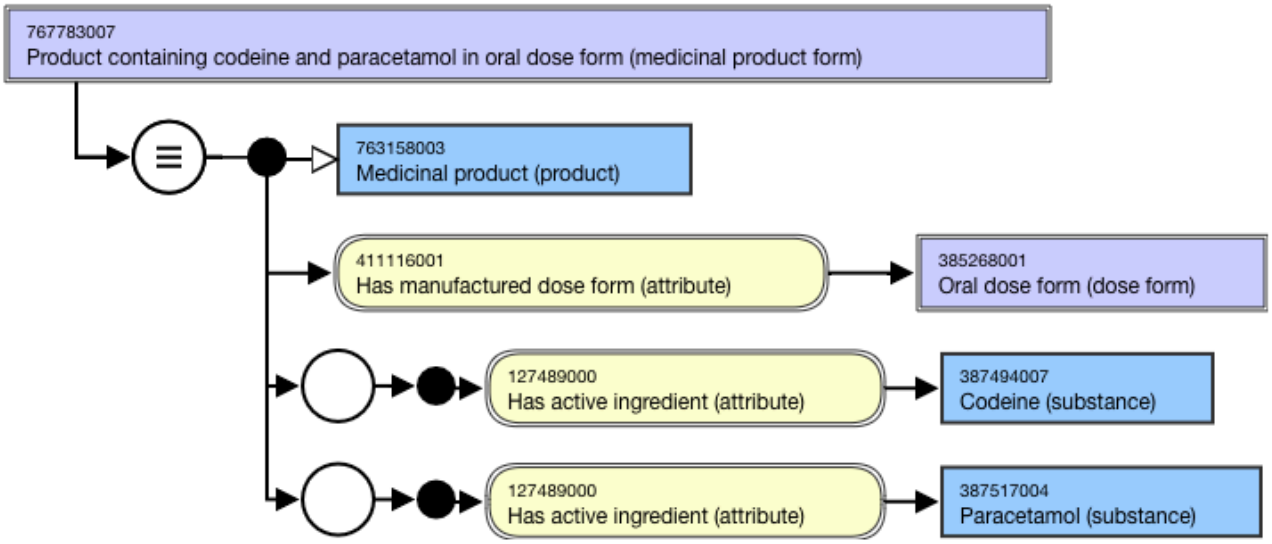
The following illustrates the **stated** view for 773391004 |Product containing axitinib in oral dose form (medicinal product form)|



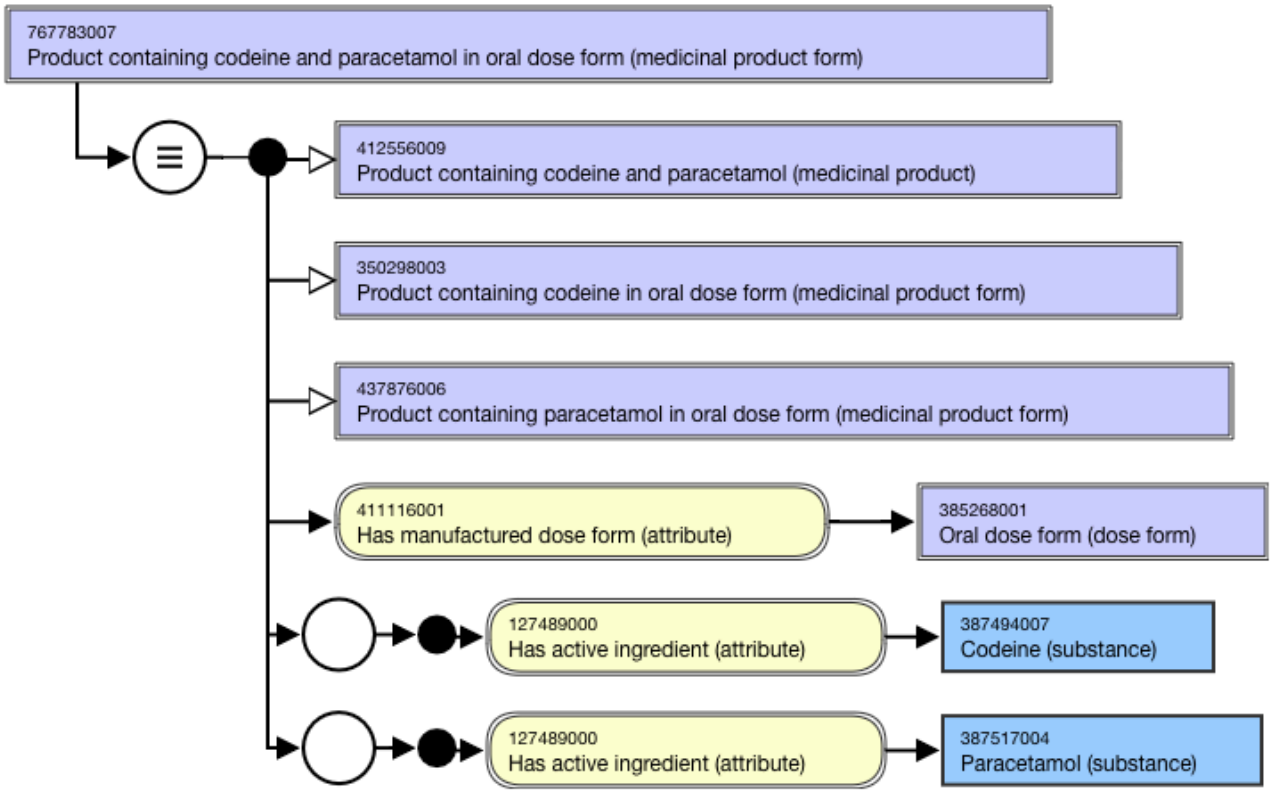
The following illustrates the **inferred** view for 773391004 |Product containing axitinib in oral dose form (medicinal product form)|:



The following illustrates the **stated** view for 767783007 |Product containing codeine and paracetamol in oral dose form (medicinal product form)|:



The following illustrates the **inferred** view for 767783007 |Product containing codeine and paracetamol in oral dose form (medicinal product form)|:



Medicinal Product containing

Overview

|Product containing x (medicinal product)| concepts are abstract representations of the active ingredient(s) for a medicinal product. The medicinal product must contain the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN or may contain additional active ingredient(s).

For example,

- Product containing axitinib (medicinal product)
- Product containing abacavir and lamivudine (medicinal product)

Modeling

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(medicinal product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has active ingredient**	Range: <105590001 |Substance (substance) excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..* • There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date.

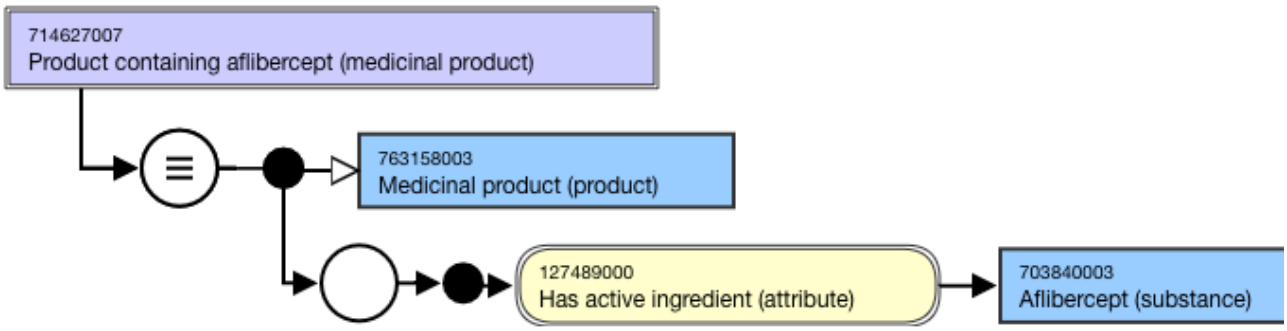
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value, excluding the semantic tag. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • Product containing <Active ingredient FSN> (medicinal product) • Product containing <Active ingredient FSN> and <Active ingredient FSN> (medicinal product) • Product containing <Active ingredient FSN> and <Active ingredient FSN> and <Active ingredient FSN tag> (medicinal product) For example, • Product containing axitinib (medicinal product) • Product containing abacavir and lamivudine (medicinal product) • Product containing abacavir and lamivudine and zidovudine (medicinal product)

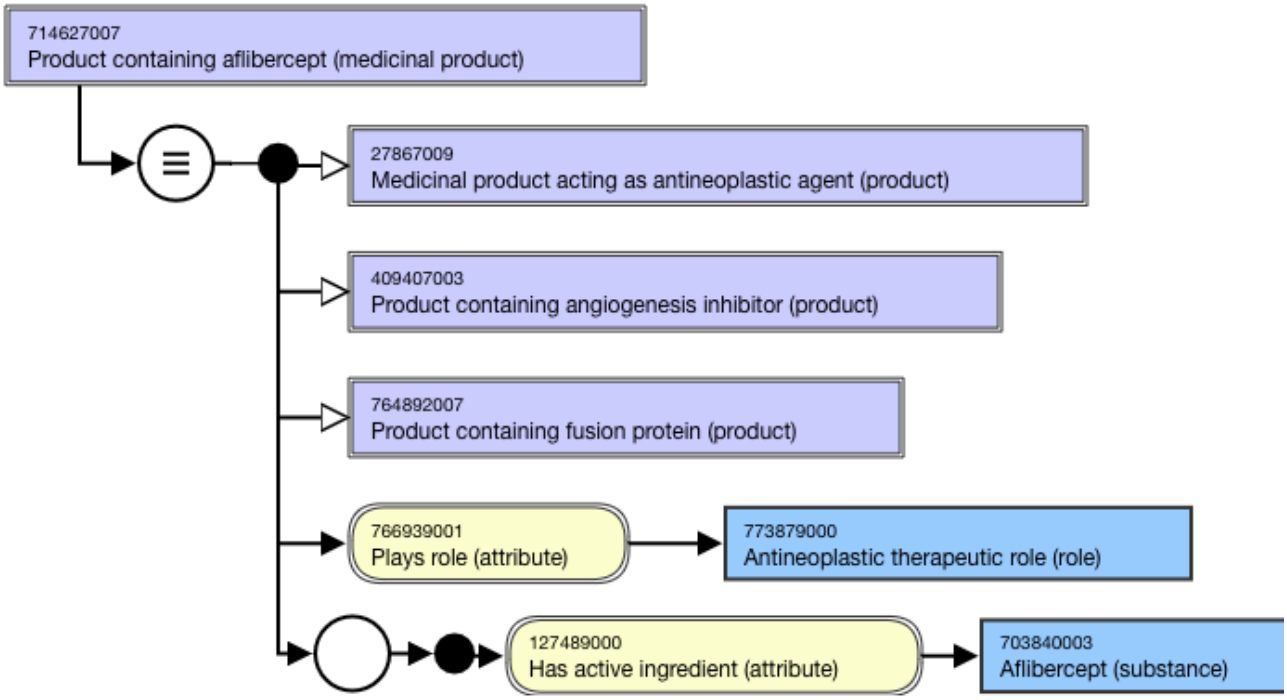
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word "and". • <Active ingredient PT>-containing product • <Active ingredient PT>- and <Active ingredient PT>-containing product • <Active ingredient PT>- and <Active ingredient PT>- and <Active ingredient PT>-containing product For example, • Axitinib-containing product • Abacavir- and lamivudine-containing product • Abacavir- and lamivudine- and zidovudine-containing product
Synonym	Synonyms matching the FSN are not required.

Exemplars

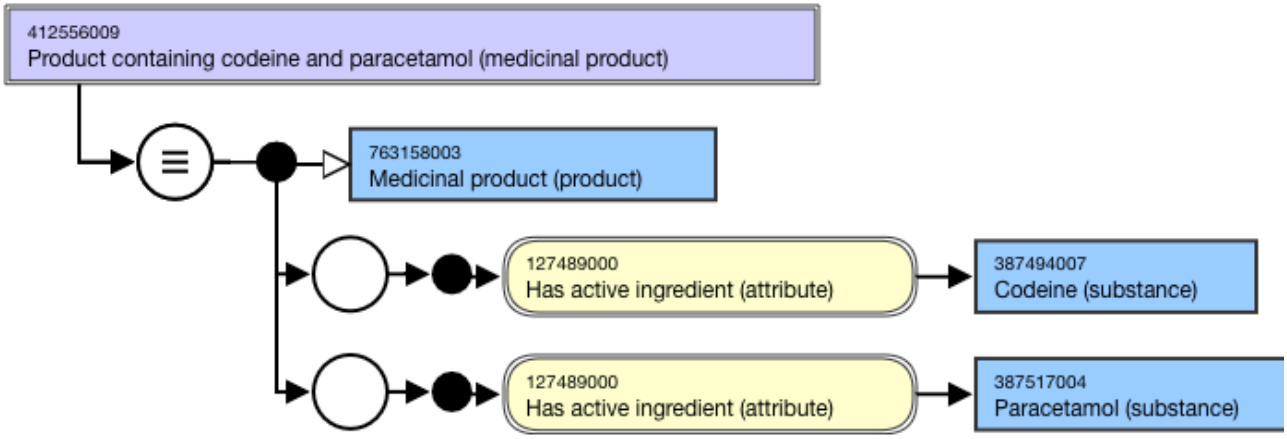
The following illustrates the **stated** view for 714627007 |Product containing aflibercept (medicinal product)|:



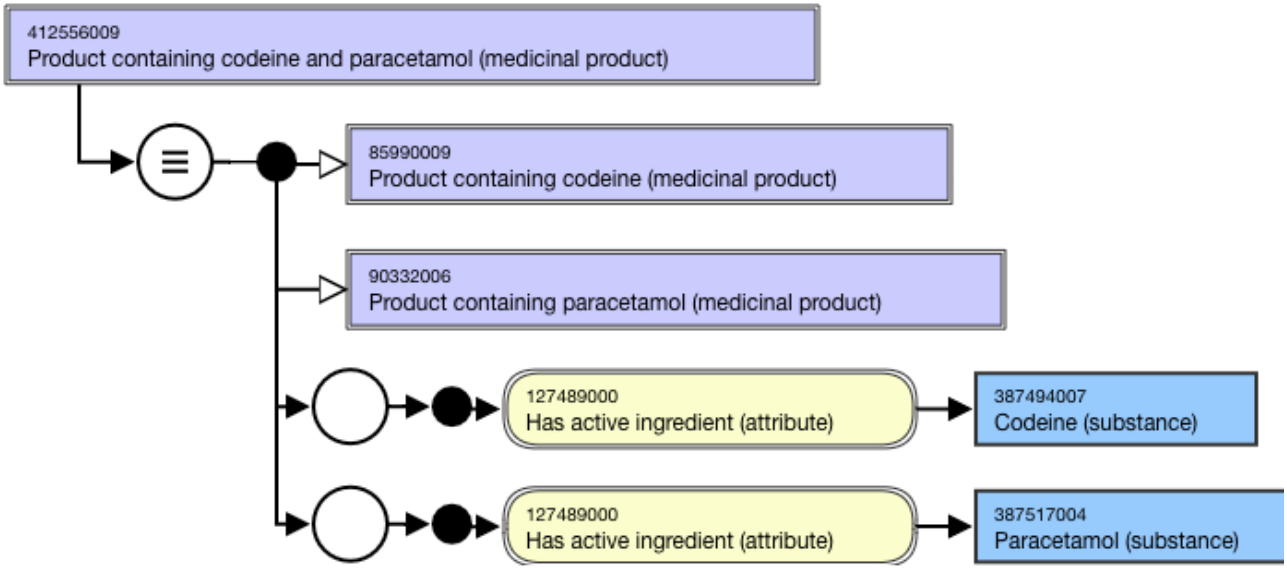
The following illustrates the **inferred** view for 714627007 |Product containing aflibercept (medicinal product)|:



The following illustrates the **stated** view for 412556009 |Product containing codeine and paracetamol (medicinal product)|:



The following illustrates the **inferred** view for 412556009 |Product containing codeine and paracetamol (medicinal product)|:



Medicinal Product containing only Concept

Overview
The Medicinal Product "containing only" (MP-only) concept is an abstract representation of the active ingredient(s) for a medicinal product. It means that the medicinal product must contain only the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN.

For example,

- Product containing only axitinib (medicinal product)
- Product containing only abacavir and lamivudine (medicinal product)

Modeling

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(medicinal product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute:
Has active ingredient
	Range: <105590001 |Substance (substance), excluding concepts representing structural groupers, dispositions, or combined substances
	
	Cardinality: 1..* - there is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date.
	
	For content in the International Release, this attribute value should represent the base ingredient, not a modification, unless explicitly identified as an exception.
	
	• Exceptions:
	  • Chemical element with multiple modification (e.g. 422232005 |Calcium lactate gluconate (substance)|, 715220007 |Tenofovir alafenamide (substance)|)
	  • Chloral hydrate (e.g. 775158004 |Product containing only chloral hydrate (medicinal product)|)
	  • Liposome or lipid complex substances (e.g. 426490000 | Vincristine liposome (substance)|, 425953004 | Amphotericin B lipid complex (substance)|, 768664009 | Amphotericin B phospholipid complex (substance)|, 427544000 |Amphotericin B cholesteryl sulfate complex (substance)|)
	  • Pegylated substance (e.g. 385544005 |Pegfilgrastim (substance)|, 770965008 |Pegvaliase (substance)|)
	  • Radiopharmaceutical (e.g. 783865003 |Product containing only cyanocobalamin (58-Co) (medicinal product)|, 783855009 |Product containing only sodium iodide (131-I) (medicinal product)|)
	  • Silver sulfadiazine (e.g. 864008004 |Product containing only silver sulfadiazine (medicinal product)|)
	  • Benzylpenicillin (e.g. 1234764000 |Product containing only benzathine benzylpenicillin (medicinal product)|)

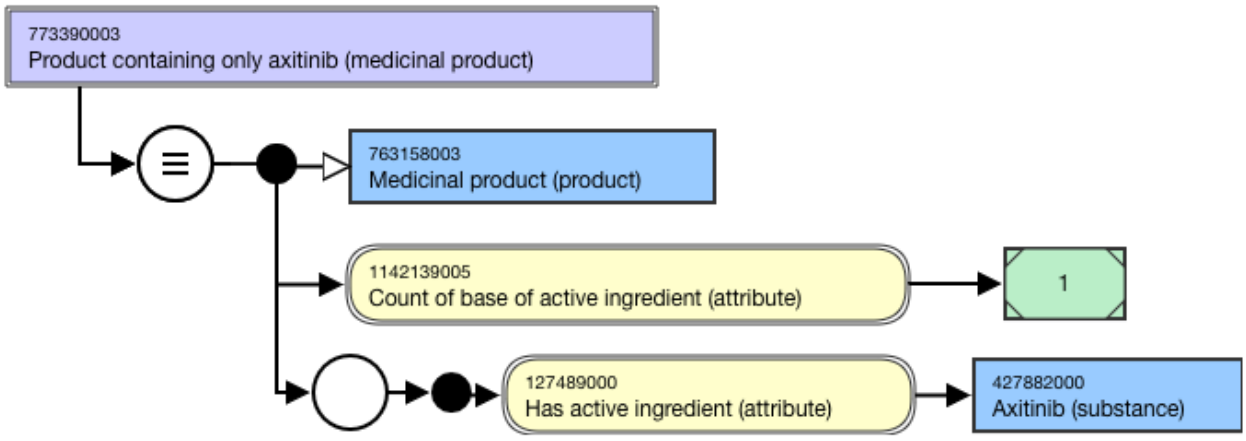
Attribute: **Count of base of active ingredient**	Concrete Type: Integer Range: >#0.. Cardinality: 1..1

Naming Guidelines

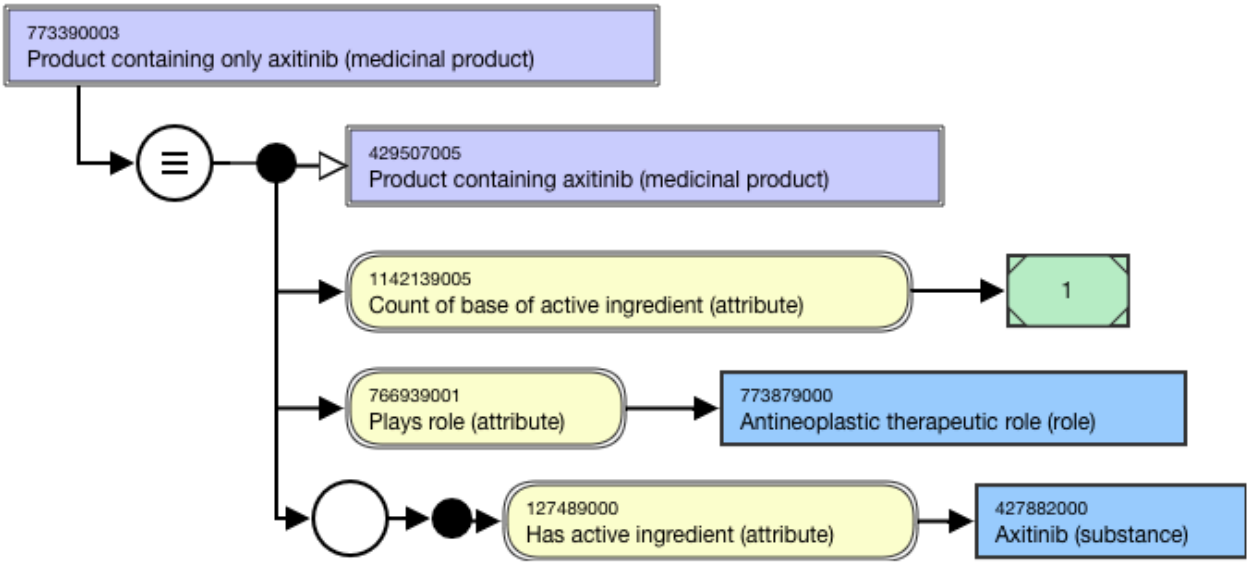
FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value, excluding the semantic tag. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • Product containing only <Active ingredient FSN> (medicinal product) • Product containing only <Active ingredient FSN> and <Active ingredient FSN> (medicinal product) • Product containing only <Active ingredient FSN> and <Active ingredient FSN> and <Active ingredient FSN> (medicinal product) For example, • Product containing only axitinib (medicinal product) • Product containing only abacavir and lamivudine (medicinal product) • Product containing only abacavir and lamivudine and zidovudine (medicinal product)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. • <Active ingredient PT> only product • <Active ingredient PT> and <Active ingredient PT> only product • <Active ingredient PT> and <Active ingredient PT> and <Active ingredient PT> only product For example, • Axitinib only product • Abacavir and lamivudine only product • Abacavir and lamivudine and zidovudine only product
Synonym	Synonyms matching the FSN are not required.

Exemplars

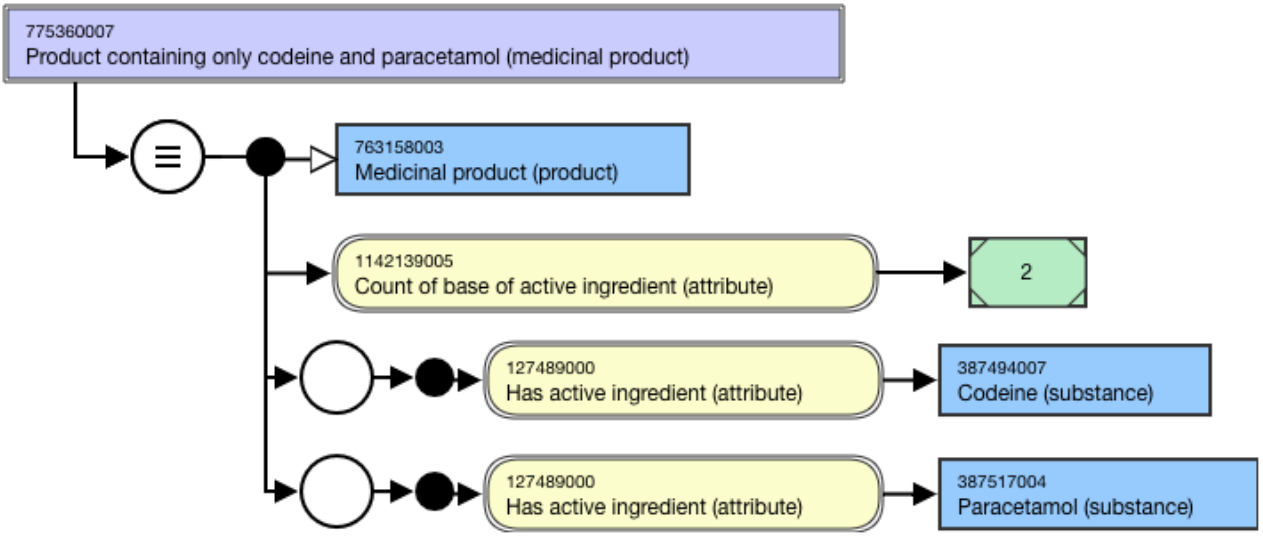
The following illustrates the **stated** view for 773390003 |Product containing only axitinib (medicinal product)|:



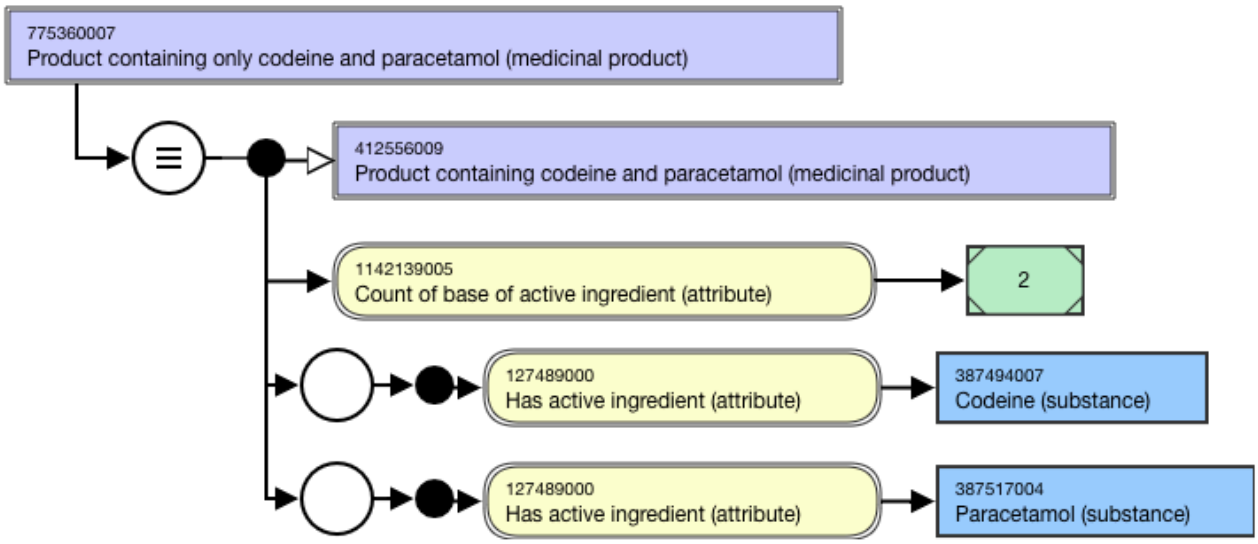
The following illustrates the **inferred** view for 773390003 |Product containing only axitinib (medicinal product)|:



The following illustrates the **stated** view for 775360007 |Product containing only codeine and paracetamol (medicinal product)|:



The following illustrates the **inferred** view for 775360007 |Product containing only codeine and paracetamol (medicinal product)|:



Medicinal Product Groupers

A *grouper* is a concept designed to aggregate concepts based on specific characteristics or commonalities.

- Groupers Based on Infusion and or Injection(see page 334)
- Groupers Based on Dose form intended site(see page 335)
- Groupers Based on Multiple Dispositions, Structures(see page 336)
- Groupers Based on Single Structure(see page 339)
- Groupers Based on Single Disposition(see page 341)

Groupers Based on Infusion and or Injection

Pharmaceutical dose form grouper concepts specifying "infusion and/or injection" are modeled using General Concept Inclusions (GCIs). These grouper concepts are the inferred parent of existing concepts that specify "infusion or injection".

For example,

- 1208958005 | Conventional release solution for infusion and/or injection (dose form)|[1042]

> Pharmaceutical dose form concepts specifying "infusion and injection" can be created in a national extension if needed. These concepts would be modeled using multiple 736472000 | Has dose form administration method (attribute)|[1043] attributes and would be subtypes of existing concepts that specify "infusion or injection".

Clinical drug (CD) concepts modeled using the new pharmaceutical dose form groupers for “infusion and/or injection” are included in the International Release.

For example,

1042 http://snomed.info/id/1208958005
1043 http://snomed.info/id/736472000

- Product containing precisely remdesivir 5 milligram/1 milliliter conventional release solution for infusion and/or injection (clinical drug)

The CD concepts specifying “injection and/or infusion” will be the inferred parent of existing concepts that specify infusion or injection.

In cases where corresponding CD concepts for both injection and infusion exist, the grouper for “infusion and/or injection” will be created.

Groupers Based on Dose form intended site

Overview
Groupers based on "Dose form intended site" that can be sufficiently defined may be included in the 763158003| Medicinal product (product)| hierarchy.

Example:

- Product manufactured as oral dose form (product)
- Product manufactured as parenteral dose form (product)

Modeling (stated view)
Grouper concepts based on "Dose form intended site" shall be modeled using the proximal primitive modeling pattern.

Stated parent	763158003 |Medicinal product (product)
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

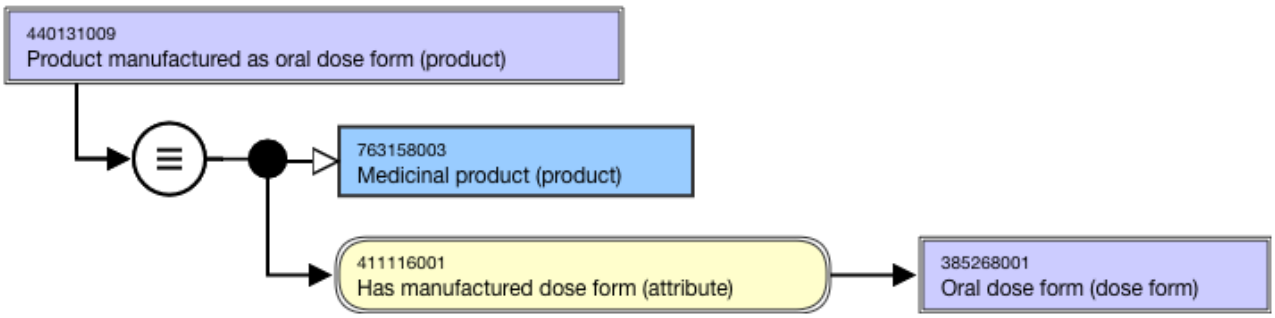
Attribute:
Has manufactured dose form
	• Range: <<736542009 |Pharmaceutical dose form (dose form)
	  • While the allowed range is broader, the |Medicinal product| grouper concepts based on dose form intended site should use sufficiently defined grouper concepts that are descendants of 736542009 |Pharmaceutical dose form (dose form)| representing intended site as attribute values.
	• Cardinality: 0..*
	  • While the allowed range is broader, the |Medicinal product| grouper concepts based on disposition should have one and only one Has manufactured dose form (attribute).

Naming Guidelines

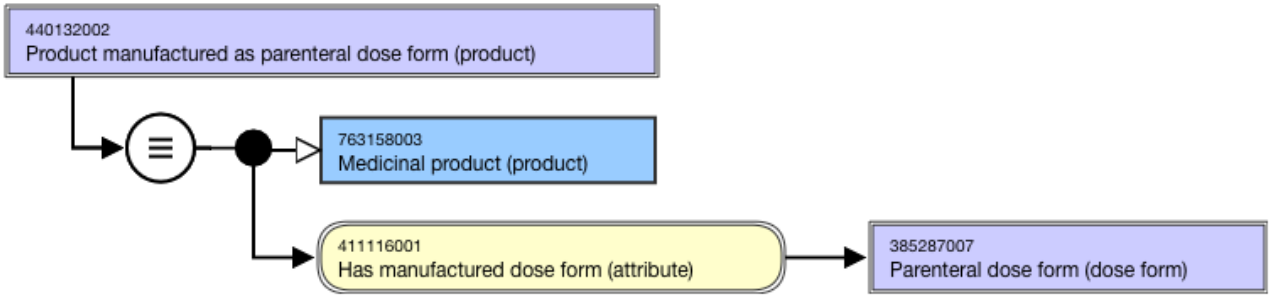
FSN	Use the following pattern for the FSN; align naming and case significance with the FSN for the concepts that are selected as the attribute value, excluding the semantic tag. • Product manufactured as <Manufactured dose form FSN> (product) For example, • Product manufactured as oral dose form (product) • Product manufactured as parenteral dose form (product)
Preferred Term	Use the following pattern for the Preferred Term; align naming and case significance with the PT for the concept that is selected as the attribute value. Product manufactured as <Manufactured dose form PT> For example, • Product manufactured as oral dose form • Product manufactured as parenteral dose form
Synonyms	Synonyms are not generally created.

Exemplars

The following illustrates the **stated and inferred** view for 440131009 |Product manufactured as oral dose form (product)|:



The following illustrates the **stated and inferred** view for 440132002 |Product manufactured as parenteral dose form (product)|:



Groupers Based on Multiple Dispositions, Structures

Overview

Groupers comprised of two or more existing disposition and/or structure groupers that can be sufficiently defined may be included in the |Medicinal product| hierarchy.

High-level grouper concepts support the organization of the combined groupers based on disposition and/or structure:

- 766779001 |Medicinal product categorized by disposition (product)|
- 763760008 |Medicinal product categorized by structure (product)|

Modeling (stated view)
Combined grouper concepts shall be modeled using the proximal primitive modeling pattern.

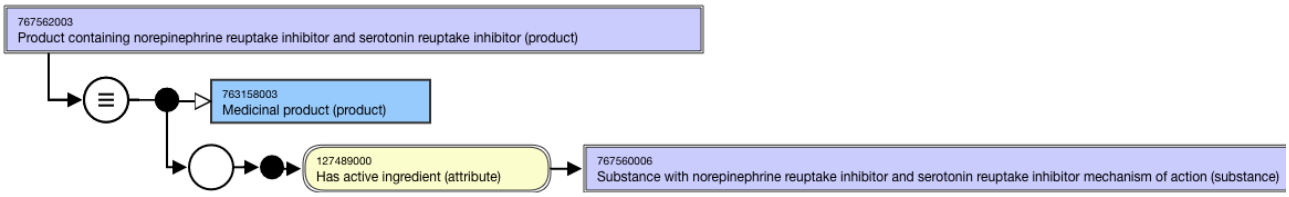
Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute:
Has active ingredient
	• Range: <<105590001 |Substance (substance)
	  • While the allowed range is broader, the |Medicinal product| combined grouper concepts based on disposition and/or structure should only use sufficiently defined grouper concepts that are descendants of 766739005 |Substance categorized by disposition (substance)| and/or primitive grouper concepts that are descendants of 312413002 |Substance categorized by structure (substance)| as attribute values.
	• Cardinality: 0..*
	  • While the allowed range is broader, the |Medicinal product| combined grouper concepts should have one or more |Has active ingredient| attributes.

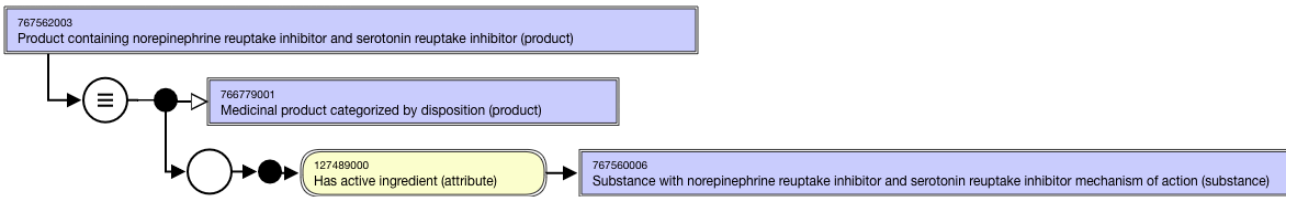
Naming Guidelines

FSN	Use the following pattern for the FSN if the combined grouper is comprised of two dispositions or two structural groupers; align naming and case significance with the PT as described in Section 4.1 and 4.2, respectively. The active ingredients must be in alphabetical order and separated by the word “and”. • Product containing <Active ingredient PT> and <Active ingredient PT> (product) For example, • Product containing norepinephrine reuptake inhibitor and serotonin reuptake inhibitor (product) Use the following pattern for the FSN if the combined grouper is comprised of one disposition and one structural grouper; align naming and case significance with the FSN for the concept with the FSN as described in Section 4.1 and 4.2, respectively. • Product containing <Structural grouper active ingredient PT> and <Disposition grouper active ingredient PT> (product) For example, • Product containing piperazine derivative and histamine receptor antagonist (product)
Preferred Term	Use the following pattern for the PT if the combined grouper is comprised of two dispositions or two structural groupers; align naming and case significance with the PT for the concept that is selected as the attribute value. The active ingredients must be in alphabetical order and separated by the word “and". • <Active ingredient PT> and <Active ingredient PT>-containing product For example, • Norepinephrine reuptake inhibitor and serotonin reuptake inhibitor-containing product Use the following pattern for the FSN if the combined grouper is comprised of one disposition and one structural grouper; align naming and case significance with the FSN for the concept that is selected as the attribute value. • <Structural grouper active ingredient PT> and <Disposition grouper active ingredient PT>-containing product For example, • Piperazine derivative and histamine receptor antagonist-containing product
Synonyms	Synonyms matching the FSN are not required.

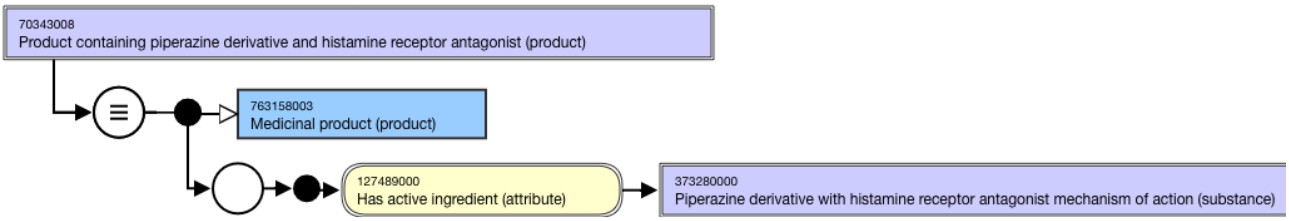
Exemplars
The following illustrates the **stated** view for combined grouper concept 767562003 |Product containing norepinephrine reuptake inhibitor and serotonin reuptake inhibitor (product)|:



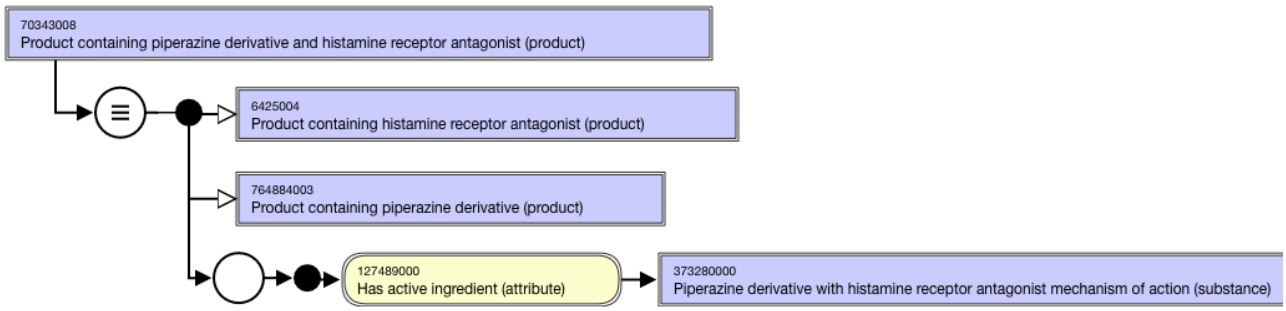
The following illustrates the **inferred** view for combined grouper concept 767562003 |Product containing norepinephrine reuptake inhibitor and serotonin reuptake inhibitor (product)|:



The following illustrates the **stated** view for combined grouper concept 70343008 |Product containing piperazine derivative and histamine receptor antagonist (product)|:



The following illustrates the **inferred** view for combined grouper concept 70343008 |Product containing piperazine derivative and histamine receptor antagonist (product)|:



Groupers Based on Single Structure

Overview

Grouper concepts based on chemical structure of an active ingredient that can be sufficiently defined may be included in the |Medicinal product| hierarchy.

> This section applies to grouper concepts representing a **single** structure; groupers comprised of multiple structures are described in Groupers Based on Multiple Dispositions, Structures(see page 336).

A high-level grouper concept supports the organization of the hierarchy based on structure:

- 763760008 |Medicinal product categorized by structure (product)|

Modeling

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute:
Has active ingredient
	• Range: <<105590001 |Substance (substance)|
	  • While the allowed range is broader, the |Medicinal product| grouper concepts based on structure should only use primitive grouper concepts that are descendants of 312413002 |Substance categorized by structure (substance)| as attribute values.
	• Cardinality: 0..*
	  • While the allowed range is broader, the |Medicinal product| grouper concepts based on structure should have one and only one |Has active ingredient| attribute.

Naming Guidelines

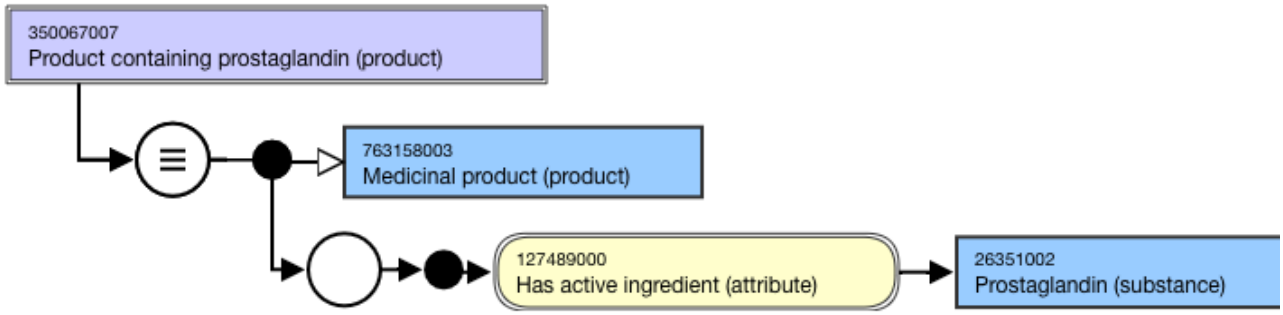
FSN	Use the following pattern for the FSN; align naming and case sensitivity with the PT for the concept that is selected as the attribute value for the 127489000 |Has active ingredient (attribute)|, excluding the semantic tag.
	• Product containing <Active ingredient PT> (product)
	For example,
	  • Product containing prostaglandin (product)
	  • Product containing A series prostaglandin (product)

Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the attribute value.
	• <Active ingredient PT>-containing product
	For example,
	  • Prostaglandin-containing product
	  • A series prostaglandin-containing product

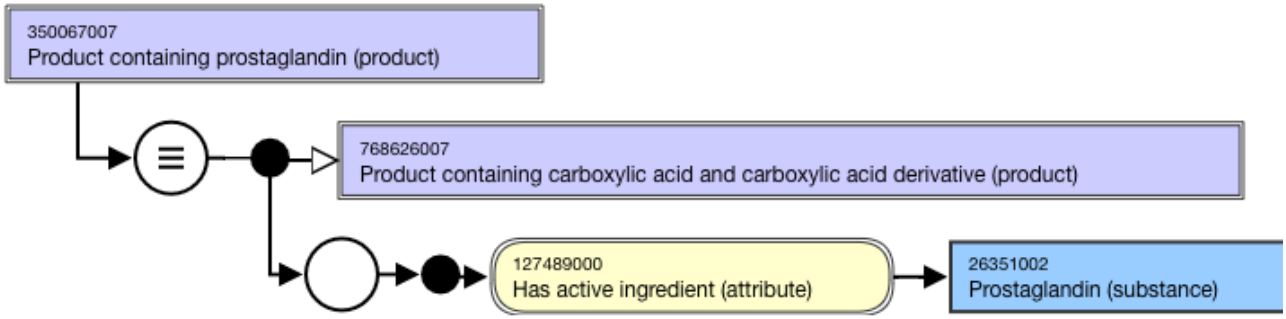
Synonyms	Synonyms matching the FSN are not required.

Exemplars

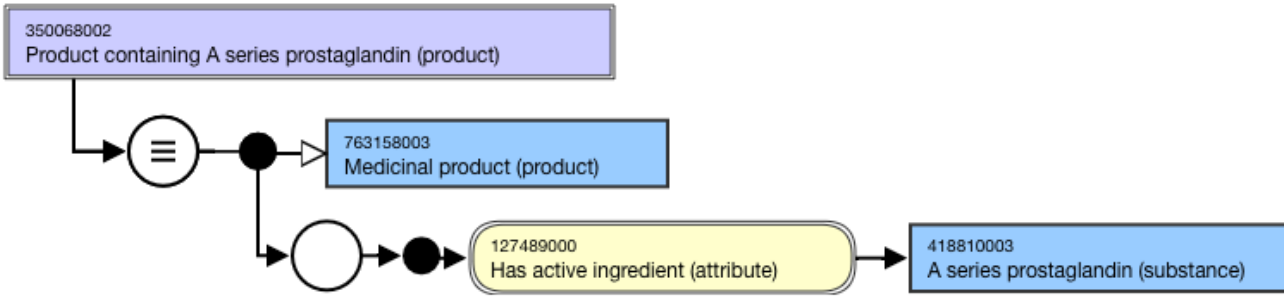
The following illustrates the **stated** view for 350067007 |Product containing prostaglandin (product)|:



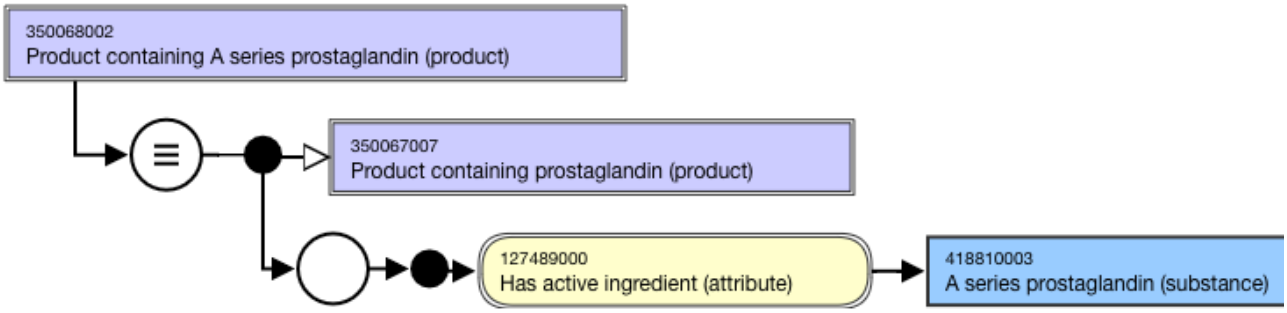
The following illustrates the **inferred** view for 350067007 |Product containing prostaglandin (product)|:



The following illustrates the **stated** view for 350068002 |Product containing A series prostaglandin (product)|:



The following illustrates the **inferred** view for 350068002 |Product containing A series prostaglandin (product)|:



Groupers Based on Single Disposition

Overview

Grouper concepts based on disposition of an active ingredient that can be sufficiently defined may be included in the 763158003 |Medicinal product (product)| hierarchy.

> This section applies to grouper concepts representing a **single** disposition; groupers comprised of multiple dispositions are described in Groupers Based on Multiple Dispositions, Structures(see page 336).

A high-level grouper concept supports the organization of the medicinal product concepts based on disposition:

- 766779001 |Medicinal product categorized by disposition (product)|

Modeling (stated view)

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has active ingredient**	Range: <<105590001 |Substance (substance) • While the allowed range is broader, the |Medicinal product| grouper concepts based on disposition should only use sufficiently defined grouper concepts that are descendants of 766739005 |Substance categorized by disposition (substance)| as attribute values. Cardinality: 0..* • While the allowed range is broader, the |Medicinal product| grouper concepts based on disposition should have one and only one |Has active ingredient| attribute.

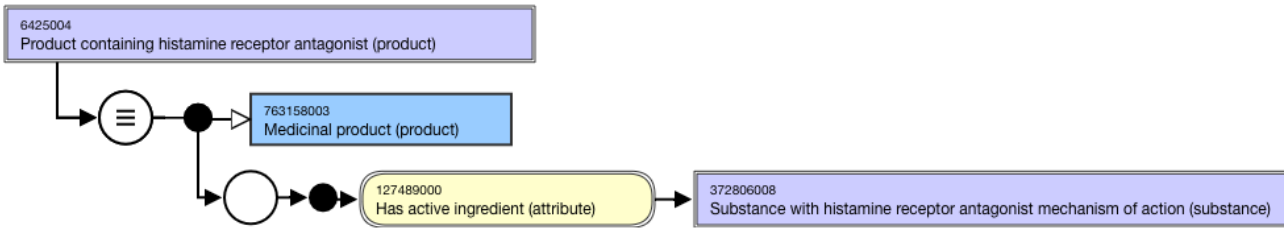
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the PT for the concept that is selected as the 726542003 |Has disposition (attribute)| attribute value for the substance concept used as the attribute value for the 127489000 |Has active ingredient (attribute)|. • Product containing <Active ingredient PT> (product) For example, • Product containing histamine receptor antagonist (product) • Product containing histamine H2 receptor antagonist (product)

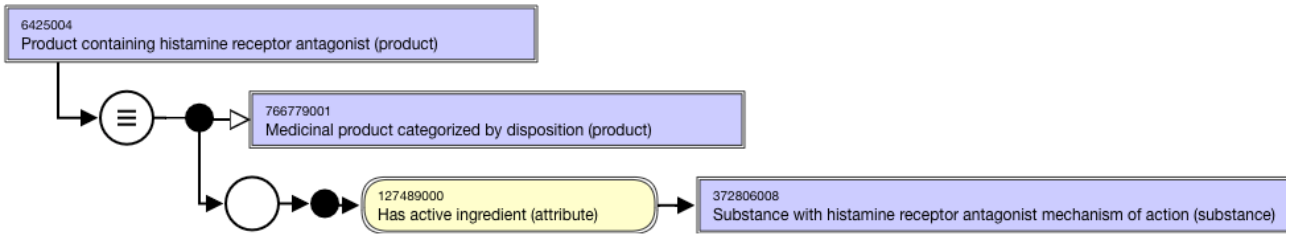
Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the 726542003 |Has disposition (attribute)| attribute value for the substance concept used as the attribute value for the 127489000 |Has active ingredient (attribute)|. • <Active ingredient PT>-containing product For example, • Histamine receptor antagonist-containing product • Histamine H2 receptor antagonist-containing product
Synonyms	Synonyms matching the FSN are not required.

Exemplars

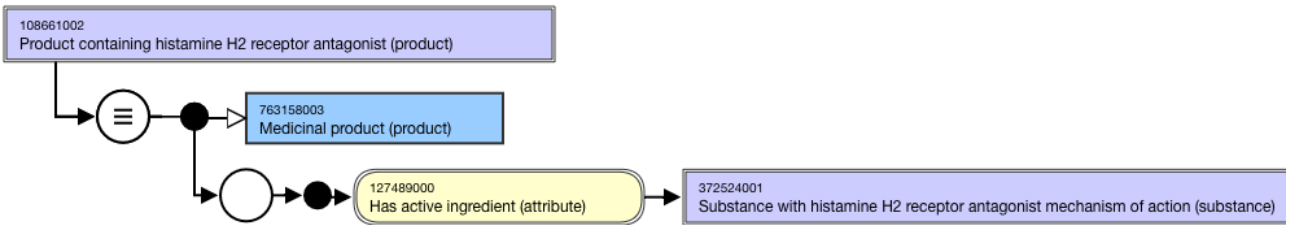
The following illustrates the **stated** view for grouper concept 6425004 |Product containing histamine receptor antagonist (product)|:



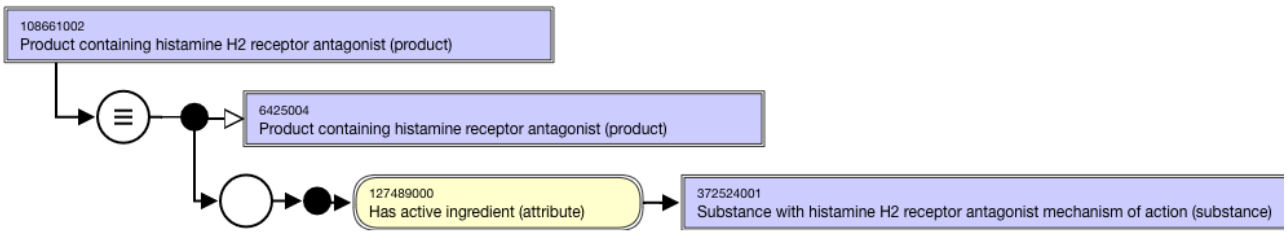
The following illustrates the **inferred** view for grouper concept 6425004 |Product containing histamine receptor antagonist (product)|:



The following illustrates the **stated** view for grouper concept 108661002 |Product containing histamine H2 receptor antagonist (product)|:



The following illustrates the **inferred** view for grouper concept 108661002 |Product containing histamine H2 receptor antagonist (product)|:



Vaccine Products in the Medicinal Product Hierarchy

The following sections apply to the vaccine product concepts in the |Medicinal product| hierarchy in the International Release.

In the International Release, vaccine products are those concepts with |Plays role (attribute) = 318331000221102 | Active immunity stimulant role (role)|. Products that provide passive immunity should be modeled using the general Medicinal product guidelines.

- Vaccine Product Top Level Groupers(see page 344)
- Vaccine Product containing Concepts(see page 348)
- Vaccine Product containing only Concepts(see page 351)

Modeling "antigen" as a role or disposition may be considered in the future but is out of scope at this time.

Vaccine Product Top Level Groupers

Overview
The following high level vaccine-related grouper concepts will be included in the |Medicinal product| hierarchy.

- 787859002 |Vaccine product (medicinal product)|
- 836368004 |Vaccine product containing bacteria antigen (medicinal product)|
- 836369007 |Vaccine product containing virus antigen (medicinal product)|
- 863950005 |Vaccine product containing bacteria and virus antigens (medicinal product)|

Modeling (stated view)

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(medicinal product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute: **Has active ingredient**	Range: <<105590001 |Substance (substance)| Cardinality: 0..*
Attribute: **Plays role**	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, top level vaccine-related grouper concepts should have one and only one Plays role (attribute) with attribute value = 318331000221102 | Active immunity stimulant therapeutic role (role)|.

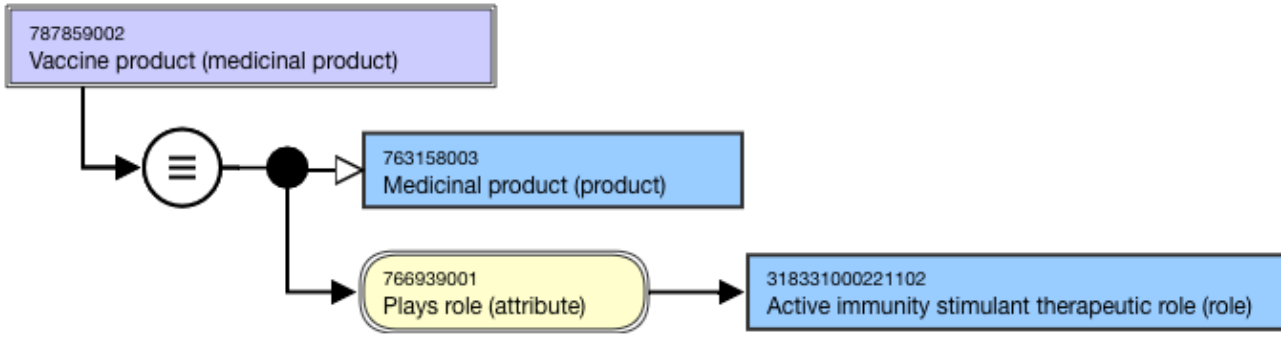
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the PT for the concept that is selected as the attribute value for the 127489000 |Has active ingredient (attribute)|. • Vaccine product containing <Active ingredient PT excluding "antigen"> antigen (medicinal product) • Vaccine product containing <Active ingredient PT excluding "antigen"> and <Active ingredient PT excluding "antigen"> antigens (medicinal product) Exception: • Top level grouper 787859002 |Vaccine product (medicinal product)| does not have a Has active ingredient (attribute). For example, • Vaccine product (medicinal product) • Vaccine product containing bacteria antigen (medicinal product) • Vaccine product containing virus antigen (medicinal product) • Vaccine product containing bacteria and virus antigens (medicinal product)
Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the attribute value for the 127489000 |Has active ingredient (attribute)|. • <Active ingredient PT excluding "antigen">-containing vaccine product • <Active ingredient PT excluding "antigen">- and <Active ingredient PT excluding "antigen"> antigens-containing vaccine product Exception: • Top level grouper 787859002 |Vaccine product (medicinal product)| does not have a Has active ingredient attribute. For example, • Vaccine product • Bacteria antigen-containing vaccine product • Virus antigen-containing vaccine product • Bacteria- and virus antigens-containing vaccine product

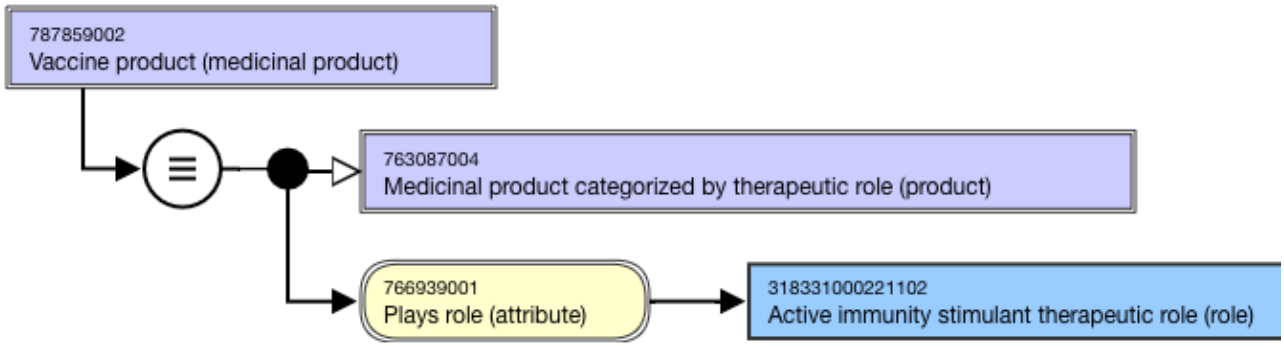
Synonyms	Synonyms matching the FSN are not required.

Exemplars

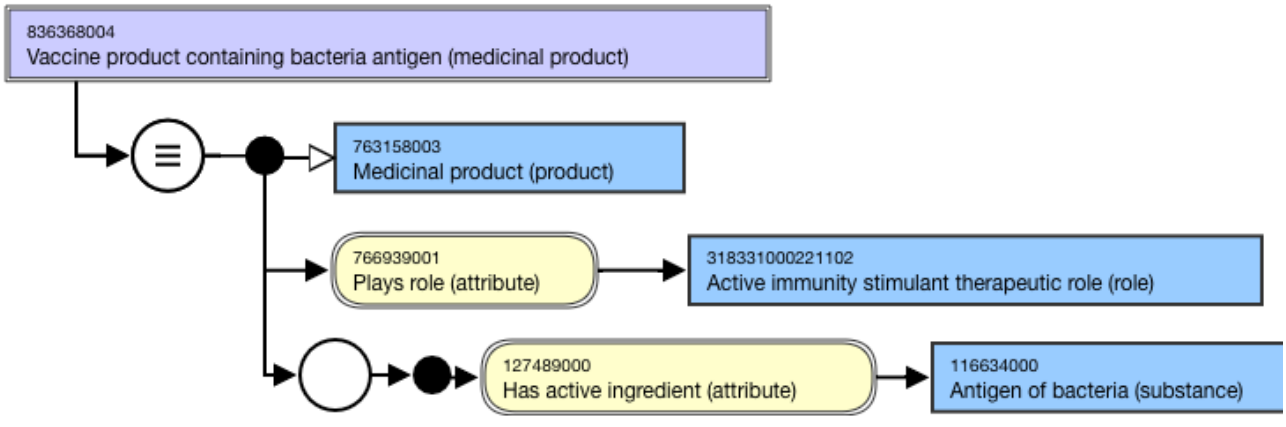
The following illustrates the **stated** view for 787859002 |Vaccine product (product)|:



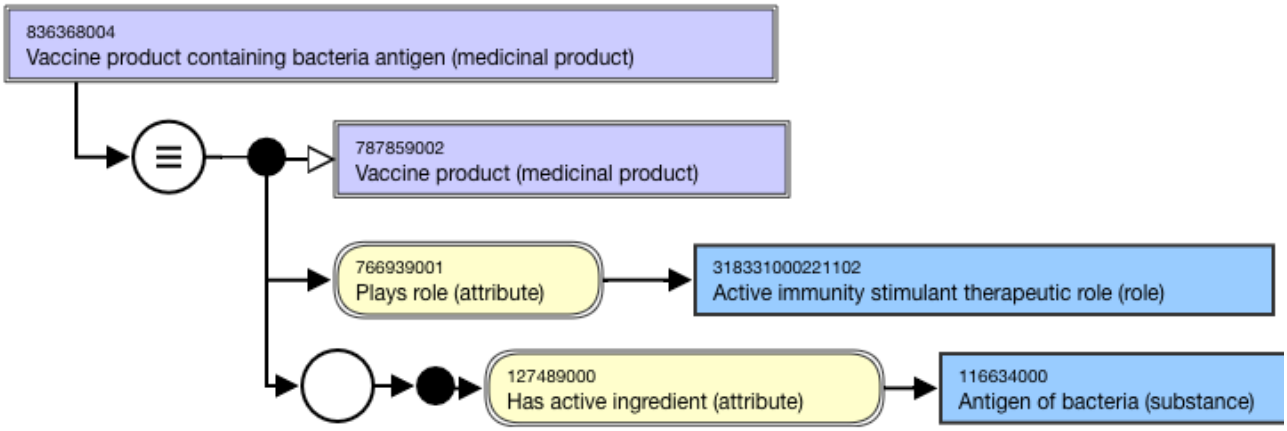
The following illustrates the **inferred** view for 787859002 |Vaccine product (product)|:



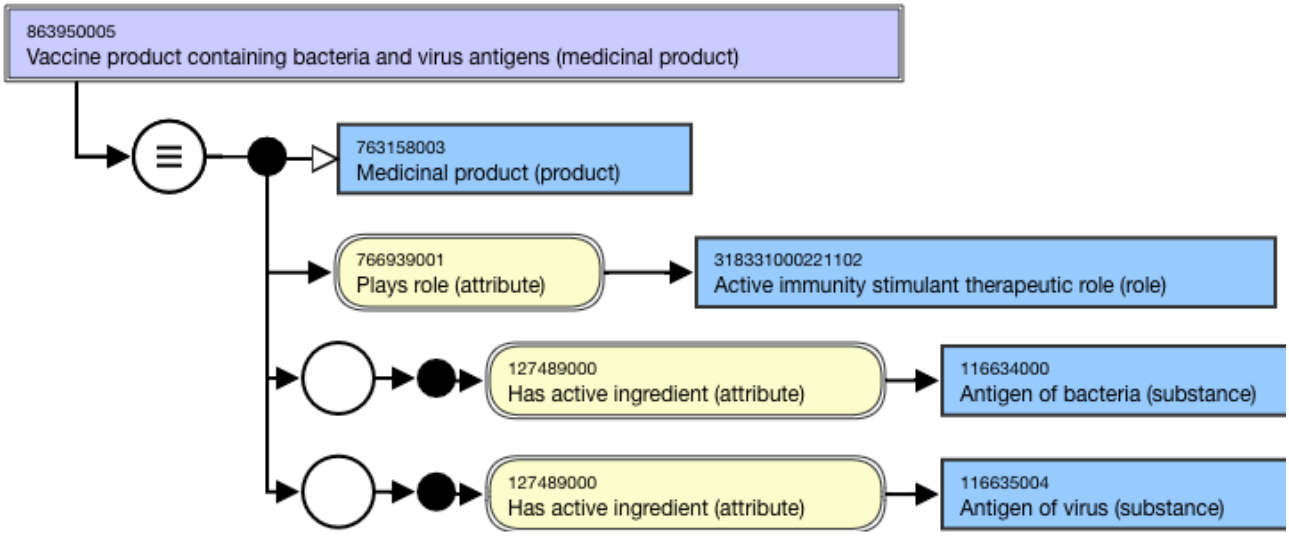
The following illustrates the **stated** view for 836368004 |Vaccine product containing bacteria antigen (medicinal product)|:



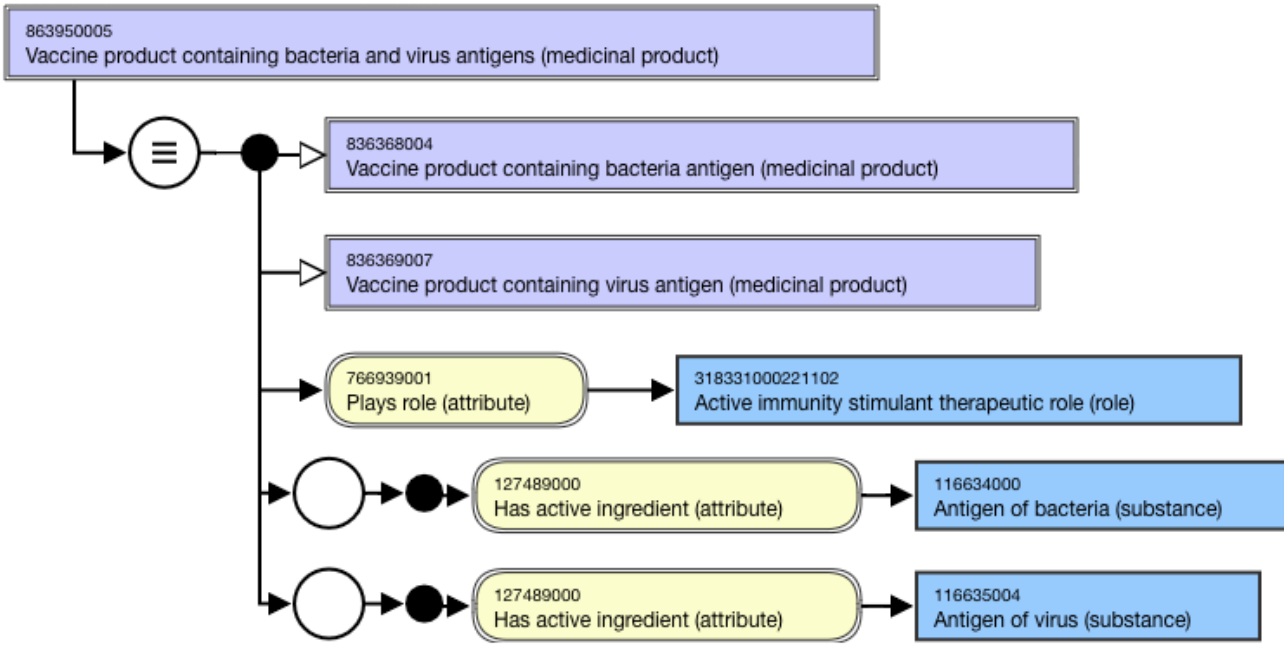
The following illustrates the **inferred** view for 836368004 |Vaccine product containing bacteria antigen (medicinal product)|:



The following illustrates the **stated** view for 863950005 |Vaccine product containing bacteria and virus antigens (medicinal product)|:



The following illustrates the **inferred** view for 863950005 |Vaccine product containing bacteria and virus antigens (medicinal product)|:



Vaccine Product containing Concepts

Overview
The Vaccine Product "containing" concept is an abstract representation of the active ingredient(s) in a vaccine product. It means that the vaccine product must contain the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN or may contain additional active ingredient(s).

Example:

- 836374004 |Vaccine product containing Hepatitis B virus antigen (medicinal product)|
- 836389008 |Vaccine product containing Vaccinia virus antigen (medicinal product)|

Both vaccine product "containing" and vaccine product "containing only" concepts may be created for products that only have one active ingredient (e.g. 836374004 |Vaccine product containing Hepatitis B virus antigen (medicinal product)| and 871822003 |Vaccine product containing only Hepatitis B virus antigen (medicinal product)|).

Vaccine product "containing" concepts are not created for multiple ingredient vaccine products; vaccine product "containing only" concepts are created for multiple ingredient vaccine products.

Modeling (stated view)

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(medicinal product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute:
Has active ingredient
	Range: <105590001 |Substance (substance) excluding concepts representing structural groupers, dispositions, or combined substances
	Cardinality: 1..*
	• While the allowed range is broader, Vaccine product "containing" concepts in the International Release should have one and only one |Has active ingredient| attribute.
	For content in the International Release, this attribute value should represent the organism antigen, not a modification or subtype, unless explicitly identified as an exception.
	• Exceptions: Vaccine product containing concepts for the following substance subtypes are included (to support vaccination certificates):
	  • 161000221102 |Antigen of Corynebacterium diphtheriae toxoid (substance)|
	  • 551000221106 |Antigen of Clostridium tetani toxoid (substance)|

Attribute: **Plays role**	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, Vaccine product "containing" concepts should have one and only one |Plays role| attribute with attribute value = 318331000221102 |Active immunity stimulant therapeutic role (role)|.

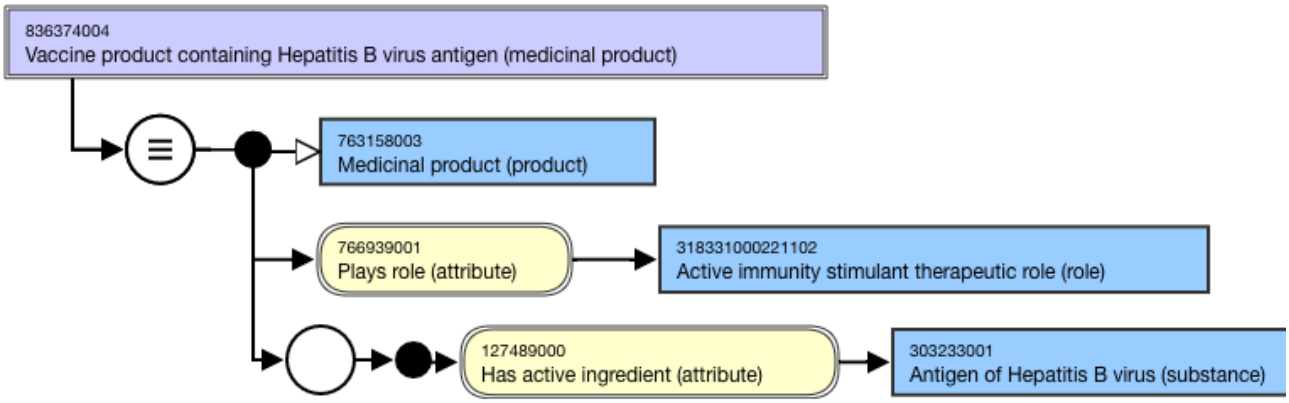
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the PT for the concept that is selected as the attribute value for the 127489000 |Has active ingredient (attribute)|. For multiple ingredient vaccine products, the active ingredients must be listed in alphabetical order, separated by the word "and", and the word "antigen" will be omitted. For concepts where all active ingredients are virus, the word "virus" may be omitted and added before "antigens".
	• Vaccine product containing <Active ingredient PT> (medicinal product)
	For example,
	  • Vaccine product containing Hepatitis B virus antigen (medicinal product)
	  • Vaccine product containing Haemophilus influenzae type B antigen (medicinal product)

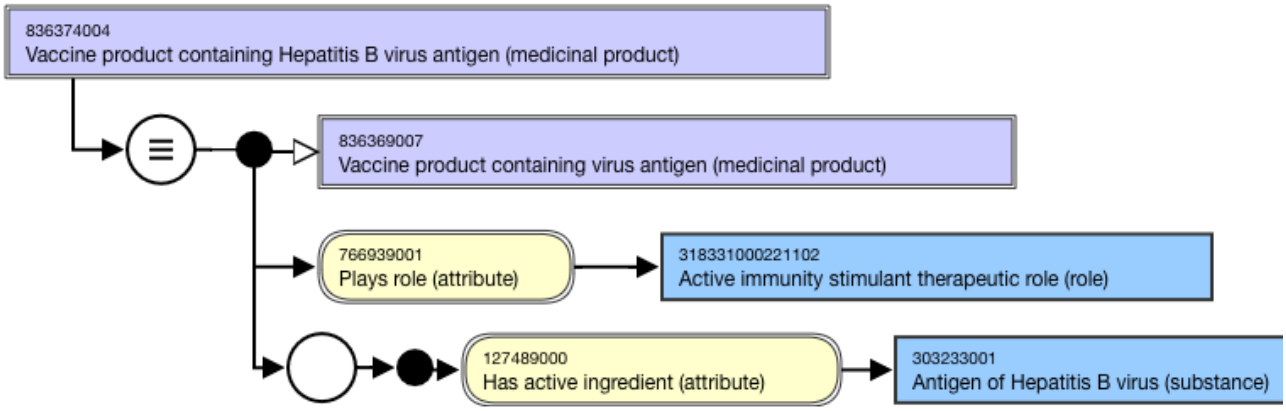
Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the attribute value for the 127489000 |Has active ingredient (attribute)|. For multiple ingredient vaccine products, the active ingredients must be listed in alphabetical order, separated by the word "and", and the word "antigen" will be omitted. For concepts where all active ingredients are virus, the word "virus" may be omitted and added before "antigens". • <Active ingredient PT>-containing vaccine product For example, • Hepatitis B virus antigen-containing vaccine product • Haemophilus influenzae type B antigen-containing product
Synonyms	Synonyms matching the FSN are not required. Synonyms corresponding to the disorder that is the target of the vaccine are not allowed; they may be applied to the "Vaccine product containing only" concepts.

Exemplars

The following illustrates the **stated** view for 836374004 |Vaccine product containing Hepatitis B virus antigen (medicinal product)|:



The following illustrates the **inferred** view for 836374004 |Vaccine product containing Hepatitis B virus antigen (medicinal product)|:



Vaccine Product containing only Concepts

Overview
The Vaccine Product "only" concept is an abstract representation of the active ingredient(s) in a vaccine product. It means that the vaccine product must contain only the active ingredient(s) specified in the FSN but may also contain a modification of the active ingredient(s) specified in the FSN. The vaccine product "containing only" may be sufficient to serve as an interoperability layer or to support prescribing use cases.

Example*:*

- |Vaccine product containing only Hepatitis B virus antigen (medicinal product)|
- |Vaccine product containing only Vaccinia virus antigen (medicinal product)|
- |Vaccine product containing only Hepatitis A and Hepatitis B virus antigens (medicinal product)|
- |Vaccine product containing only Bordetella pertussis and Clostridium tetani and Corynebacterium diphtheriae antigens (medicinal product)|

Note: Both vaccine product "containing" and vaccine product "containing only" concepts may be created for products that only have one active ingredient (e.g. 836374004 |Vaccine product containing Hepatitis B virus antigen (medicinal product)| and 871822003 |Vaccine product containing only Hepatitis B virus antigen (medicinal product)|). Vaccine product "containing" concepts are not created for multiple ingredient vaccine products; vaccine product "containing only" concepts are created for multiple ingredient vaccine products.

Note: Modeling and terming for vaccines that have variable composition (e.g. influenza that may be specific to a year or hemisphere) will be addressed at a future date when use cases and requirements are better understood.

Modeling (stated view)

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(medicinal product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|

Attribute: **Has active ingredient**	Range: <105590001 |Substance (substance) excluding concepts representing structural groupers, dispositions, or combined substances Cardinality: 1..* • There is no technical limit on the number of Has active ingredient attributes that may be added to a concept; a practical limit may be imposed at a later date. For content in the International Release, this attribute value should represent either the organism antigen, or the organism antigen(s), including modifications or subtypes, that are contained in a manufactured product.
Attribute: Has ingredient qualitative strength	Range: < 1149484003 |Ingredient qualitative strength (qualifier value)| Cardinality: 0..*
Attribute: Has target population	Range: < 27821000087106 |Product target population (qualifier value)| Cardinality: 0..1
Attribute: **Plays role**	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, Vaccine product "containing" concepts should have one and only one |Plays role| attribute with attribute value = 318331000221102 |Active immunity stimulant therapeutic role (role)|. • Exceptions: none identified
Attribute: **Count of base of active ingredient**	Range: <260299005 |Number (qualifier value)| Cardinality: 1..1 For content in the International Release, this attribute value should represent the total number of discrete active ingredients, excluding modifications or subtypes.
Attribute: **Count of active ingredient**	Concrete Type: Integer Range: >#0.. Cardinality: 1..1

Terming Guidelines

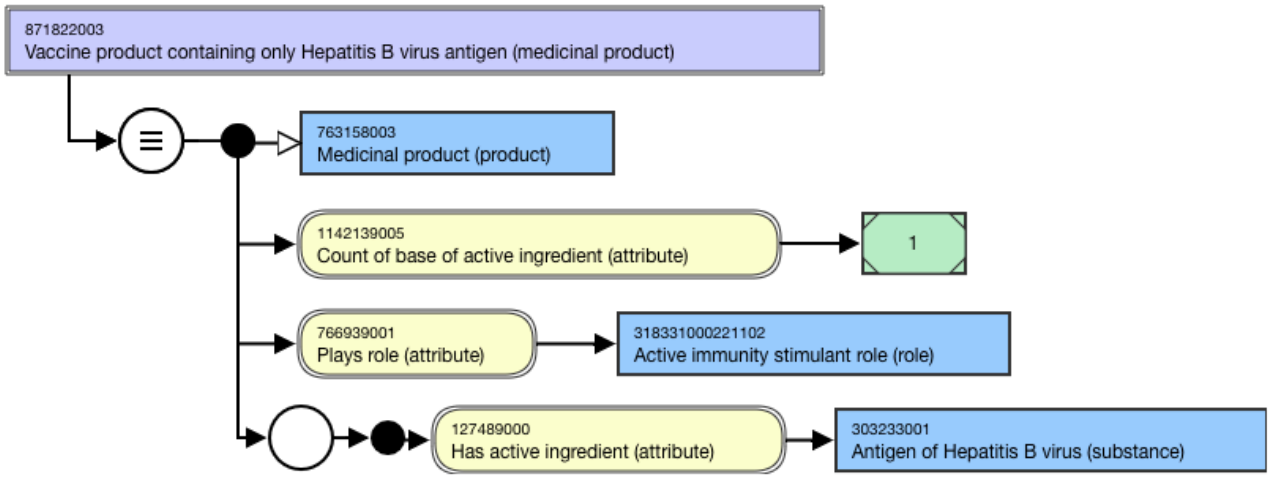
FSN	Use the following pattern for the FSN; align terming and case sensitivity with the PT for the concept that is selected as the attribute value for the |Has active ingredient (attribute)|. For multiple ingredient vaccine products, the active ingredients must be listed in alphabetical order, separated by the word "and", and the word "antigen" will be omitted. For concepts where all active ingredients are virus, the word "virus" may be omitted and added before "antigens". • Vaccine product containing only <Active ingredient PT> (medicinal product) • Vaccine product containing only <Active ingredient PT> and <Active ingredient PT> antigens (medicinal product) • Vaccine product containing only <Active ingredient PT> and <Active ingredient PT> and <Active ingredient PT> antigens (medicinal product) For example, • Vaccine product containing only Hepatitis B virus antigen (medicinal product) • Vaccine product containing only Hepatitis A and Hepatitis B virus antigens (medicinal product) • Vaccine product containing only Bordetella pertussis and Clostridium tetani and Corynebacterium diphtheriae antigens (medicinal product) |Has product characteristic| and |Has ingredient characteristic| attribute values should be added as appropriate. Example of |Has product characteristic (attribute)|: • Adult vaccine product containing only Hepatitis A virus antigen (medicinal product) • Pediatric vaccine product containing only Hepatitis A virus antigen (medicinal product) • Adult vaccine product containing only acellular Bordetella pertussis and Clostridium tetani toxoid and Corynebacterium diphtheriae toxoid antigens (medicinal product) Example of |Has ingredient characteristic (attribute): • Vaccine product containing only Clostridium tetani and low dose Corynebacterium diphtheriae antigens (medicinal product) • Vaccine product containing only Clostridium tetani and low dose Corynebacterium diphtheriae and inactivated Human poliovirus antigens (medicinal product)

Preferred Term	Use the following pattern for the PT; align terming and case significance with the PT for the concept that is selected as the attribute value for the |Has active ingredient (attribute)|. For multiple ingredient vaccine products, the active ingredients must be listed in alphabetical order, separated by the word "and", and the word "antigen" will be omitted. For concepts where all active ingredients are virus, the word "virus" may be omitted and added before "antigens". • <Active ingredient PT> only vaccine product • <Active ingredient PT> and <Active ingredient PT> antigen only vaccine product • <Active ingredient PT> and <Active ingredient PT> and <Active ingredient PT> antigen only vaccine product For example, • Hepatitis B virus antigen only vaccine product • Hepatitis A and Hepatitis B virus antigens only vaccine product • Bordetella pertussis and Clostridium tetani and Corynebacterium diphtheriae antigens only vaccine product |Has product characteristic| and |Has ingredient characteristic| attribute values should be added as appropriate. Example of |Has product characteristic (attribute)|: • Hepatitis A virus antigen only adult vaccine product • Hepatitis A virus antigen only pediatric vaccine product • Adult acellular Bordetella pertussis and Clostridium tetani toxoid and Corynebacterium diphtheriae toxoid antigens only vaccine product Example of |Has ingredient characteristic (attribute): • Clostridium tetani and low dose Corynebacterium diphtheriae antigens only vaccine product • Clostridium tetani and low dose Corynebacterium diphtheriae and inactivated Human poliovirus antigens only vaccine product

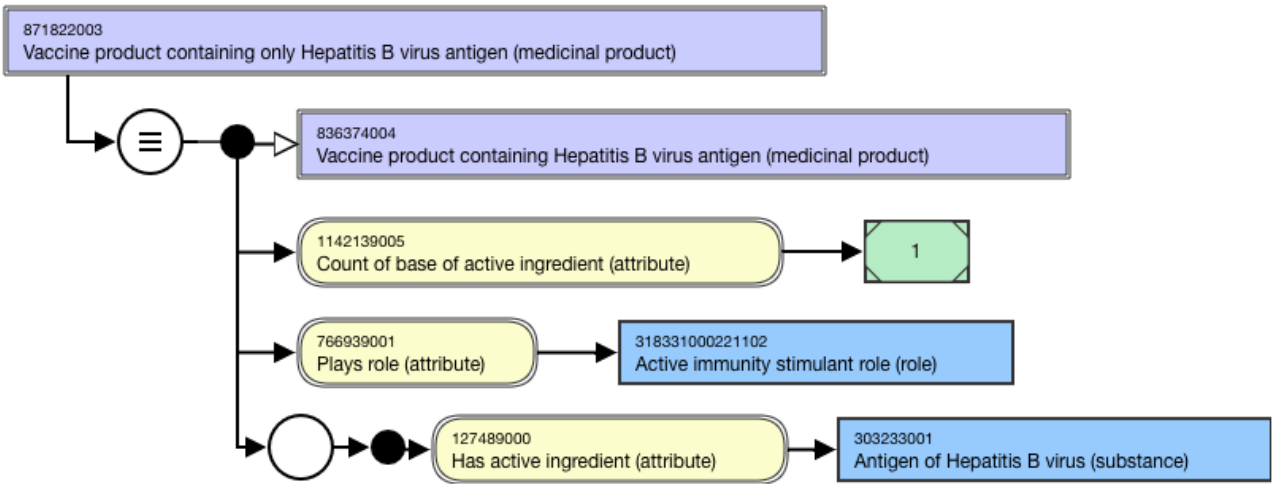
Synonyms	Synonyms matching the FSN are not required. Synonyms corresponding to the disorder that is the target of the vaccine are allowed. For multiple ingredient vaccine products, the disorders must be listed in alphabetical order and separated by the word "and". Note that these are not true synonyms; they may be updated and identified as "near-synonym" descriptions when that functionality becomes available. For example, • Hepatitis B vaccine • Hepatitis A and Hepatitis B vaccine • Diphtheria and pertussis and tetanus vaccine |Has product characteristic| and |Has ingredient characteristic| attribute values should be added as appropriate. Example of |Has product characteristic (attribute)|: • Hepatitis A adult vaccine • Hepatitis A pediatric vaccine • Diphtheria toxoid and acellular pertussis and tetanus toxoid adult vaccine Example of |Has ingredient characteristic (attribute): • Low dose diphtheria and tetanus vaccine • Low dose diphtheria and inactivated poliomyelitis and tetanus vaccine Synonyms representing abbreviations for product (e.g. MMR, DTaP) will not be included in the International Release due to lack of internationally accepted reference source.

Exemplars

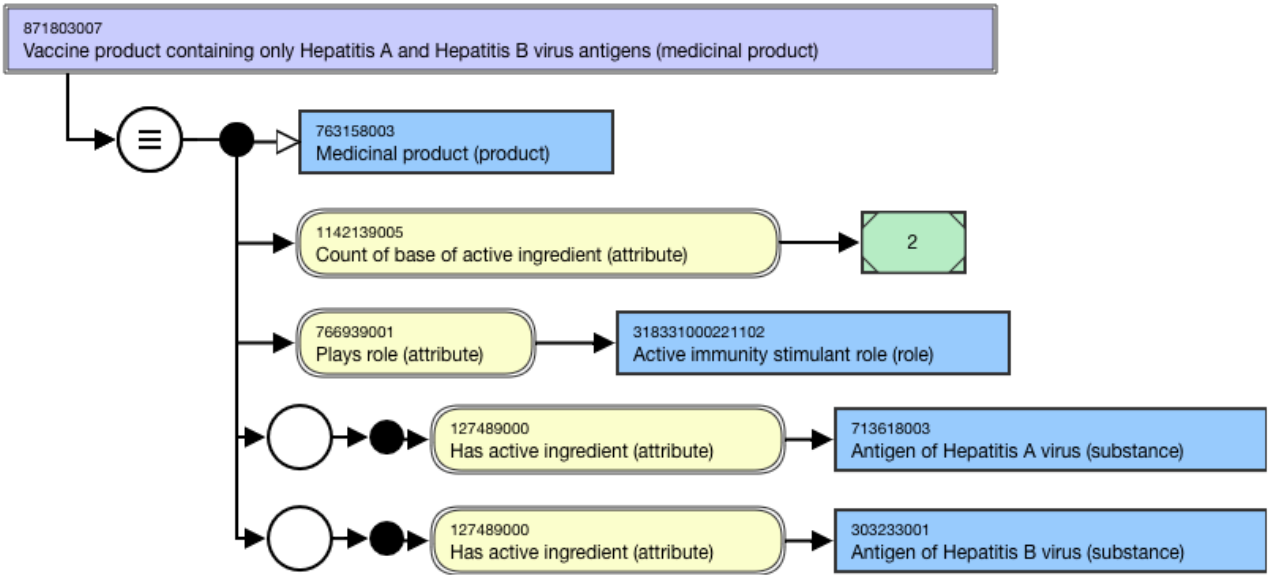
The following illustrates the **stated** view for 871822003 |Vaccine product containing only Hepatitis B virus antigen (medicinal product)|:



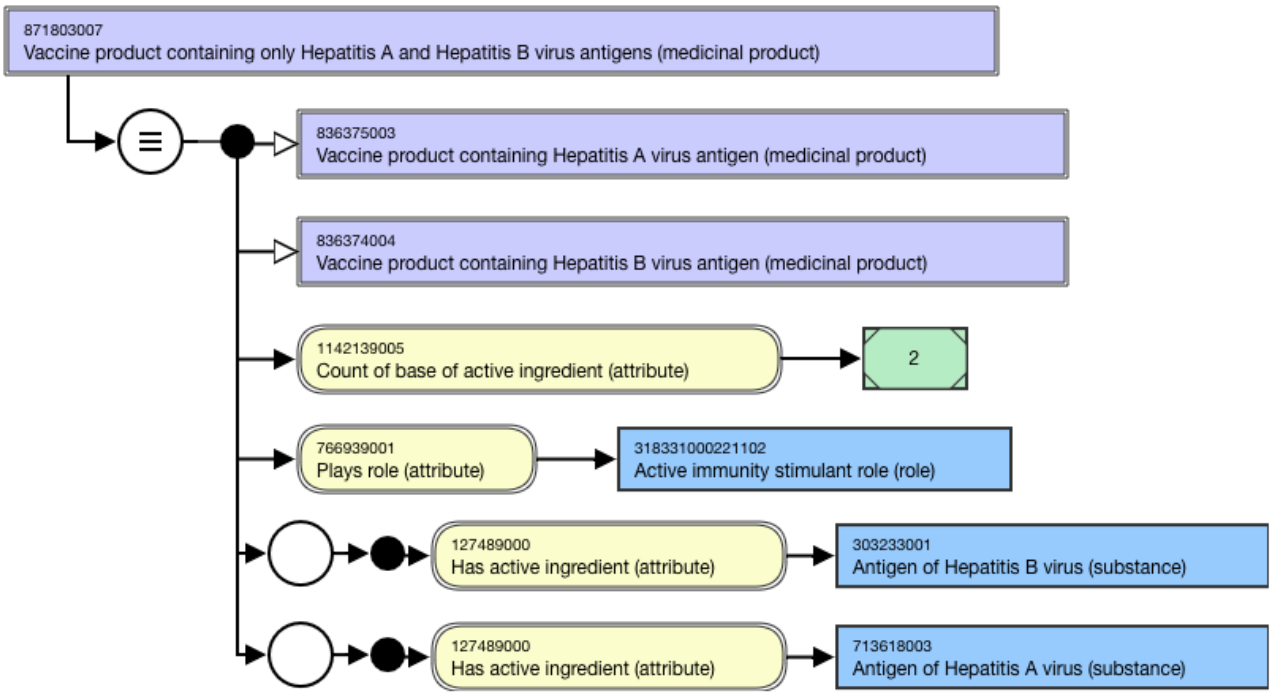
The following illustrates the **inferred** view for 871822003 |Vaccine product containing only Hepatitis B virus antigen (medicinal product)|:



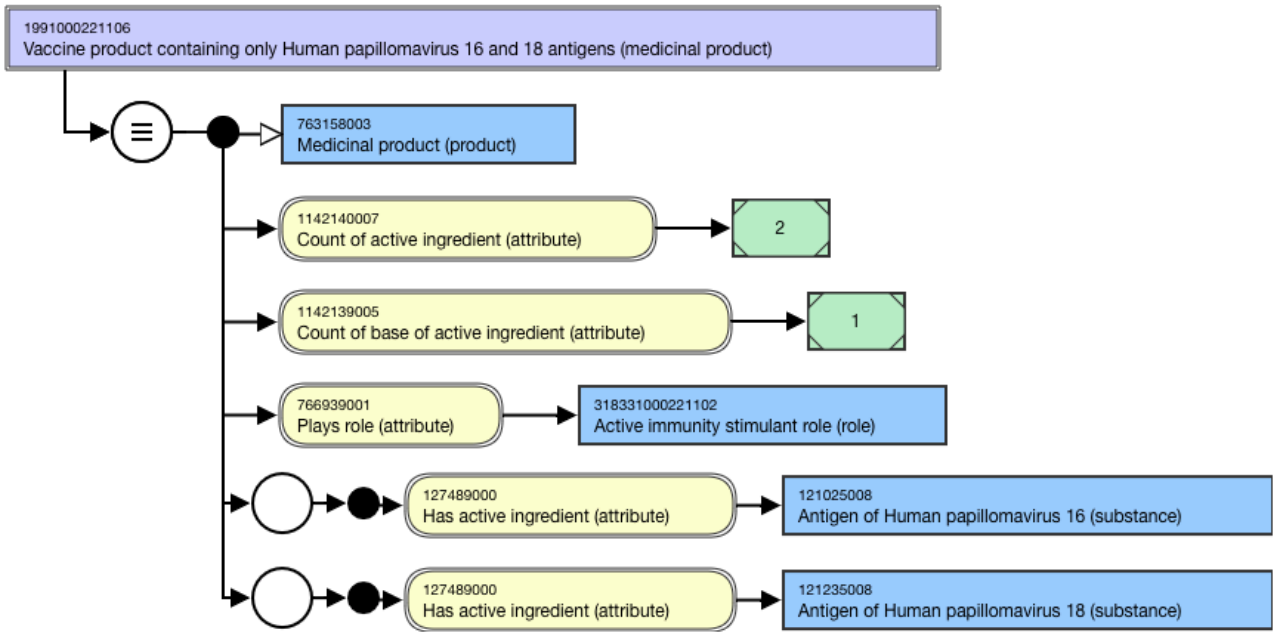
The following illustrates the **stated** view for 871803007 |Vaccine product containing only Hepatitis A and Hepatitis B virus antigens (medicinal product)|:



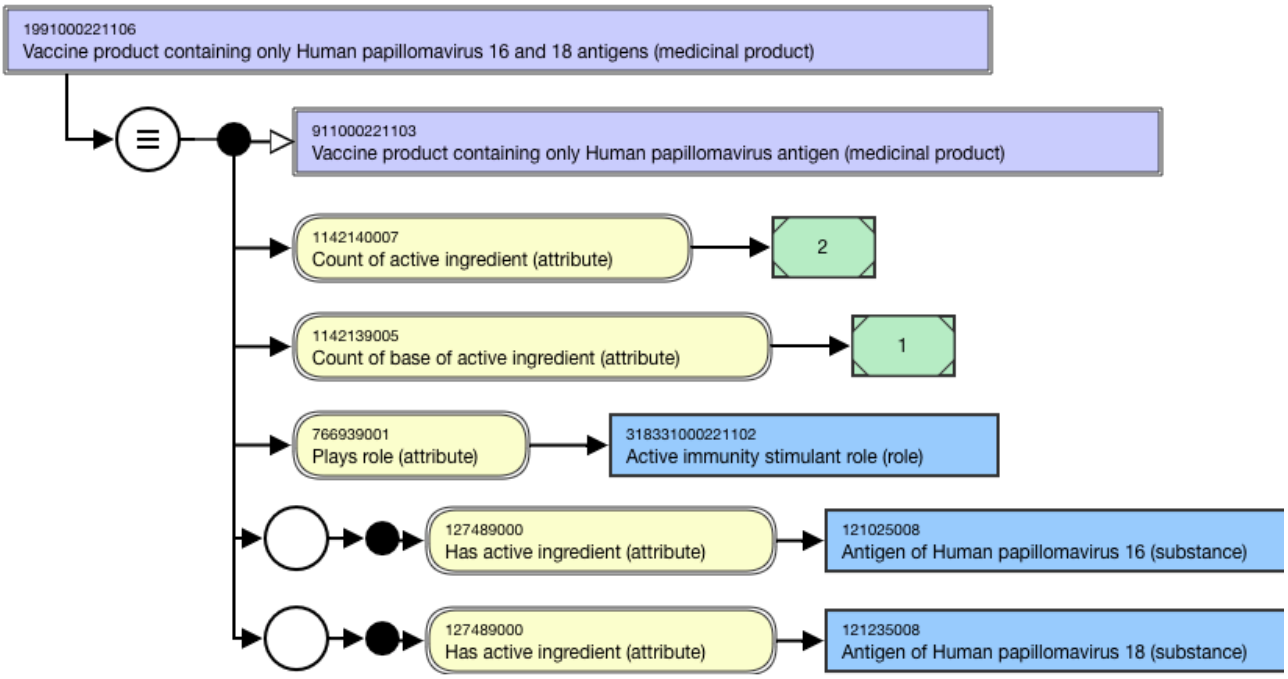
The following illustrates the **inferred** view for 871803007 |Vaccine product containing only Hepatitis A and Hepatitis B virus antigens (medicinal product)|:



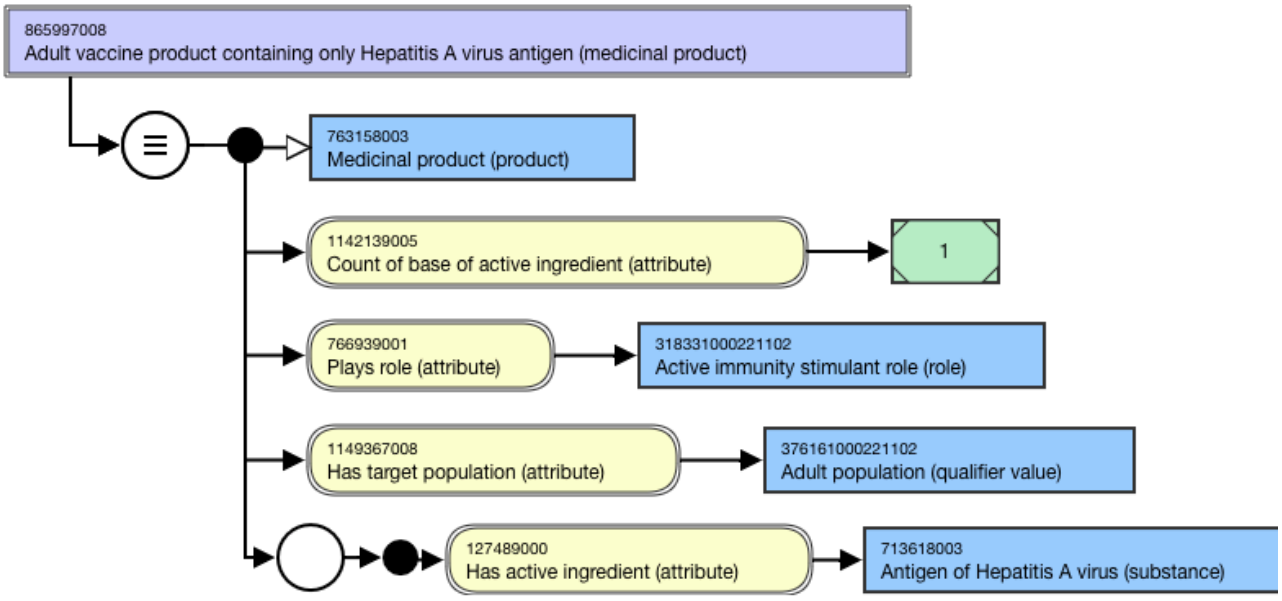
The following illustrates the **stated** view for 1991000221106 |Vaccine product containing only Human papillomavirus 16 and 18 antigens (medicinal product)|:



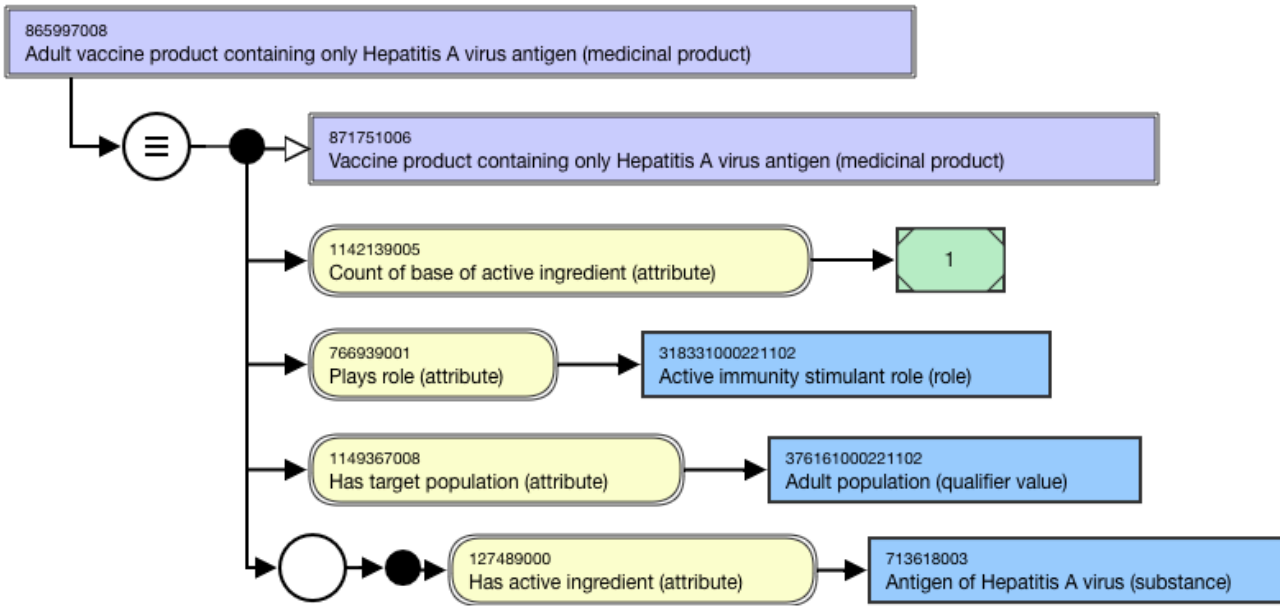
The following illustrates the **inferred** view for 1991000221106 |Vaccine product containing only Human papillomavirus 16 and 18 antigens (medicinal product)|:



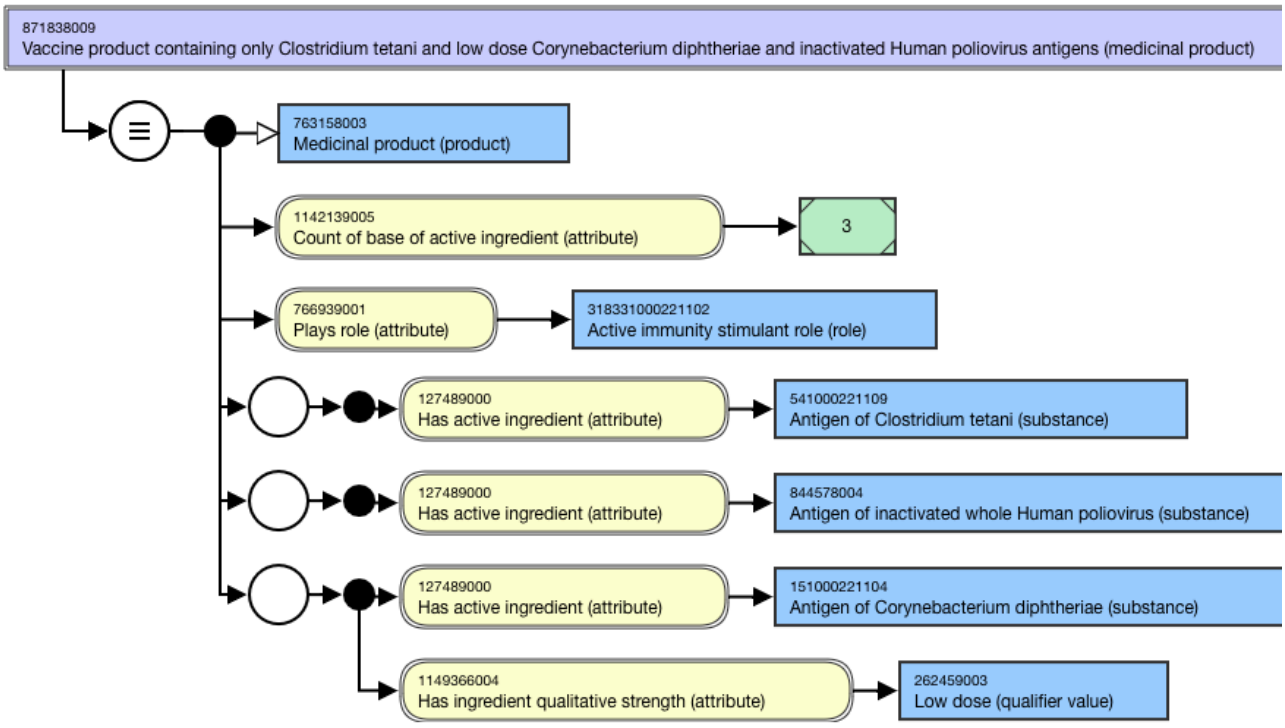
The following illustrates the **stated** view for 865997008 |Adult vaccine product containing only Hepatitis A virus antigen (medicinal product)| and illustrates the use of the "Has product characteristic" attribute:



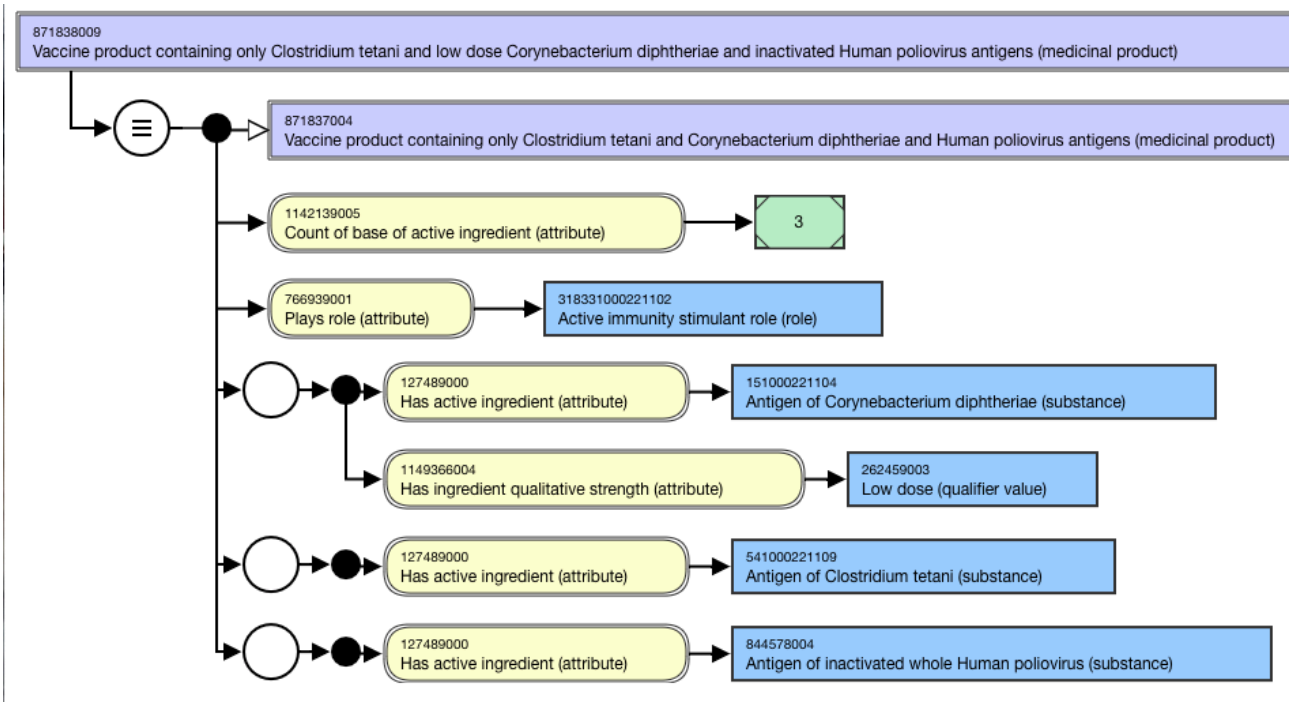
The following illustrates the **inferred** view for 865997008 |Adult vaccine product containing only Hepatitis A virus antigen (medicinal product)| and illustrates the use of the "Has product characteristic" attribute:



The following illustrates the **stated** view for 871838009 |Vaccine product containing only Clostridium tetani and low dose Corynebacterium diphtheriae and inactivated Human poliovirus antigens (medicinal product)| and illustrates use of the "Has ingredient characteristic" attribute:



The following illustrates the **inferred** view for 871838009 |Vaccine product containing only Clostridium tetani and low dose Corynebacterium diphtheriae and inactivated Human poliovirus antigens (medicinal product)| and illustrates use of the "Has ingredient characteristic" attribute:



3.8.8.4 Qualifier values supporting Pharmaceutical and Biologic Product

This section explains subtypes of 362981000 |Qualifier value (qualifier value)| that are pertinent to Pharmaceutical and Biological Product and the drug model.

Pharmaceutical Dose Form

Editorial guidelines for the 736542009 | Pharmaceutical dose form (dose form)|[1044] hierarchy and for supporting hierarchies required to support creation of sufficiently defined pharmaceutical dose form concepts are documented in the following sections.

General Assumptions and Requirements

Concept model will include attributes necessary to define the concepts to ensure consistent and reproducible modeling of concepts, whose use is primarily to describe or group concepts in the 763158003 | Medicinal product (product)|[1045] hierarchy.

Any requirement to align to external standards or registries will be explicitly documented.

Concept model will be compatible with the following ISO (International Organization for Standardization) IDMP (Identification of Medicinal Products) standards where appropriate:

- ISO 11239 Health informatics — Identification of medicinal products — Data elements and structures for the unique identification and exchange of regulated information on pharmaceutical dose forms, units of presentation, routes of administration and packaging
- ISO/TS 20440 Health informatics — Identification of medicinal products — Implementation guide for ISO 11239 data elements and structures for the unique identification and exchange of regulated information on pharmaceutical dose forms, units of presentation, routes of administration and packaging

Concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy shall be sufficiently defined using proximal primitive modeling methodology unless explicitly noted as an exception in the editorial guidelines.

Content in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy in the International Release is not intended to eliminate the need for a national extension.

Out of Scope

- Concepts representing combined dose forms (e.g. single concepts describing the multiple dose forms found in kit products such as cream and pessary)
- Concepts in pattern "x for y for z" (e.g. Powder for concentrate for dispersion for infusion)
- Concepts representing proprietary dose forms

> ⓘ Concepts that are not allowed to be used in modeling Medicinal product concepts in the International Release may be added to the Pharmaceutical dose form hierarchy to support national extension modeling.
> For example,
> 420378007 |Prolonged-release film-coated oral tablet (dose form)|)

Overview

The 736542009 |Pharmaceutical dose form (dose form)| hierarchy is comprised of the types of concepts as shown in the table below. Detailed editorial guidelines for each distinct concept type, including required attributes and naming guidelines, are found in the sections that follow.

For the purposes of the following editorial guidelines, pharmaceutical dose form refers to the physical manifestation of a medicinal product that contains the active ingredient substance(s) and inactive ingredient substances that are intended for administration for the patient.

1044 http://snomed.info/id/736542009
1045 http://snomed.info/id/763158003

Concept type	Examples
Grouper based on intended site	• 740596000 |Cutaneous dose form (dose form)| • 385268001 |Oral dose form (dose form)|
Grouper concept without basic dose form	• 385105007 |Conventional release cutaneous spray (dose form) | • 385136004 |Conventional release ear drops (dose form)|
Pharmaceutical dose form	• 385151008 |Conventional release nasal ointment (dose form) | • 421026006 |Conventional release oral tablet (dose form)| • 385053008 |Prolonged-release oral capsule (dose form)|

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Pharmaceutical Dose Form Naming and Modeling Conventions

Overview
Pharmaceutical dose form concepts (e.g. conventional release oral tablet, prolonged-release oral capsule) that are deemed to be clinically useful and that can be sufficiently defined will be included in the 736542009 \| Pharmaceutical dose form (dose form)\| hierarchy. Primitive concepts may be included if documented as an exception.

Out of Scope
Lyophilized dose forms are out of scope for the international edition of SNOMED CT.

Modeling

Parent concept	736542009 |Pharmaceutical dose form (dose form)|
Semantic tag	(dose form)

Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
	Exceptions:
	• The following concepts cannot be sufficiently defined and will be modeled with the parent concept 736542009 |Pharmaceutical dose form (dose form) and all applicable attributes but will have a Definition status = 900000000000074008 | Necessary but not sufficient concept definition status (core metadata concept); these concepts should classify as leaf nodes in the hierarchy.
	  • Concepts that reference:
	  • coated
	  • drug delivery system
	  • iontophoresis (e.g. 385113008 |Conventional release solution for iontophoresis (dose form)|)
	  • liposomal suspension
	  • nebulizer (e.g. 385198000 |Conventional release solution for nebulizer (dose form)|)
	  • particle (421535006 |Gastro-resistant oral particles tablet (dose form)|)
	  • pellet (e.g. 420767002 |Gastro-resistant oral pellets capsule (dose form)|)
	  • syrup (e.g. 385033009 |Powder for conventional release oral syrup (dose form)|)
	  • vapor

Attribute: **Has basic dose form**	Range: <736478001 |Basic dose form (basic dose form)| Cardinality: 0..1 • While the allowed range is broader, concepts representing a sufficiently defined pharmaceutical dose form should have one and only one |Has basic dose form| attributes.
Attribute: **Has dose form intended site**	Range: <736479009 |Dose form intended site (intended site)| Cardinality: 0..* • While the allowed range is broader, concepts representing a sufficiently defined pharmaceutical dose form should have one or more |Has dose form intended site| attributes. Exceptions: • 785898006 |Conventional release solution for irrigation (dose form)| • 785910004 |Prolonged-release intralesional implant (dose form)|
Attribute: **Has dose form release characteristic**	Range: <736480007 |Dose form release characteristic (release characteristic)| Cardinality: 0..1 • While the allowed range is broader, concepts representing a sufficiently defined pharmaceutical dose form should have one and only one |Has dose form release characteristic| attributes.

Attribute: **Has dose form administration method**	Range: <736665006 |Dose form administration method (administration method)| Cardinality: 0..* • While the allowed range is broader, concepts representing a sufficiently defined pharmaceutical dose form should have one and only one |Has dose form administration method| attributes.
Attribute: **Has dose form transformation**	Range: <736477006 |Dose form transformation (transformation)| Cardinality: 0..* • While the allowed range is broader, concepts representing a sufficiently defined pharmaceutical dose form should have one and only one |Has dose form transformation| attributes.

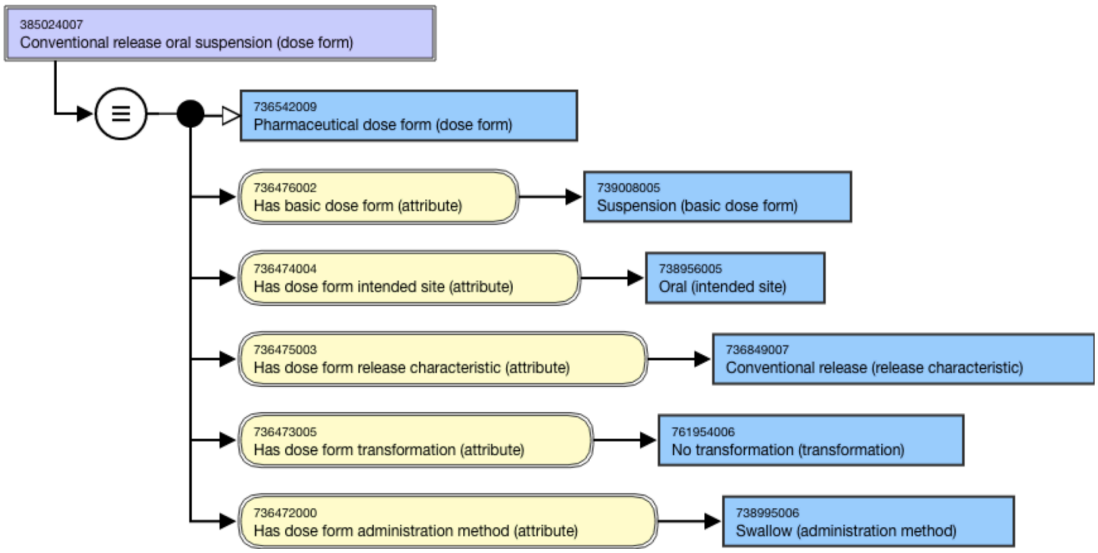
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concepts that are selected as the attribute values, excluding the semantic tag. For multiple intended sites, the sites must be in alphabetical order and separated by the word “or”. <Dose form release characteristic FSN> <Dose form intended site FSN> <Basic dose form> (dose form) For example, • Conventional release oral capsule (dose form) • Conventional release oral suspension (dose form) • Prolonged-release oral capsule (dose form) • Conventional release and prolonged-release oral tablet (dose form) • Conventional release cutaneous cream (dose form) • Conventional release vaginal ointment (dose form) • Gastro-resistant oral suspension (dose form)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concepts that are selected as the attribute values, excluding the semantic tag. For multiple intended sites, the sites must be in alphabetical order and separated by the word “or”. Exclude <Dose form release characteristic> when = 736849007 |Conventional release (release characteristic)|. <Dose form release characteristic FSN> <Dose form intended site FSN> <Basic dose form> For example, • Oral capsule • Oral suspension • Prolonged-release oral capsule • Conventional release and prolonged-release oral tablet • Cutaneous cream • Vaginal ointment • Gastro-resistant oral suspension

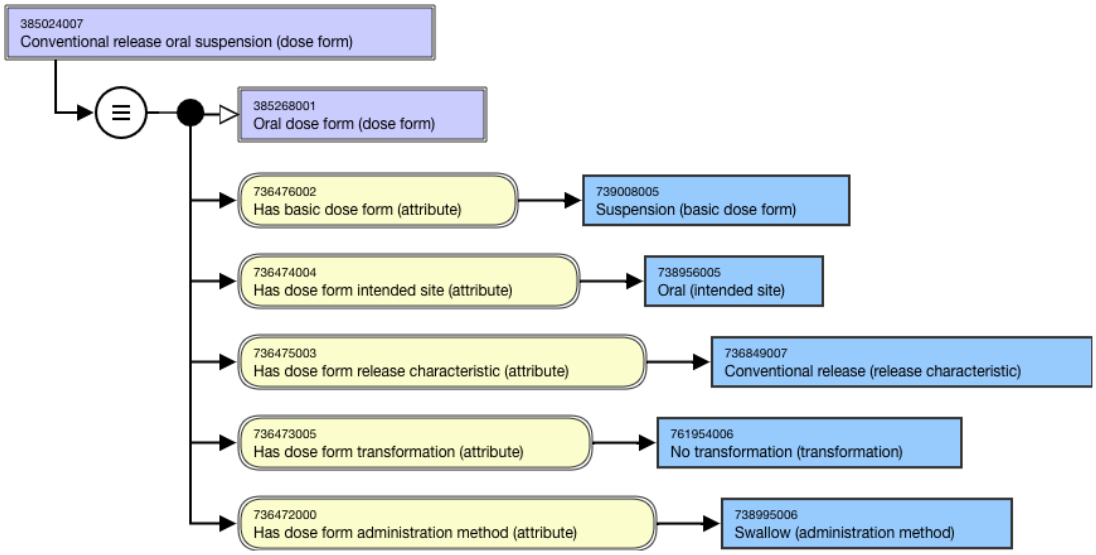
Synonyms	A synonym matching the FSN is required; other synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines. Exceptions: • Synonyms with eye instead of ocular, ear instead of otic, or nose instead of nasal may be created.
Text Definitions	Optional

Exemplar

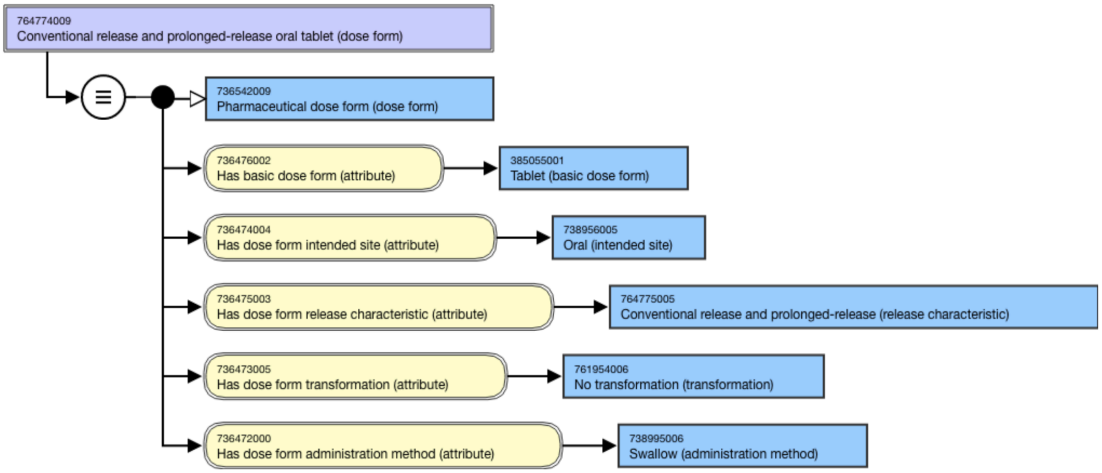
The following illustrates the **stated** view for 385024007 |Conventional release oral suspension (dose form)|:



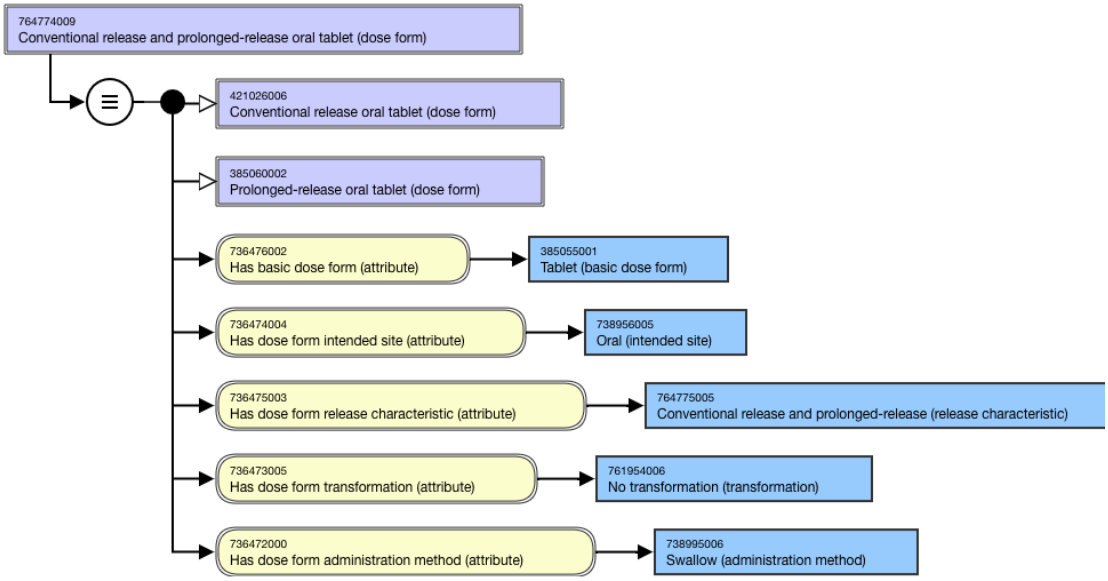
The following illustrates the **inferred** view for 385024007 |Conventional release oral suspension (dose form)|:



The following illustrates the **stated** view for 764774009 |Conventional release and prolonged-release oral tablet (dose form)|:



The following illustrates the **inferred** view for 764774009 |Conventional release and prolonged-release oral tablet (dose form)|:



Pharmaceutical Dose Form Grouper Based on Intended Site

Overview
Pharmaceutical dose form grouper concepts based on intended site of use for the dose form that are deemed to be clinically useful or which provide a helpful organizing grouper and that can be sufficiently defined may be included in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy.

These concepts are used in modeling (medicinal product form) concepts in the International Release; they are not allowed to model (clinical drug) concepts in the International Release.

Modeling (stated view)

Pharmaceutical dose form grouper concepts based on intended site shall be modeled using the proximal primitive modeling pattern.

Parent concept	736542009 |Pharmaceutical dose form (dose form)
Semantic tag	(dose form)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has dose form intended site**	• Range: << 736479009 |Dose form intended site (intended site) • Cardinality: 0..* • NOTE: While the allowed range is broader, the grouper concepts based on dose form intended site should have one or more |Has dose form intended site| attributes.

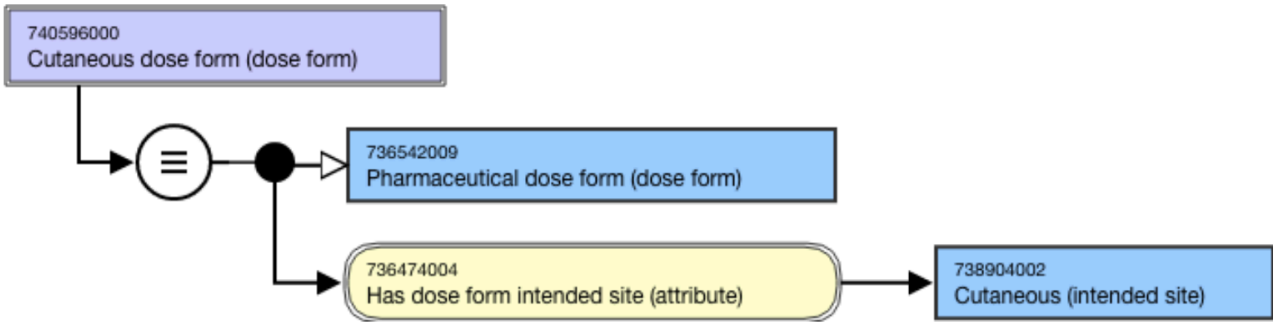
Naming Guidelines

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value, excluding the semantic tag. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". • <Dose form intended site FSN> dose form (dose form) • <Dose form intended site FSN> or <Dose form intended site FSN> dose form (dose form) Example: • Cutaneous dose form (dose form) • Oral dose form (dose form) • Parenteral dose form (dose form) • Ocular or otic dose form (dose form) • Nasal or ocular or otic dose form (dose form)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". • <Dose form intended site PT> dose form (dose form) • <Dose form intended site PT> or <Dose form intended site PT> dose form (dose form) Example: • Cutaneous dose form • Oral dose form • Parenteral dose form • Ocular or otic dose form • Nasal or ocular or otic dose form

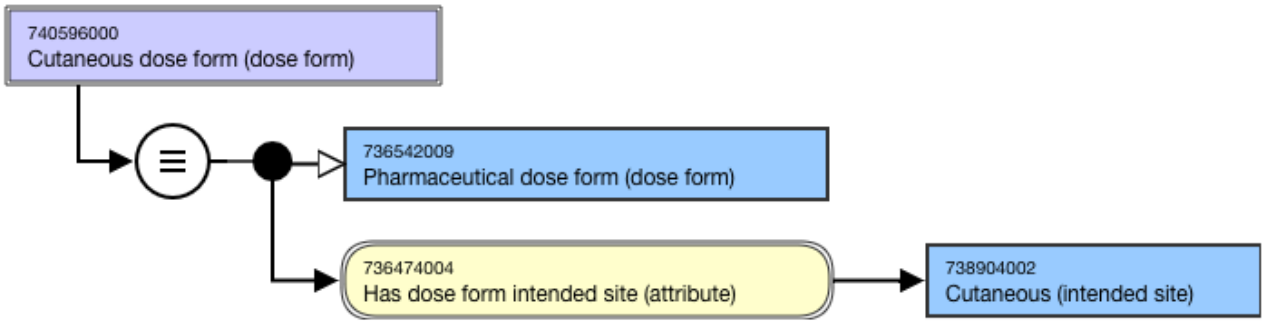
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text definitions	Optional

Exemplars

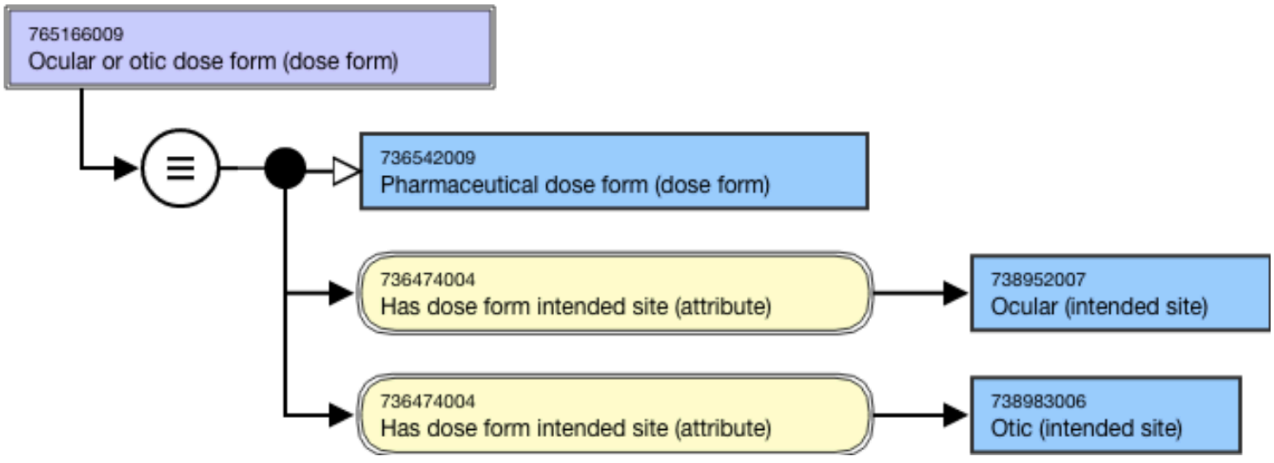
The following illustrates the **stated** view for grouper concept 740596000 |Cutaneous dose form (dose form)|:



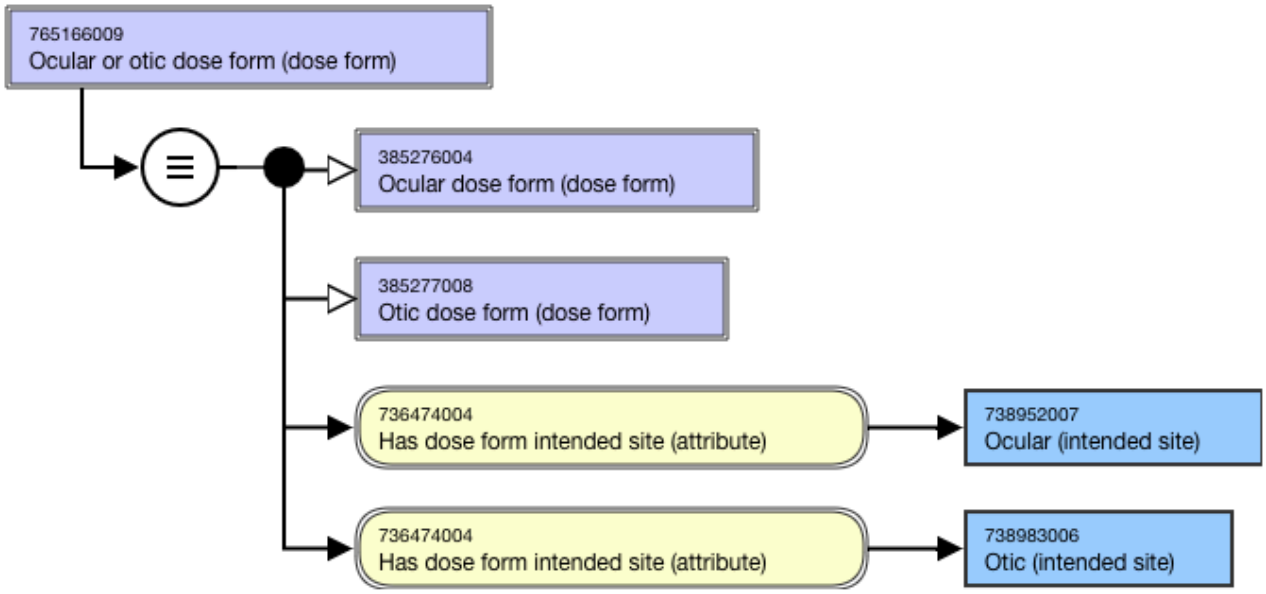
The following illustrates the **inferred** view for grouper concept 740596000 |Cutaneous dose form (dose form)|:



The following illustrates the **stated** view for grouper concept 765166009 |Ocular or otic dose form (dose form)|:



The following illustrates the **inferred** view for grouper concept 765166009 |Ocular or otic dose form (dose form)|:



Pharmaceutical Dose Form Grouper Without Basic Dose Form

Overview
Pharmaceutical dose form grouper concepts that do not include a basic dose form but are deemed to be clinically useful and that can be sufficiently defined will be included in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy.

Modeling (stated view)
Grouper concepts concepts that do not include a basic dose form shall be modeled using the proximal primitive modeling pattern.

Parent concept	736542009 |Pharmaceutical dose form (dose form)
Semantic tag	(dose form)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)| Exceptions: • Grouper concepts representing drug delivery systems will have Definition status = 900000000000074008 |Not sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has dose form release characteristic**	Range: << 736480007 |Dose form release characteristic (release characteristic)| Cardinality: 0..* • While the allowed range is broader, the grouper concepts without basic dose form should have 1..1 |Has dose form release characteristic| attributes.

Attribute: **Has dose form intended site**	Range: << 736479009 |Dose form intended site (intended site) Cardinality: 0..* • While the allowed range is broader, the grouper concepts without basic dose form should have 1..* |Has dose form intended site| attributes.
Attribute: **Has dose form administration method**	Range: << 736665006 |Dose form administration method (administration method) Cardinality: 0..* • While the allowed range is broader, the grouper concepts without basic dose form should have 1..1 |Has dose form administration method| attributes.

Naming Guidelines

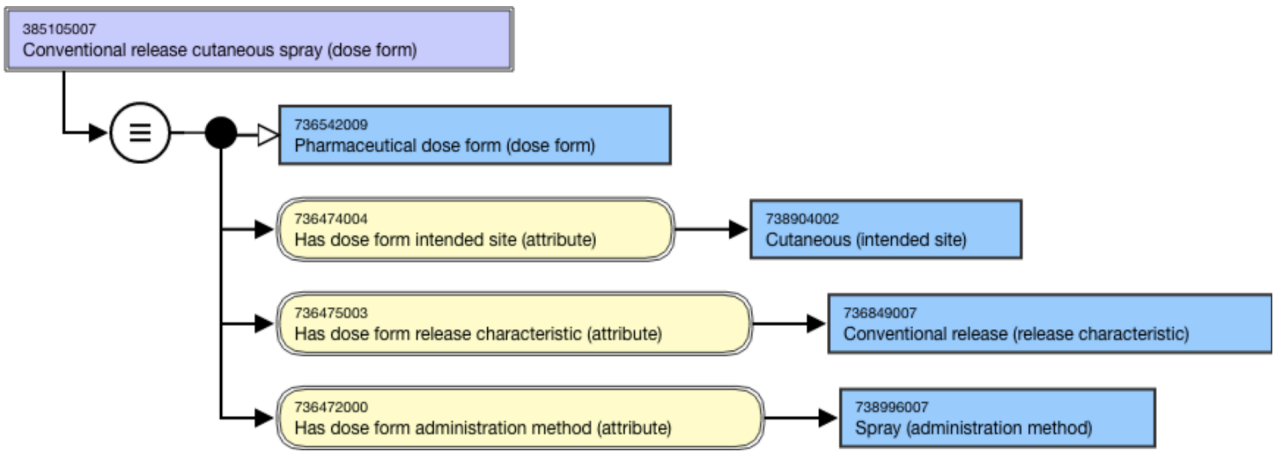
FSN	For concepts with 736472000 |Has dose form administration method (attribute)| = 738996007 |Spray (administration method)|, use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". • <Dose form release characteristic> <Dose form intended site FSN> <Dose form administration method> (dose form) Example: • Conventional release cutaneous spray (dose form) • Conventional release nasal spray (dose form) • Conventional release sublingual spray (dose form) --- For concepts representing drops with 736472000 |Has dose form administration method (attribute)| = 738994005 |Instill (administration method)|, use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". • <Dose form release characteristic> <Dose form intended site FSN> <Dose form administration method> (dose form) Example: • Conventional release nasal drops (dose form) • Prolonged-release eye drops (dose form) --- For concepts representing drug delivery systems, use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". • <Dose form release characteristic> <Dose form intended site FSN> drug delivery system Example: • Prolonged-release intrauterine drug delivery system (dose form) • Prolonged-release transdermal drug delivery system (dose form)

Preferred Term	For concepts with 736472000 |Has dose form administration method (attribute)| = 738996007 |Spray (administration method)|, use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". Exclude <Dose form release characteristic> when = 736849007 |Conventional release (release characteristic)|. • <Dose form release characteristic> <Dose form intended site FSN> <Dose form administration method> Example: • Cutaneous spray • Nasal spray • Sublingual spray --- For concepts representing drops with 736472000 |Has dose form administration method (attribute)| = 738994005 |Instill (administration method)|, use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". Exclude <Dose form release characteristic> when = 736849007 |Conventional release (release characteristic)|. • <Dose form release characteristic> <Dose form intended site FSN> <Dose form administration method> Example: • Nasal drops • Prolonged-release eye drops --- For concepts representing drug delivery systems, use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple intended sites, the intended sites must be in alphabetical order and separated by the word "or". Exclude <Dose form release characteristic> when = 736849007 |Conventional release (release characteristic)|. • <Dose form release characteristic> <Dose form intended site FSN> drug delivery system Example: • Prolonged-release intrauterine drug delivery system (dose form) • Prolonged-release transdermal drug delivery system (dose form)

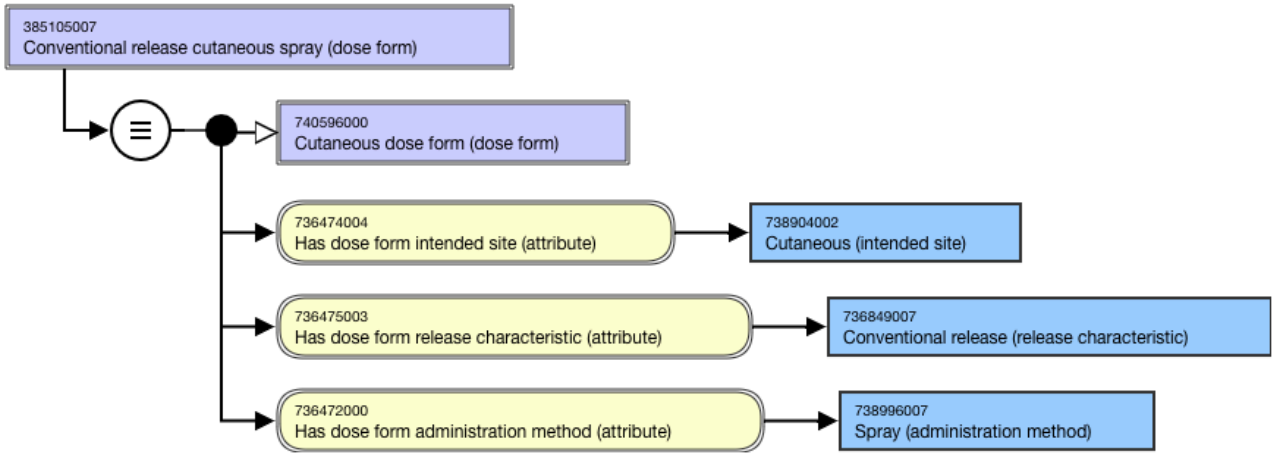
Synonyms	A synonym matching the FSN is required; additional synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines. Exceptions: • Synonyms with eye instead of ocular, ear instead of otic, or nose instead of nasal may be created.
Text definitions	Optional

Exemplars

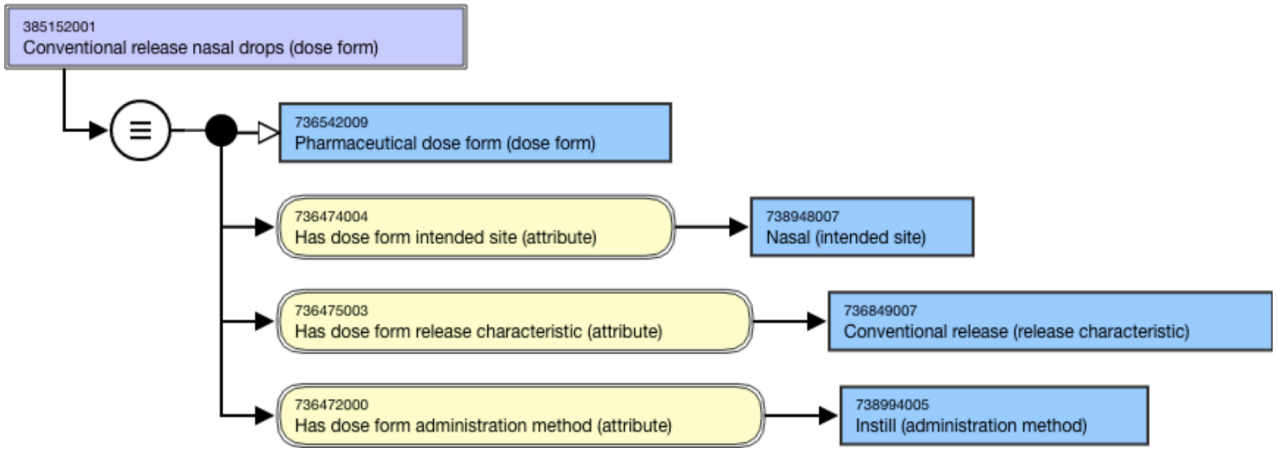
The following illustrates the **stated** view for concept 385105007 |Conventional release cutaneous spray (dose form)|:



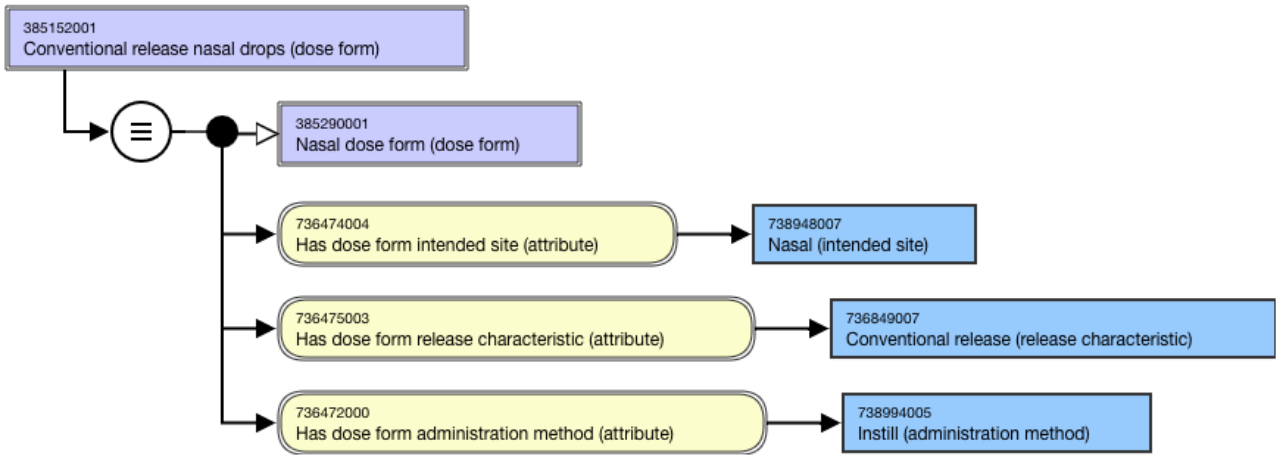
The following illustrates the **inferred** view for concept 385105007 |Conventional release cutaneous spray (dose form)|:



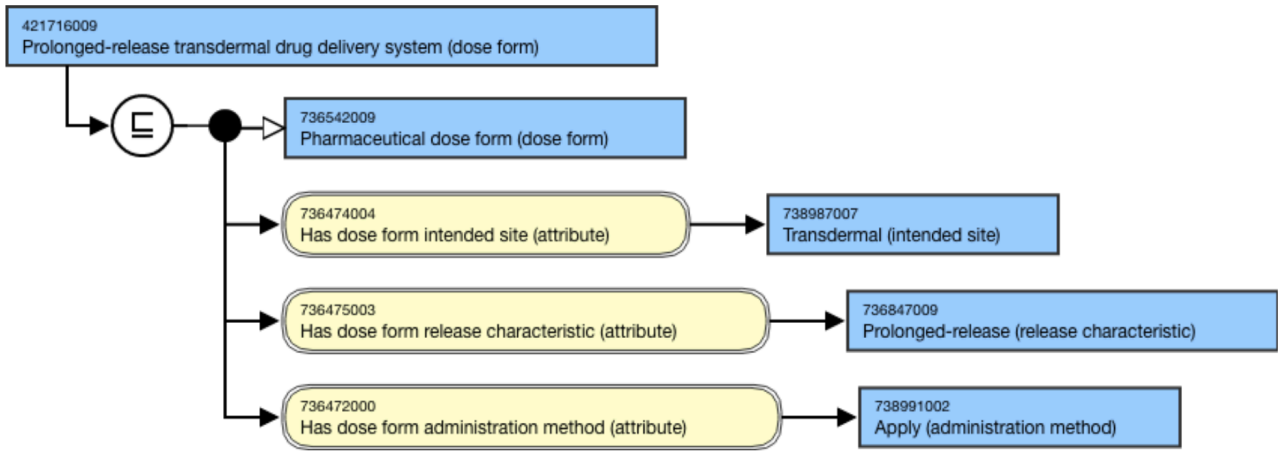
The following illustrates the **stated** view for concept 385152001 |Conventional release nasal drops (dose form)|:



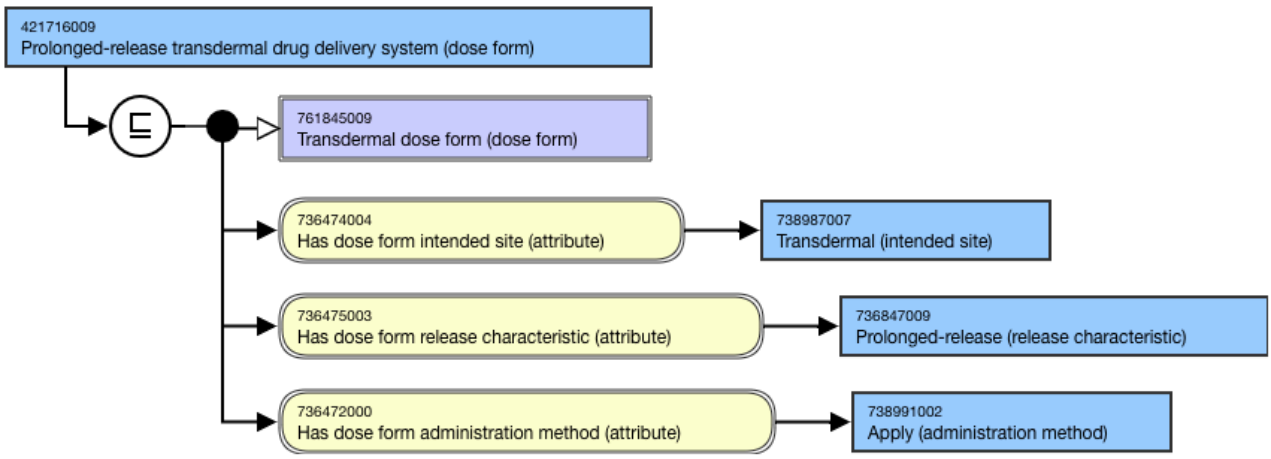
The following illustrates the **inferred** view for concept 385152001 |Conventional release nasal drops (dose form)|:



The following illustrates the **stated** view for concept 421716009 |Prolonged-release transdermal drug delivery system (dose form)|:



The following illustrates the **inferred** view for concept 421716009 |Prolonged-release transdermal drug delivery system (dose form)|:



Pharmaceutical Dose Form Supporting Hierarchies

The 736542009 |Pharmaceutical dose form (dose form)| subhierarchy of 362981000 |Qualifier value (qualifier value)| contains concepts which support the Medicinal product model.

Editorial guidelines for the supporting hierarchies required to support creation of sufficiently defined pharmaceutical dose form concepts are documented in the following sections.

- Basic Dose Form(see page 375)
- Dose Form Administration Method(see page 378)
- Dose Form Intended Site(see page 380)
- Dose Form Release Characteristic(see page 381)
- Dose Form Transformation(see page 383)
- State of Matter(see page 385)

Basic Dose Form
Overview
The basic dose form represents a general type of pharmaceutical formulation (e.g. tablet, capsule, cream, ointment, solution, emulsion) used for medicinal products. To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing basic dose form is required.

Concepts in the 736478001 |Basic dose form (basic dose form)| hierarchy will be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy; they will not be used to model concepts in the 763158003 |Medicinal product (product)| hierarchy.

The 736478001 |Basic dose form (basic dose form)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value)|.

Modeling (stated view)

Descendants shall be modeled as follows.

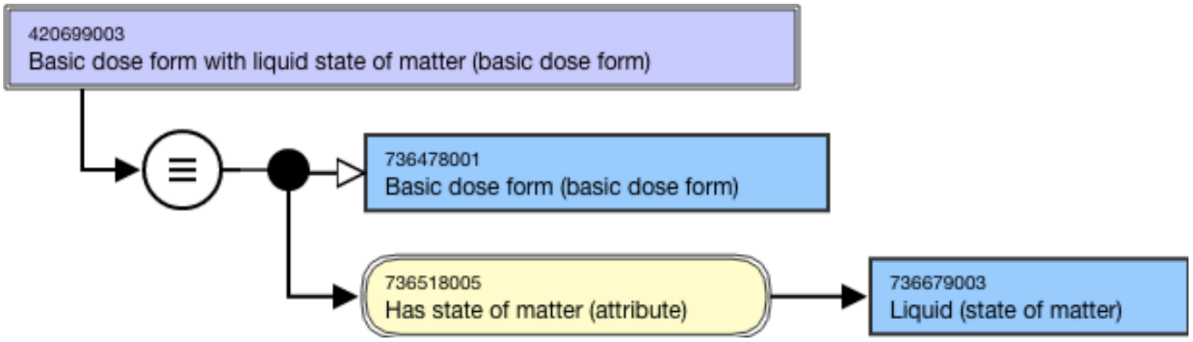
Parent concept	736478001 |Basic dose form (basic dose form)
Semantic tag	(basic dose form)

Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept) • Exceptions: • Grouper concepts based on state of matter shall have definition status 900000000000073002 |Sufficiently defined concept definition status (core metadata concept)
Attribute: **Has state of matter (attribute)**	Range: <736471007 |State of matter (state of matter) Cardinality: 1..1

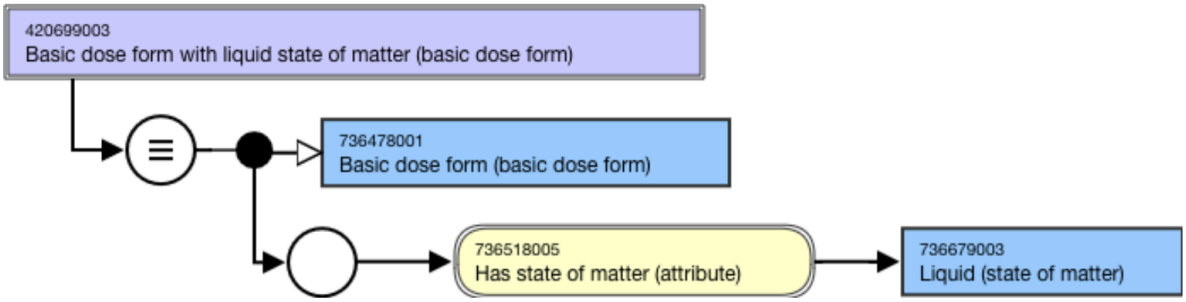
Naming Guidelines for Grouper Concept

FSN	Use the following pattern for the FSN; align naming and case sensitivity with the FSN for the concept that is selected as the attribute value, excluding the semantic tag. • Basic dose form with <State of matter> state of matter (basic dose form) For example, • Basic dose form with liquid state of matter (basic dose form) • Basic dose form with solid state of matter (basic dose form)
Preferred Term	Use the following pattern for the PT; align naming and case sensitivity with the PT for the concept that is selected as the attribute value. • <State of matter PT> state of matter For example, • Liquid dose form • Solid dose form
Synonyms	A synonym to match the FSN is required. Additional synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

Exemplars for Grouper Concept
The following illustrates the **stated** view for 420699003 |Basic dose form with liquid state of matter (basic dose form)|:



The following illustrates the **inferred** view for 420699003 |Basic dose form with liquid state of matter (basic dose form)|:

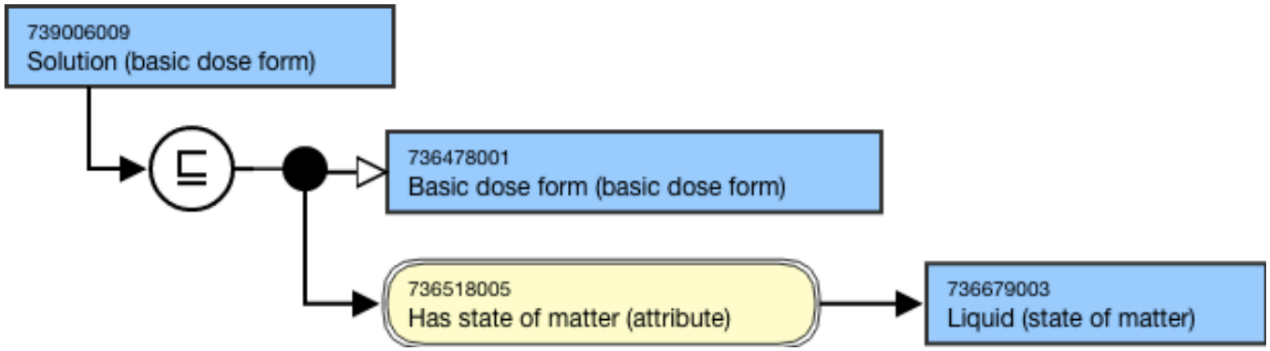


Naming Guidelines for Basic Dose Form Concept

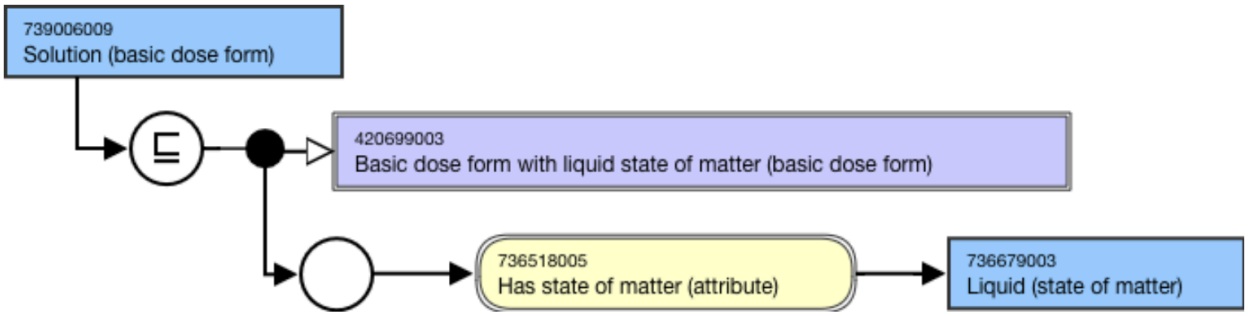
FSN	Use the following pattern for the FSN where X is the basic dose form: • X (basic dose form) For example, • Cream (basic dose form) • Gel (basic dose form) • Suppository (basic dose form) • Tablet (basic dose form) Exceptions: • Plural form to be used for Granules (basic dose form)
Preferred Term	Use the following pattern for the PT where X is the basic dose form: • X For example, • Cream • Gel • Suppository • Tablet Exceptions: • Plural form to be used for Granules

Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Text definitions are not required but are encouraged.

Exemplars for Basic Dose Form Concept
The following illustrates the **stated** view for 739006009 |Solution (basic dose form)|:



The following illustrates the **inferred** view for 739006009 |Solution (basic dose form)|:



Dose Form Administration Method
Overview
The dose form administration method represents a general type of method of administration (e.g. apply, chew, spray, swallow) that a dose form is designed to be administered by (e.g. a chewable tablet is formulated to be administered by chewing). To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing dose form administration method is required.

Concepts in the 736665006 |Dose form administration method (administration method)| hierarchy will be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy; they will not be used to model concepts in the 763158003 |Medicinal product (product)| hierarchy.

The 736665006 |Dose form administration method (administration method)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value)|.

Modeling (stated view)
Descendants shall be modeled as follows.

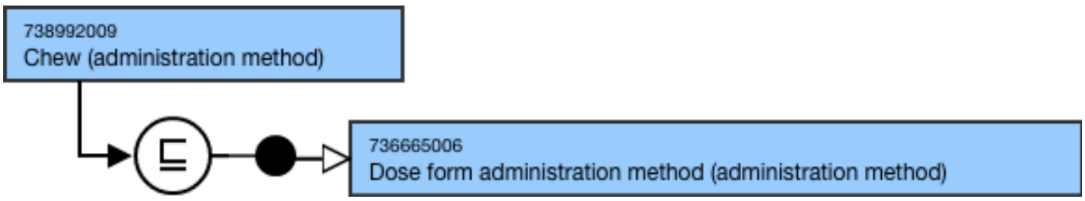
Parent concept	736665006 |Dose form administration method (administration method)
Semantic tag	(administration method)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming Guidelines

FSN	Use the following pattern for the FSN where X is the administration method and is in the form of an imperative: X (administration method) Example: • Administer (administration method) • Apply (administration method) • Instill (administration method) • Spray (administration method) • Swallow (administration method)
Preferred Term	Use the following pattern for the PT where X is the administration method: X Example: • Administer • Apply • Instill • Spray • Swallow
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

Exemplars

The following illustrates the **stated** and **inferred** view for 738992009 |Chew (administration method)|:



Dose Form Intended Site
Overview
The dose form intended site represents a general type of site of administration (e.g. cutaneous, nasal, oral, parenteral). To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing dose form intended site is required. Even though the concepts appear similar, dose form intended site should not be confused with route of administration, which is a concept used in dosage instructions for the administration of a particular medicinal product to a particular patient.

Concepts in the 736479009 |Dose form intended site (intended site)| hierarchy will be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy; they will not be used to model concepts in the 763158003 |Medicinal product (product)| hierarchy.

The 736479009 |Dose form intended site (intended site)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value)|.

Modeling (stated view)
Descendants shall be modeled as follows.

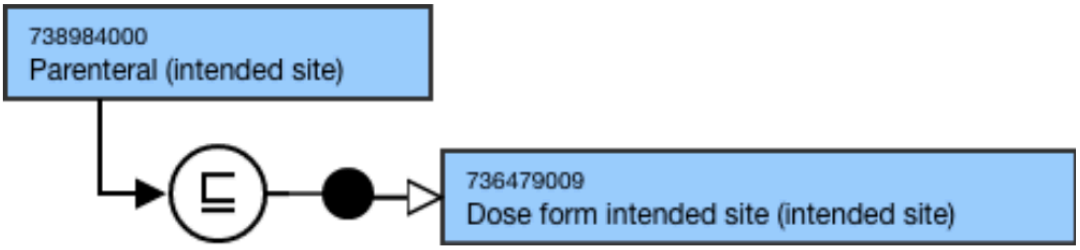
Parent concept	<<736479009 |Dose form intended site (intended site)
Semantic tag	(intended site)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming Guidelines

FSN	Use the following pattern for the FSN where X is the intended site: X (intended site) For example, • Oral (intended site) • Otic (intended site) • Parenteral (intended site) • Vaginal (intended site)

Preferred Term	Use the following pattern for the PT where X is the intended site: X For example, • Oral • Otic • Parenteral • Vaginal
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

Exemplars
The following illustrates the **stated** and **inferred** view for 738984000 |Parenteral (intended site)|:



Dose Form Release Characteristic
Overview
The dose form release characteristic represents a general type of pattern of release (e.g. conventional, modified, delayed, prolonged) of the active ingredient substance(s) from the dose form. To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing dose form release characteristics is required.

Concepts in the 736480007 |Dose form release characteristic (release characteristic)| hierarchy will be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy; they will not be used to model concepts in the 763158003 |Medicinal product (product)| hierarchy.

The 736480007 |Dose form release characteristic (release characteristic)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value).

Modeling (stated view)
Descendants shall be modeled as follows.

Parent concept	736480007 |Dose form release characteristic (release characteristic) or one or more descendants of 736480007 |Dose form release characteristic (release characteristic)
Semantic tag	(release characteristic)

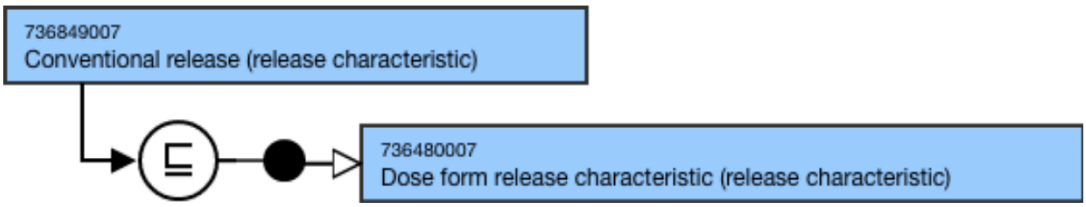
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming Guidelines

FSN	Use the following pattern for the FSN where X is the release characteristic, adding a hyphen when appropriate Combined release-characteristic concepts may be created to support modeling of concepts that display multiple release characteristics in a single formulation. • X (release characteristic) For example, • Conventional release (release characteristic) • Delayed-release (release characteristic) • Prolonged-release (release characteristic)* • Modified-release (release characteristic)** • Delayed-release and prolonged-release (release characteristic) *Prolonged was selected rather than Extended because feedback was received that it is more clear to translate for non-English speaking users; existing national drug extensions appear to use one or the other of these terms. **Modified-release is a grouper that is not allowed to be used to model a Clinical drug concept.
Preferred Term	Use the following pattern for the PT where X is the release characteristic, adding a hyphen when appropriate: • X For example, • Conventional release • Delayed-release • Prolonged-release • Modified-release • Delayed-release and prolonged-release
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

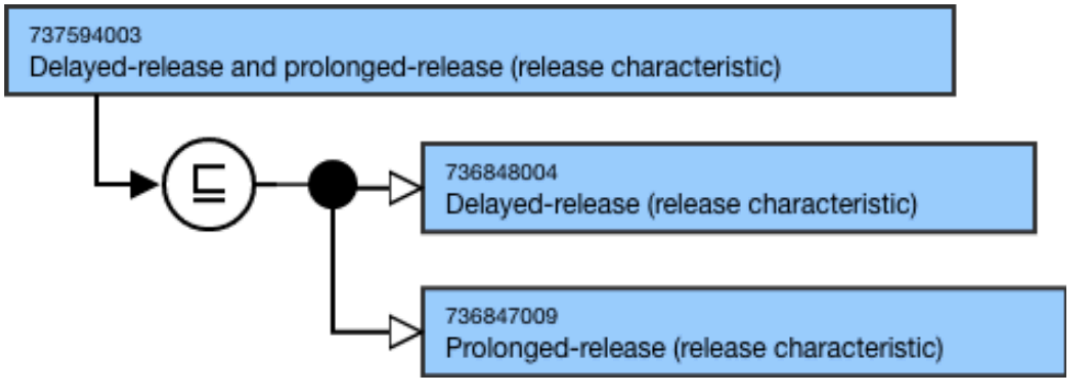
Exemplars

The following illustrates the **stated** and **inferred** view for 736849007 |Conventional release (release characteristic)|:



The following illustrates the **stated** and **inferred** view for 736848004 |Delayed-release (release characteristic)|:

The following illustrates the **stated** and **inferred** view for 737594003 |Delayed-release and prolonged-release (release characteristic)|:



Dose Form Transformation
Overview
The dose form transformation represents a process where a dose form is transformed from that supplied by the manufacturer into a new dose form, usually to make it suitable for administration (e.g. dissolving a "powder for solution for injection" dose form into a "solution for injection" dose form). This may occur as part of the dispensing act or immediately before administration. To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing dose form transformation is required.

Concepts in the 736477006 |Dose form transformation (transformation)| hierarchy will be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy; they will not be used to model concepts in the 763158003 |Medicinal product (product)| hierarchy.

The 736477006 |Dose form transformation (transformation)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value).

Modeling (stated view)
Descendants shall be modeled as follows.

Parent concept	<<736477006 |Dose form transformation (transformation)|

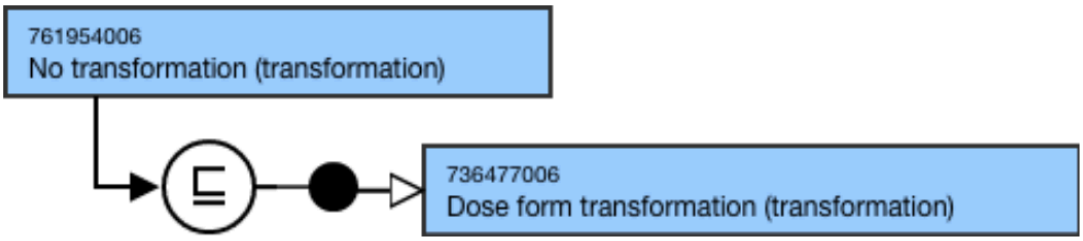
Semantic tag	(transformation)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming Guidelines

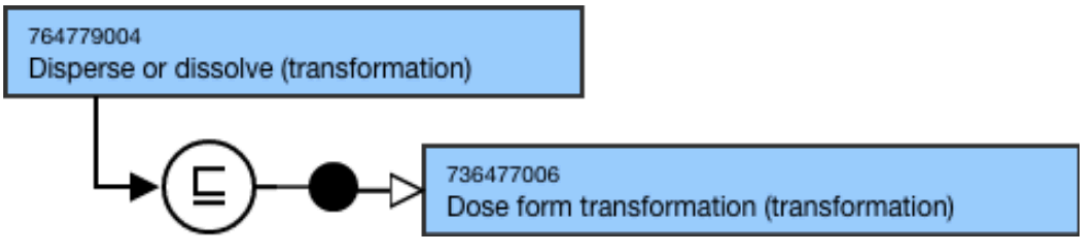
FSN	Use the following pattern for the FSN where X is the transformation: • X (transformation) Example: • Dissolve (transformation) • Disperse (transformation) • No transformation (transformation) • Disperse or dissolve (transformation)
Preferred Term	Use the following pattern for the PT where X is the transformation: • X Example: • Dissolve • Disperse • No transformation • Disperse or dissolve
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

Exemplars

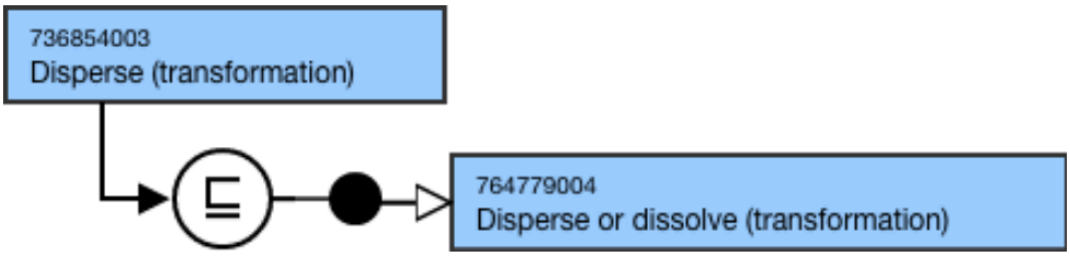
The following illustrates the **stated** and **inferred** view for 761954006 |No transformation (transformation)|:



The following illustrates the **stated** and **inferred** view for 764779004 |Disperse or dissolve (transformation)|:



The following illustrates the **stated** and **inferred** view for 736854003 |Disperse (transformation)|:



State of Matter
Overview
The state of matter represents a physical state of matter. To support fully defining concepts in the 736542009 |Pharmaceutical dose form (dose form)| hierarchy, a hierarchy representing state of matter is required.

Concepts in the 736471007 |State of matter (state of matter)| hierarchy will be used to model concepts in the 736478001 |Basic dose form (basic dose form)| hierarchy; they will not be used to model concepts in the 736542009 |Pharmaceutical dose form (dose form)| or 763158003 |Medicinal product (product)| hierarchies.

The 736471007 |State of matter (state of matter)| hierarchy is a descendant of 362981000 |Qualifier value (qualifier value).

Modeling (stated view)

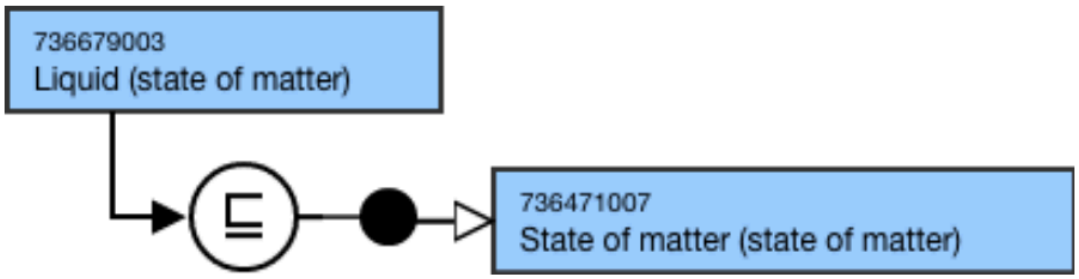
Descendants shall be modeled as follows.

Parent concept	736471007 |State of matter (state of matter)|
Semantic tag	(state of matter)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming Guidelines

FSN	Use the following pattern for the FSN where X is the state of matter: X (state of matter) Example: • Gas (state of matter) • Liquid (state of matter) • Semi-solid (state of matter) • Solid (state of matter)
Preferred Term	Use the following pattern for the PT where X is the state of matter: X Example: • Gas • Liquid • Semi-solid • Solid
Synonyms	Synonyms are not allowed unless explicitly identified as an exception in the Editorial Guidelines.
Text Definitions	Preferred; not required.

Exemplars
The following illustrates the **stated** and **inferred** view for 736679003 |Liquid (state of matter)|:



Role in Medicinal Product

See subsections for editorial guidelines related to modeling and terming for roles in the 763158003 | Medicinal product (product) |[1046] hierarchy.

- Role Hierarchy(see page 387)
- Groupers Based on Role(see page 388)
- Groupers Based on Role plus Structure(see page 391)
- Modeling Association between Role and Product(see page 394)

1046 http://snomed.info/id/763158003

Role Hierarchy

Overview
766940004 |Role (role)| is an abstract representation of a high-level role for a product; the concepts are not intended to describe a detailed indication for use nor imply that use is appropriate in all clinical situations.

The role hierarchy is comprised of concepts required to model or group concepts in SNOMED CT; it is not a comprehensive hierarchy. Concepts not required for modeling in SNOMED CT may be deprecated if not needed as groupers.

> Editorial guidelines for other types of roles will be added when a need for such concepts is identified and implemented.

Modeling

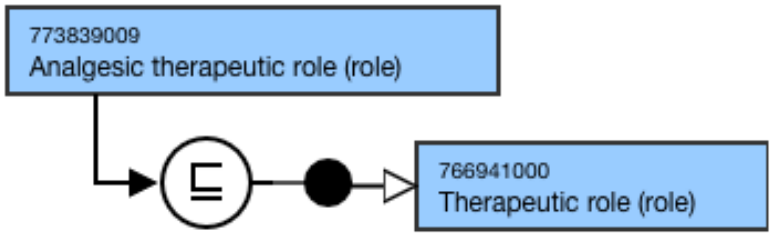
Stated parent concept	<<766940004 |Role (role)|
Semantic tag	(role)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Naming

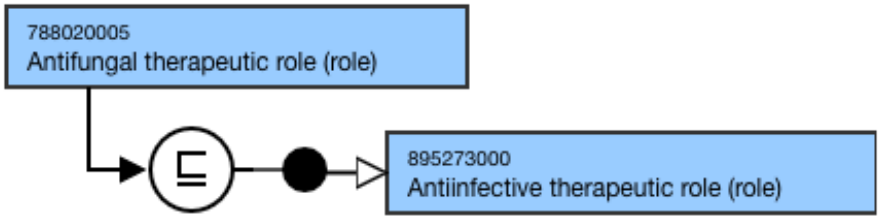
FSN	Use the following naming pattern for the FSN where X is a role. Each concept should represent a single role. • X role (role) For example, • Active immunity stimulant role (role) Use the following pattern for the FSN where X is a therapeutic role. Each concept should represent a single therapeutic role. • X therapeutic role (role) For example, • Analgesic therapeutic role (role) • Antifungal therapeutic role (role)

Preferred Term	Use the following naming pattern for the FSN where X is a role; align naming and case sensitivity with the FSN. • X role Use the following pattern for the PT; align naming and case sensitivity with the FSN. • X therapeutic role For example, • Analgesic therapeutic role • Antifungal therapeutic role
Synonym	Synonyms matching the FSN are not required.

Exemplars
The following illustrates the **stated and inferred** view for 773839009 |Analgesic therapeutic role (role)|:



The following illustrates the **stated and inferred** view for 788020005 |Antifungal therapeutic role (role)|:



Groupers Based on Role

Overview
Grouper concepts based on role that are deemed to be clinically useful and that can be sufficiently defined may be included in the |Medicinal product| hierarchy.

Note: This section applies to grouper concepts representing a single role.

A high-level grouper concept supports the organization of the hierarchy based on therapeutic role:

- 763087004 |Medicinal product categorized by therapeutic role (product)|

Modeling

Stated parent concept	763158003 |Medicinal product (product)

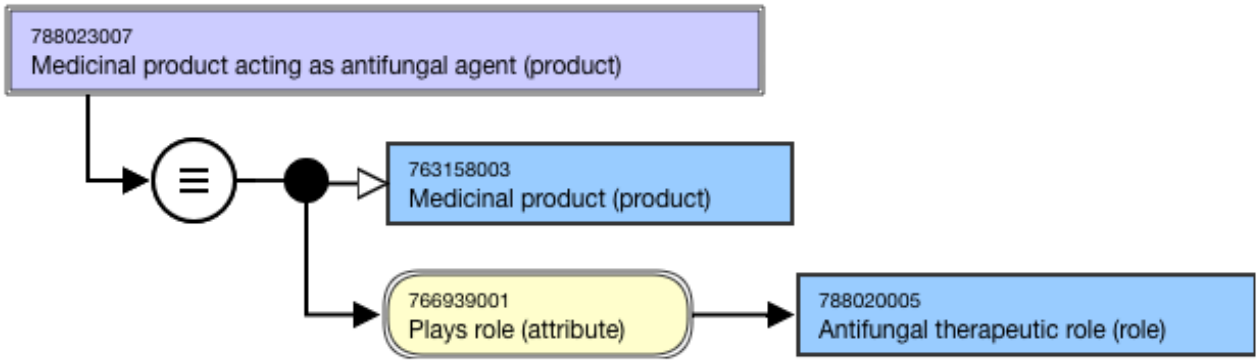
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: Plays role	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, the |Medicinal product| grouper concepts based on role should have one and only one Plays role (attribute).

Naming Guidelines

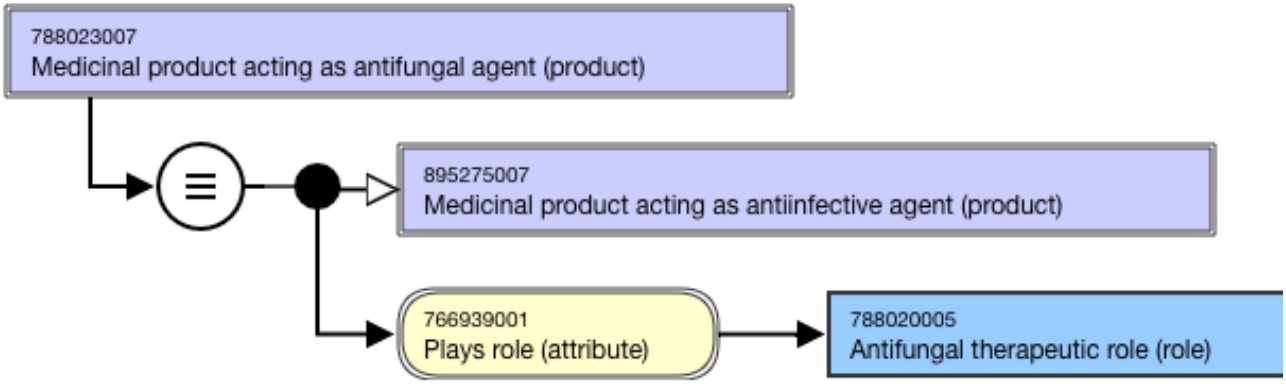
FSN	Use the following pattern for the FSN; align naming and case significance with the FSN for the concept that is selected as the attribute value, excluding the semantic tag and the words "therapeutic role". • Medicinal product acting as <Therapeutic role FSN> agent (product) For example, • Medicinal product acting as analgesic agent (product)| • Medicinal product acting as antacid agent (product)| • Medicinal product acting as antiglaucoma agent (product)|
Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the attribute value, excluding the words "therapeutic role". • <Therapeutic role PT> agent For example, • Analgesic agent • Antacid agent • Antiglaucoma agent
Synonyms	Synonyms matching the FSN are not required.

Exemplars

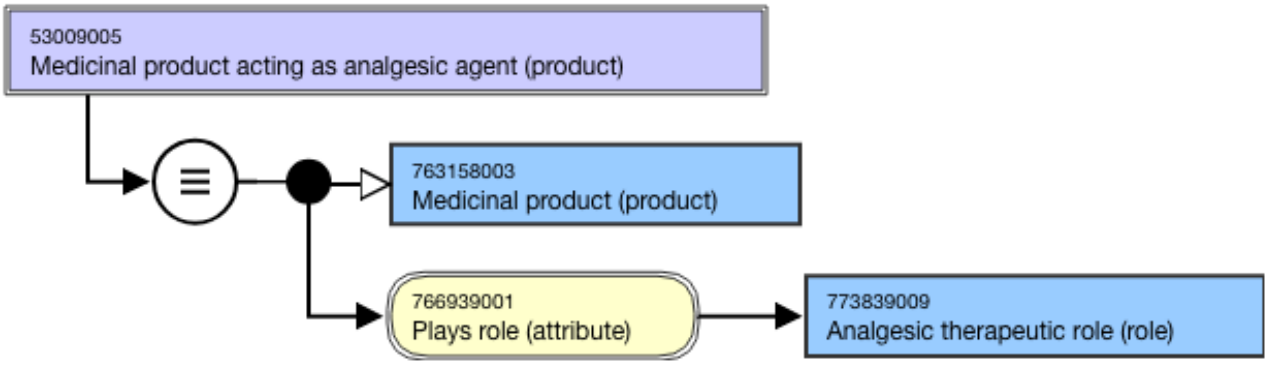
The following illustrates the **stated** view for grouper concept 788023007 |Medicinal product acting as antifungal agent (product)|:



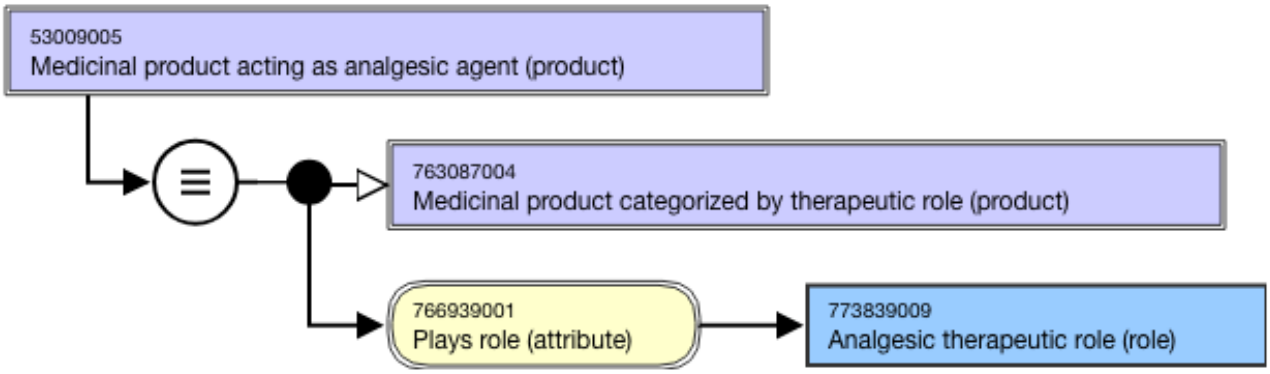
The following illustrates the **inferred** view for grouper concept 788023007 |Medicinal product acting as antifungal agent (product)|:



The following illustrates the **stated** view for grouper concept 53009005 |Medicinal product acting as analgesic agent (product)|:



The following illustrates the **inferred** view for grouper concept 53009005 |Medicinal product acting as analgesic agent (product)|:



Groupers Based on Role plus Structure

Overview
Grouper concepts based on role plus structure that are deemed to be clinically useful and that can be sufficiently defined may be included in the |Medicinal product| hierarchy.

Note: This section applies to grouper concepts representing a single role plus a single structure.

Modeling

Stated parent concept	763158003 |Medicinal product (product)
Semantic tag	(product)
Definition status	900000000000073002 |Sufficiently defined by necessary conditions definition status (core metadata concept)|
Attribute: **Has active ingredient**	Range: <<105590001 |Substance (substance) • While the allowed range is broader, the |Medicinal product| grouper concepts based on role plus structure should only use primitive grouper concepts that are descendants of 312413002 |Substance categorized by structure (substance)| as attribute values. Cardinality: 0..* • While the allowed range is broader, the |Medicinal product| grouper concepts based on role plus structure should have one and only one |Has active ingredient| attribute.

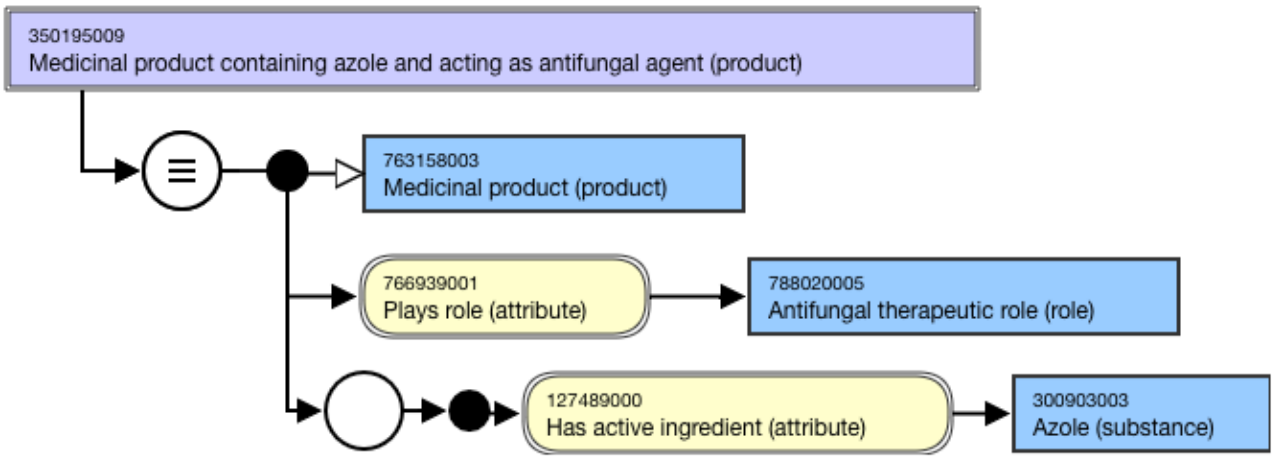
Attribute: **Plays role**	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, the |Medicinal product| grouper concepts based on role plus structure should have one and only one |Plays role| attribute.

Naming Guidelines

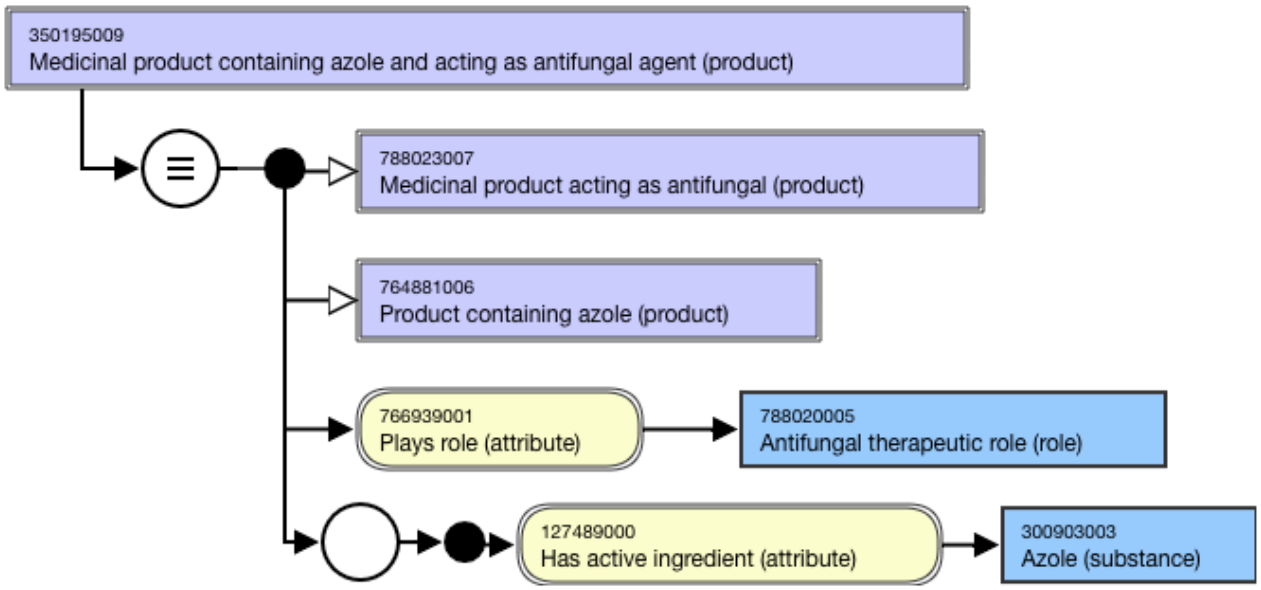
FSN	Use the following pattern for the FSN; align naming and case significance with the FSN for the concept that is selected as the attribute value, excluding the semantic tag and the words "therapeutic role". • Medicinal product containing <Active ingredient PT> and acting as <Therapeutic role FSN> agent (product) For example, • Medicinal product containing tricyclic and acting as antidepressant agent (product)| • Medicinal product containing azole and acting as antifungal agent (product)|
Preferred Term	Use the following pattern for the PT; align naming and case significance with the PT for the concept that is selected as the attribute value, excluding the words "therapeutic role". • <Active ingredient PT> <Therapeutic role PT> agent For example, • Tricyclic antidepressant agent • Azole antifungal agent
Synonyms	Synonyms matching the FSN are not required.

Exemplars

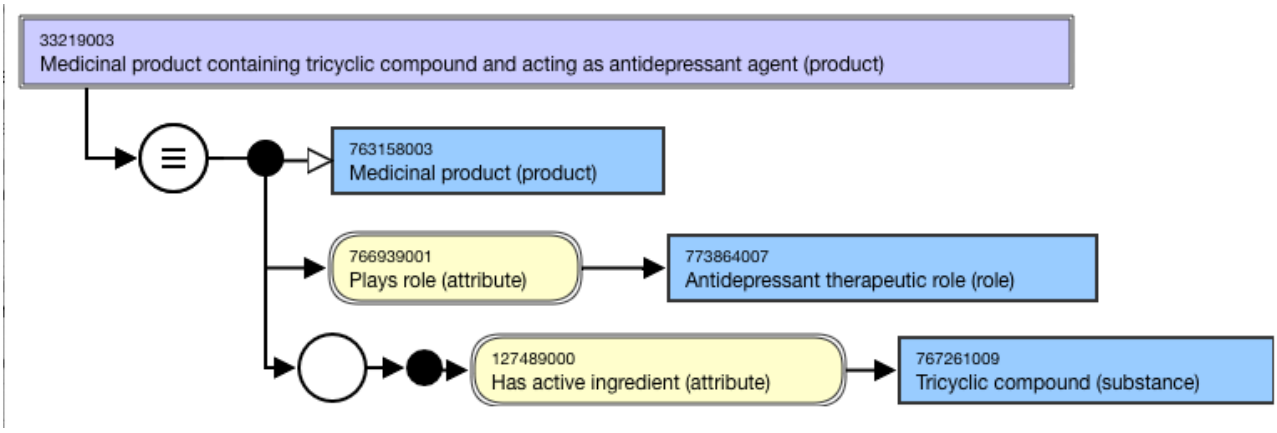
The following illustrates the **stated** view for grouper concept 350195009 |Medicinal product containing azole and acting as antifungal agent (product)|:



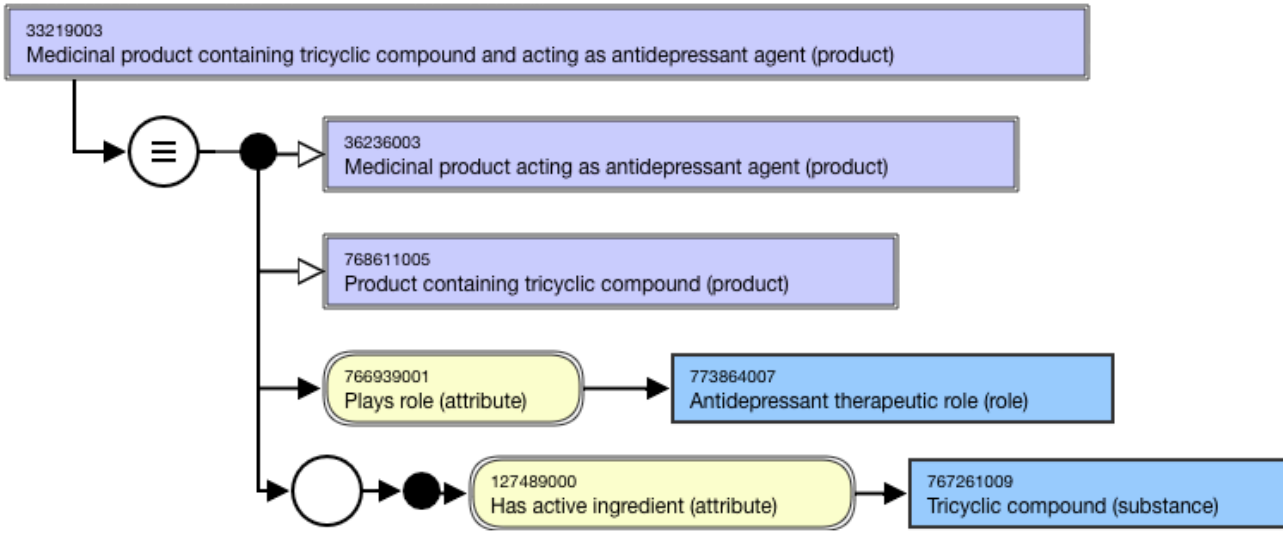
The following illustrates the **inferred** view for grouper concept 350195009 |Medicinal product containing azole and acting as antifungal agent (product)|:



The following illustrates the **stated** view for grouper concept 33219003 |Medicinal product containing tricyclic compound and acting as antidepressant agent (product)|:



The following illustrates the **inferred** view for grouper concept 33219003 |Medicinal product containing tricyclic compound and acting as antidepressant agent (product)|:



Modeling Association between Role and Product

Overview
Associations between role and product in the Medicinal product hierarchy are primarily created to support modeling in other hierarchies; however, organization of content or facilitation of maintenance activities may also be reasons for creation of associations.

Modeling
Associations between therapeutic role and concepts in the Medicinal product hierarchy shall be modeled by creation of an additional non-defining axiom.

The additional axiom should be added to the most general possible concept with one of the following semantic tags:

- (medicinal product)
- (medicinal product form)
- (clinical drug)

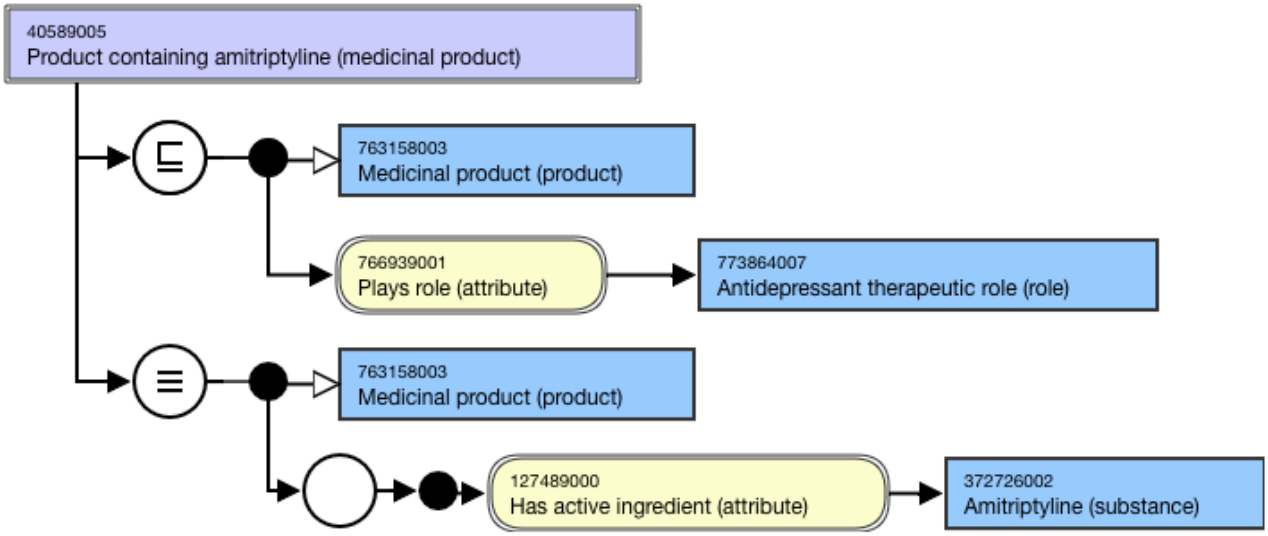
A separate additional axiom must be created for each therapeutic role.

Stated parent concept for additional axiom	763158003 |Medicinal product (product) • Addition of the additional axiom does not impact the editorial guidelines for modeling or terming for the (medicinal product), (medicinal product form), or (clinical drug) concept as described in preceding sections of this document.
Definition status for additional axiom	900000000000074008 |Not sufficiently defined by necessary conditions definition status (core metadata concept)|

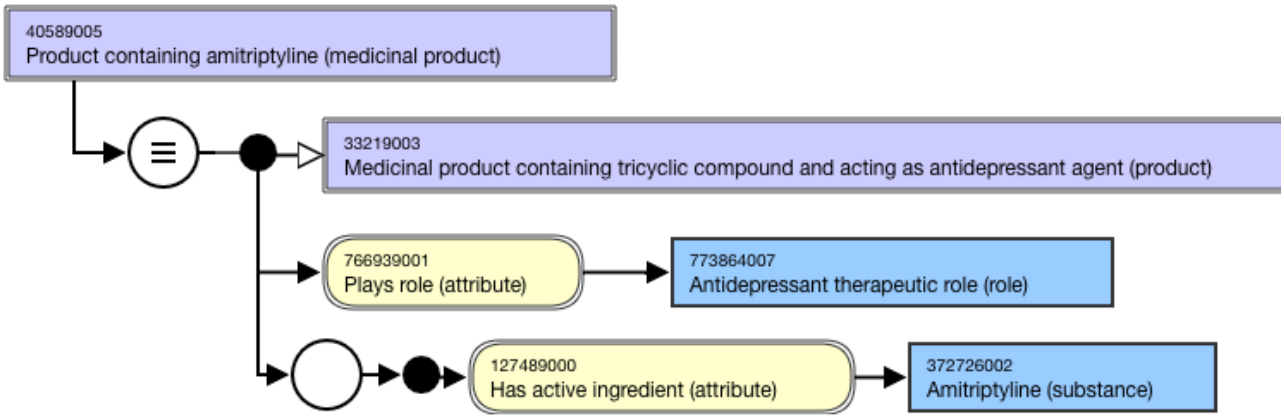
Attribute: **Plays role**	Range: <<766940004 |Role (role)| Cardinality: 0..* • While the allowed range is broader, the additional axiom should have one and only one Plays role (attribute).

Exemplars

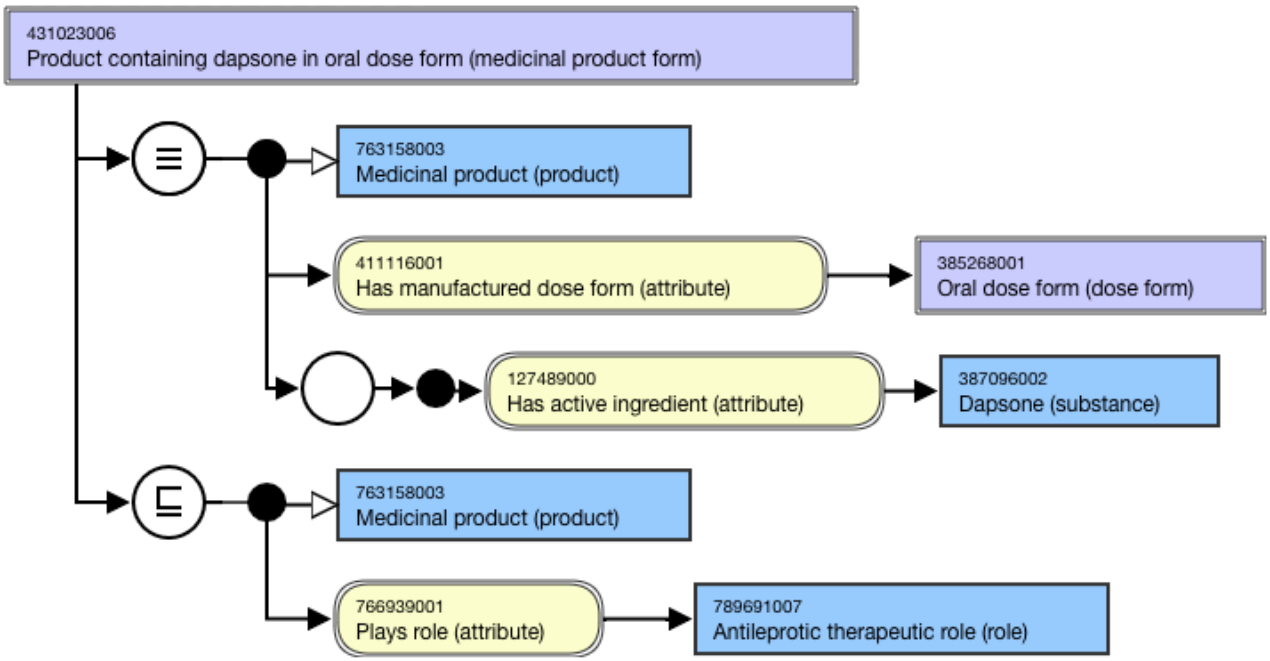
The following illustrates the **stated** view for concept 40589005 |Product containing amitriptyline (medicinal product)|:



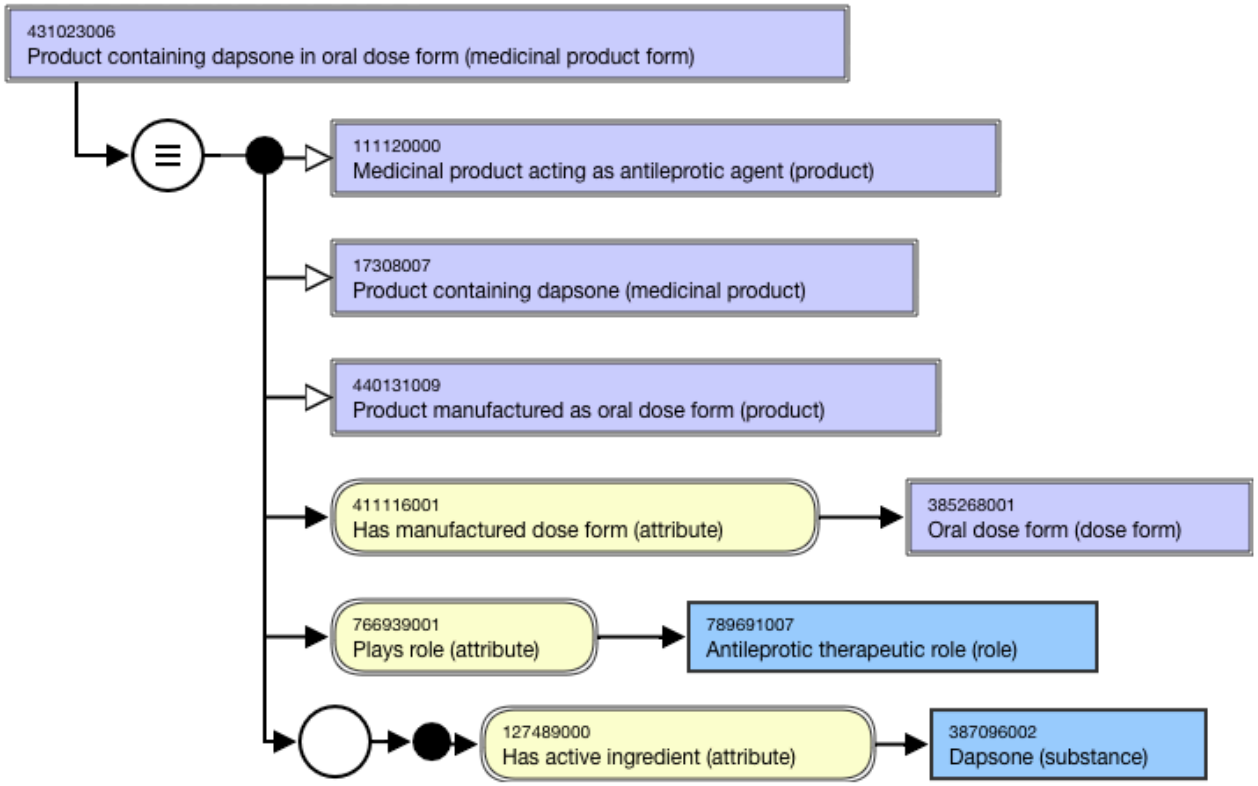
The following illustrates the **inferred** view for concept 40589005 |Product containing amitriptyline (medicinal product)|:



The following illustrates the **stated** view for concept 431023006 |Product containing dapsone in oral dose form (medicinal product form)|:



The following illustrates the **inferred** view for concept 431023006 |Product containing dapsone in oral dose form (medicinal product form)|:



Type of drug preparation

Descendants of 105904009 |Type of drug preparation (qualifier value)| do not meet the criteria to be considered Pharmaceutical dose forms. This subhierarchy will be retained as a primitive subhierarchy until such time that use cases and/or detailed requirements are known. Requests for addition of new concepts or modification of existing concepts will be evaluated on a case-by-case basis.

Unit of presentation

A unit of presentation represents a qualitative concept that describes a countable entity in which the clinical drug is presented (e.g. tablet, capsule) or in which it is bounded (vial, ampule). The 732935002 | Unit of presentation (unit of presentation)|[1047] hierarchy supports harmonization between SNOMED CT's *Drug Concept Model* and the International Organization for Standardization's *Identification of Medicinal Products (IDMP)* standards for product strength.

Out of Scope:

- Concepts representing proprietary dose forms
- Concepts that contain modifiers, e.g. hard capsule, capsule for inhalation

Unit dose

The Unit dose (qualifier value) is unacceptable for representing unit of presentation.

Concept descriptions representing Unit of Presentation	
FSN	**X (unit of presentation)** For example, • Actuation (unit of presentation) • Capsule (unit of presentation) • Suppository (unit of presentation) • Tablet (unit of presentation)
PT	**X** For example, • Actuation • Capsule • Suppository • Tablet
SYN	Synonyms are not allowed

1047 http://snomed.info/id/732935002

Clinical Drugs for pre-filled pens or cartridges

In the International edition of SNOMED CT, clinical drugs presenting in pre-filled pens or cartridges will be modeled with normalized *concentration strength*.

Example of pre-filled pen:

- One pre-filled pen for injection contains 2 mg semaglutide in a 1.5 ml solution
- FSN: 782102009 |Product containing precisely semaglutide 1.34 milligram/1 milliliter conventional release solution for injection (clinical drug)|

3.8.8.5 Glossary for Medicinal Product

The following definitions and abbreviations apply to this document:

Term	Definition
Active immunity	The usually long lasting immunity which results from the production of antibodies by the immune system within an organism in response to the presence of an antigen.
Active moiety	The molecule or ion, excluding those appended portions of the molecule that cause the drug to be an ester, salt (including a salt with hydrogen or coordination bonds), or other noncovalent derivative (such as a complex, chelate, or clathrate) of the molecule, responsible for the physiological or pharmacological action of the drug substance.
Adjuvant	A substance added to a vaccine to enhance the immune response by degree and/or duration, making it possible to reduce the amount of immunogen per dose or the total number of doses needed to achieve immunity. Often aluminium salts (e.g. aluminium hydroxide, aluminium phosphate or potassium aluminium sulfate), which primarily enhance the immune response to proteins.
Adsorption	The adhesion of atoms, ions, or molecules from a gas, liquid, or dissolved solid to a surface. Similar to surface tension, adsorption is a consequence of surface energy. Atoms on the surface of the adsorbent are not wholly surrounded by other adsorbent atoms and therefore can attract adsorbates (the substance that is adsorbed - in vaccines, the antigen). Aluminium salts (e.g. aluminium hydroxide, aluminium phosphate or potassium aluminium sulfate) are absorbents in vaccine products; the adsorbent is acting as an adjuvant.
Antibody	An immunoglobulin molecule produced by B lymphoid cells with a specific amino acid sequence evoked in humans or other animals by an antigen.
Antigen	A substance that, as a result of coming into contact with appropriate cells, induces a state of sensitivity and/or immune responsiveness after a latent period (days to weeks) and that reacts in a demonstrable way with antibodies and/or immune cells of the sensitized subject in vivo or in vitro. [Stedman's Medical Dictionary].
BAN	British Approved Name

Term	Definition
Basis of Strength Substance	The Basis of Strength Substance (BoSS) represents the substance that is the part of the ingredient that the strength of a given product is based upon. It may be a base, primary modified base or secondary modified base.
BoSS	see *Basis of Strength Substance*
CD	Clinical Drug
CDC	Centers for Disease Control and Prevention; CDC is a major operating component of the United States Department of Health and Human Services. https://www.cdc.gov/
Composite product	Product that contains more than one single or multiple ingredient product packaged together. For example, • PREVPAC® consists of a daily administration pack containing lansoprazole 30 mg oral capsules, amoxicillin 500 mg oral capsules, and clarithromycin 500 mg oral tablets.
Conjugate vaccine	Conjugate vaccines combine a weak antigen with a strong antigen (usually a protein/peptide carrier) so that the immune system has a stronger response to the weak antigen. Conjugation is usually used for polysaccharide antigens, because polysaccharide antigens on their own produce only a B cell response (they are not whole cells, just pieces of pathogen cell wall). The conjugated peptide stimulate T cells which gives a more vigorous immune response and also promotes a more rapid and long-lasting immunologic memory (e.g Haemophilus influenzae type b conjugate vaccine, meningococcal conjugate vaccine). The carrier protein may be the diphtheria toxoid or the tetanus toxoid.
CVX code	The "vaccine administered" code set developed and maintained by the CDC's National Center of Immunization and Respiratory Diseases. When paired with a MVX (manufacturer) code, the specific trade named vaccine may be indicated. Each code is associated with a status indicating its availability in the United States (e.g. Active, Inactive, Non-US). https://www2a.cdc.gov/vaccines/iis/iisstandards/vaccines.asp?rpt=cvx
Disposition	A *behavior* that an active ingredient will exhibit or participate in, given the appropriate context For example, • 734727006 |Opioid receptor agonist (disposition)| • 734698003 |Beta adrenergic receptor antagonist (disposition)|
GTIN	Global Trade Item Number

Term	Definition
Hapten	A molecule that is incapable alone of causing the production of antibodies but can, however, combine with a larger antigenic molecule, called a carrier, to form an antigenic complex (see hapten-carrier complex). [Stedman's Medical Dictionary, adapted]
Hapten-carrier complex	An association between a hapten molecule and an antigen molecule that can stimulate production of antibodies, some of which combine with the hapten portion of the complex. [Stedman's Medical Dictionary, adapted]
Herbal medicine product	Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products, that contain as active ingredients parts of plants, or other plant materials, or combinations. http://www.who.int/medicines/areas/traditional/definitions/en/
Homeopathic product	An alternative approach to medicine based on the belief that natural substances, prepared in a special way and used most often in very small amounts, restore health. According to these beliefs, in order for a remedy to be effective, it must cause in a healthy person the same symptoms being treated in the patient. https://ncit.nci.nih.gov/ncitbrowser/ConceptReport.jsp?dictionary=NCI_Thesaurus&version=19.04f&ns=ncit&code=C15718&key=n1512439168&b=1&n=null https://www.nhs.uk/conditions/homeopathy/#what-is-homeopathy
IDMP	Identification of Medicinal Products; a set of five standards developed by the International Organization for Standardization (ISO) for the identification of medicinal products
Immunogen	A complete antigen (i.e. can evoke the production of antibodies). Synonym for antigen except that it is sometimes used without the specificity of the serotype (e.g. no statement of valency) whereas an antigen should have the valency specified.
Immunoglobulin	A class of polypeptide chain proteins in two pairs (one light, one heavy); antibodies are immunoglobulins and most immunoglobulins function as antibodies. The class of immunoglobulins also includes pathological proteins such as Bence Jones or myeloma globulins.
Inactivated vaccine product	A vaccine product whose antigenic content consists of the disease-causing pathogen that has been inactivated ("killed") usually by heat or by chemicals such as formaldehyde. The pathogen cannot replicate itself at all, but it is still intact and can therefore evoke antibody production (example: polio vaccine).
INN	see *International Nonproprietary Name*

Term	Definition
International Nonproprietary Name	INNs facilitate the identification of pharmaceutical substances or active pharmaceutical ingredients. Each INN is a unique name that is globally recognized and is public property. A nonproprietary name is also known as a generic name. For more information: http://www.who.int/medicines/services/inn/en/ To search for INNs: https://mednet-communities.net/inn/db/searchinn.aspx
Live attenuated vaccine product	A vaccine product whose antigenic content is derived from the disease-causing pathogen but which has been altered to make it less virulent. The pathogen in a live attenuated vaccine has lost its ability to replicate in human cells but still viable to evoke antibody production (e.g. measles, mumps, and rubella vaccine, varicella vaccine).
Monovalent vaccine	A vaccine product that contains a single antigenic serotype
MP	Medicinal Product
MPF	Medicinal Product Form
Multiple ingredient product	Product that contains more than one active ingredient in a single manufactured dose form For example, • 377265005 |Product containing precisely captopril 50 milligram and hydrochlorothiazide 15 milligram/1 each conventional release oral tablet (clinical drug)| • 407853009 |Product containing precisely codeine phosphate 15 milligram and paracetamol 500 milligram/1 each conventional release oral tablet (clinical drug)|
MVX Code	The "Manufacturers of vaccines" code set developed and maintained by the CDC's National Center of Immunization and Respiratory Diseases. When paired with a CVX (vaccine administered) code, the specific trade named vaccine may be indicated. Each code is associated with a status indicating if the manufacturer is currently making vaccines for distribution in the United States (e.g. Active, Inactive). https://www2a.cdc.gov/vaccines/iis/iisstandards/vaccines.asp?rpt=mvx
Passive immunity	The time limited, usually short lived, immunity acquired by direct transference of antibodies into an organism (e.g. by injection of immunoglobulin)
Polyvalent vaccine	A vaccine product that contains multiple antigenic serotypes; the number of which may be stated (e.g. tetravalent (4), pentavalent (5))

Term	Definition
Precise active ingredient	The actual active ingredient that is contained in the product
Role	Role is associated with a particular purpose or outcome. The role is often by virtue of its manufacture or use. Since all occurrences of a given substance or drug product may not be used in the same manner roles are not always and necessarily true. For example, • 53009005 |Medicinal product acting as analgesic agent (product)| • 27867009 |Medicinal product acting as antineoplastic agent (product)|
Serotype	A subdivision of a species or subspecies distinguishable from other strains therein on the basis of antigenicity [Stedman's Medical Dictionary]
Single ingredient product	Product that contains one and only one active ingredient in a single manufactured dose form For example, • 765732008 |Product containing precisely axitinib 1 milligram/1 each conventional release oral tablet (clinical drug)| • 446347007 |Product containing precisely denosumab 60 milligram/1 milliliter conventional release solution for injection (clinical drug)|
Subunit vaccine	A vaccine product whose antigenic content is a target part of a pathogen (e.g. a specific protein from the pathogen) rather than the whole pathogen, produced either by isolation from the pathogen or by recombinant technology
Toxoid	A vaccine product whose antigenic content is a toxin produced by a pathogen that has been treated, commonly with formaldehyde, so as to destroy its toxic property but retain its antigenicity (i.e. its capability of stimulating the production of antitoxin antibodies and thus of producing an active immunity).
Traditional medicine product	Traditional medicine is the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. https://www.who.int/traditional-complementary-integrative-medicine/en/
UCUM	Unified Code for Units of Measure; http://unitsofmeasure.org/trac
USAN	United States Adopted Name

Term	Definition
Vaccine	Any preparation intended for active immunologic prophylaxis (e.g. preparation of killed microns of virulent strains or living microbes of attenuated (variant or mutant) strain; or microbial, fungal, plant, protozoal or metazoan derivatives or products. [Stedman's Medical Dictionary] Originally only applied to live vaccine (vaccinia, cowpox) virus inoculated in the skin as prophylaxis against smallpox and obtained from the skin of calves inoculated with seed virus.
Vaccine pharmacovigilance	Vaccine pharmacovigilance is defined by the WHO as "the science and activities relating to the detection, assessment, understanding and communication of adverse events following immunization and other vaccine- or immunization-related issues, and to the prevention of untoward effects of the vaccine or immunization". https://www.who.int/vaccine_safety/initiative/tools/CIOMS_report_WG_vaccine.pdf
Vaccine valency Antigenic valency	The number of antigenic serotypes present in a vaccine product

3.8.9 Physical Force

Definition	Examples
The application of energy or effort to exert pressure, impact, or influence on an object or substance, resulting in a change in its state of motion, deformation, or overall condition.	• 87588000 | High altitude (physical force) |[1048] • 263762005 | Friction (physical force) |[1049]

Physical Force

The concepts in the *Physical force* hierarchy primarily represent physical forces that may play a role in injuries.

1048 http://snomed.info/id/87588000
1049 http://snomed.info/id/263762005

3.8.10 Physical Object

Definition	Examples
Physical devices relevant to healthcare or to injuries/ accidents	• 469785004 | Heel protector (physical object)|[1050] • 40388003 | Implant, device (physical object)|[1051]

3.8.10.1 Out of scope

The following types of concepts are out of scope for the Physical object hierarchy.

Out of Scope
High level component groupers • High lever grouper concepts that include the term "component" in their name are out of scope of the International edition. Specific device concepts which are logically components, e.g., 304121006 |Femoral head prosthesis (physical object)|, are acceptable as long as the term "component" is not included in the name.
In Vitro Diagnostic • In vitro diagnostic refers to a device that has no direct contact with the patient and does not provide treatment.
Kits or Sets • Concepts containing unspecified data characteristics of kit and set are not in scope for the International edition because what comprises a kit or set may vary across locale or institution or by manufacturer. Concepts described as a kit or set may be handled in other resources such as an UDI repository or National Extension.
Packaged Together • Packaged together means packed (e.g., wrapped or sealed) in a single container that is not intended to be unwrapped or unsealed before it is used by an end user.

3.8.10.2 Physical Object Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

1050 http://snomed.info/id/469785004
1051 http://snomed.info/id/40388003

HRCM 2023-12-01

Domain Information for 260787004 | Physical object (physical object)|[1052]	
Domain Constraint[1053]	<< 260787004 |Physical object (physical object)|[1054]
Parent Domain	-
Proximal Primitive Constraint	<< 260787004 |Physical object (physical object)|[1055]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 260787004 | Physical object (physical object)|[1056]				
Attribute[1057]	Grouped[1058]	Cardinality[1059]	In Group Cardinality[1060]	Range Constraint[1061]
1148969005 |Has absorbability (attribute)|[1062]	0	0..1	0..0	860574003 |Bioabsorbable (qualifier value)|[1063] OR 863965006 |Nonbioabsorbable (qualifier value)|[1064] OR 863968008 |Partially bioabsorbable (qualifier value)|[1065]

1052 http://snomed.info/id/260787004
1053 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1054 http://snomed.info/id/260787004
1055 http://snomed.info/id/260787004
1056 http://snomed.info/id/260787004
1057 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1058 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1059 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1060 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1061 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1062 http://snomed.info/id/1148969005
1063 http://snomed.info/id/860574003
1064 http://snomed.info/id/863965006
1065 http://snomed.info/id/863968008

1148967007 |Has coating material (attribute)|[1066]	0	0..1	0..0	< 105590001 |Substance (substance)|[1067]
840560000 |Has compositional material (attribute)|[1068]	0	0..*	0..0	<< 105590001 |Substance (substance)|[1069]
836358009 |Has device intended site (attribute)|[1070]	0	0..*	0..0	<< 123037004 |Body structure (body structure)|[1071]
827081001 |Has filling (attribute)|[1072]	0	0..*	0..0	<< 105590001 |Substance (substance)|[1073]
1148968002 |Has surface texture (attribute)|[1074]	0	0..*	0..0	82280004 |Smooth (qualifier value)|[1075] OR 860647008 |Textured (qualifier value)|[1076]
1148965004 |Is sterile (attribute)|[1077]	0	0..1	0..0	31874001 |True (qualifier value)|[1078] OR 64100000 |False (qualifier value)|[1079]

3.8.10.3 Physical Object Defining Attributes

The following defining attributes correspond to the *Physical Object Attributes Summary* table.

Has absorbability

This attribute represents the absorbability aspect of an object.

For example,

- 705633004 |Bioabsorbable vascular stent (physical object)| Has absorbability value of 860574003 |Bioabsorbable (qualifier value)|

Has coating material

This attribute represents the material with which an object is coated.

For example,

- 717296006 |Polymer coated metal colonic stent (physical object)| Has coating material value of 412155002 |Polymer (substance)|

1066 http://snomed.info/id/1148967007
1067 http://snomed.info/id/105590001
1068 http://snomed.info/id/840560000
1069 http://snomed.info/id/105590001
1070 http://snomed.info/id/836358009
1071 http://snomed.info/id/123037004
1072 http://snomed.info/id/827081001
1073 http://snomed.info/id/105590001
1074 http://snomed.info/id/1148968002
1075 http://snomed.info/id/82280004
1076 http://snomed.info/id/860647008
1077 http://snomed.info/id/1148965004
1078 http://snomed.info/id/31874001
1079 http://snomed.info/id/64100000

Has compositional material

This attribute represents the material or substance of which an object is composed.

For example,

- 257363003 |Metal stent (physical object)| Has compositional material value of 425620007 |Metal (substance)|

Has device intended site

This attribute represents the site where the device is intended to reside in or on the body.

For example,

- 705472007 |Esophageal stent (physical object)| Has device intended site value of 32849002 |Esophageal structure (body structure)|

Has filling

This attribute represents the material or substance that fills an object.

For example,

- 464376000 |Saline-filled breast implant (physical object)| Has filling value of 387390002 |Sodium chloride (substance)|

Has surface texture

This attribute represents the tactile characteristic or appearance of the surface of an object.

For example,

- 769177007 |Saline-filled smooth breast implant (physical object)| Has surface texture value of 82280004 |Smooth (qualifier value)|

Is sterile

This attribute represents the sterility quality (e.g. sterile or non-sterile) of an object.

For example,

- 716668000 |Non-sterile bare metal esophageal stent (physical object)| Is sterile value of 64100000 |False (qualifier value)|

3.8.10.4 Physical Object Naming and Modeling Conventions

Specific editorial guidelines for modeling and terming will be documented for each device type as completed.

- Breast Prosthesis Naming and Modeling(see page 408)
- Cardiac Valve Prosthesis Naming and Modeling(see page 410)
- Shunt Naming and Modeling(see page 412)
- Stent Naming and Modeling(see page 413)

Breast Prosthesis Naming and Modeling

Naming Guidelines

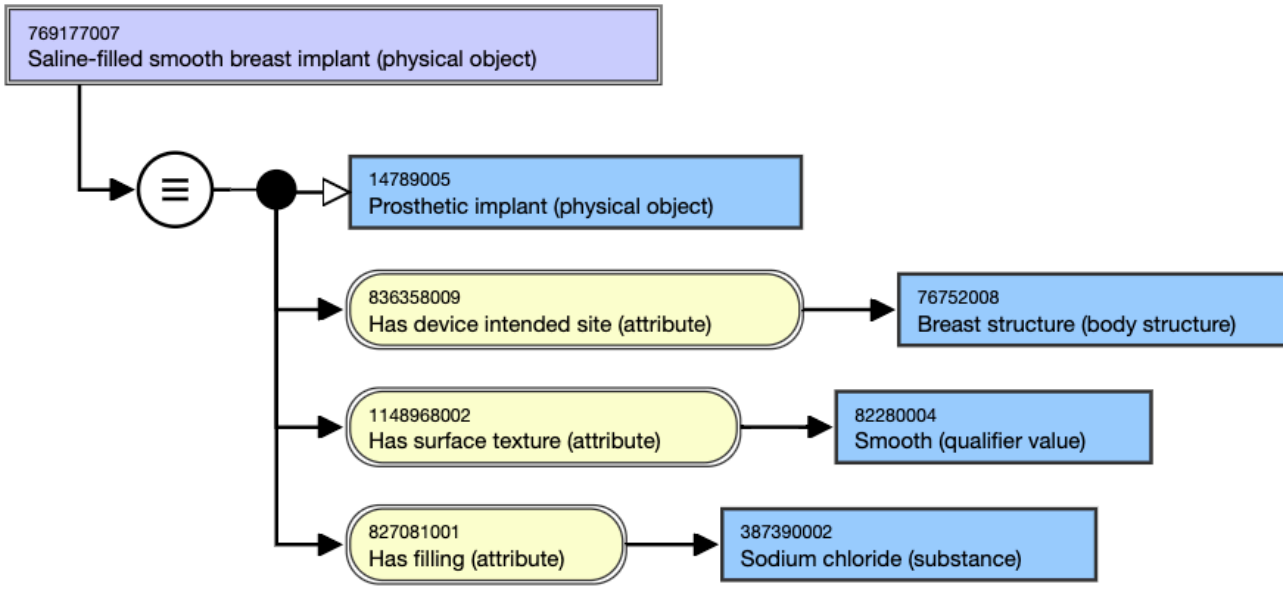
FSN	Use the following naming pattern for the FSN; align terming and case sensitivity with the FSN for the concepts selected as the attribute values, excluding the semantic tag. [filling] [surface texture] breast implant (physical object) For example, Saline-filled textured breast implant (physical object)
Preferred Term	Use the following pattern for the PT; align terming and case sensitivity with the PT for the concept that is selected as the attribute value. [filling] [surface texture] breast implant For example, Saline-filled textured breast implant
Synonym	Synonyms are not generally added for concepts in this hierarchy.

Modeling (stated view)

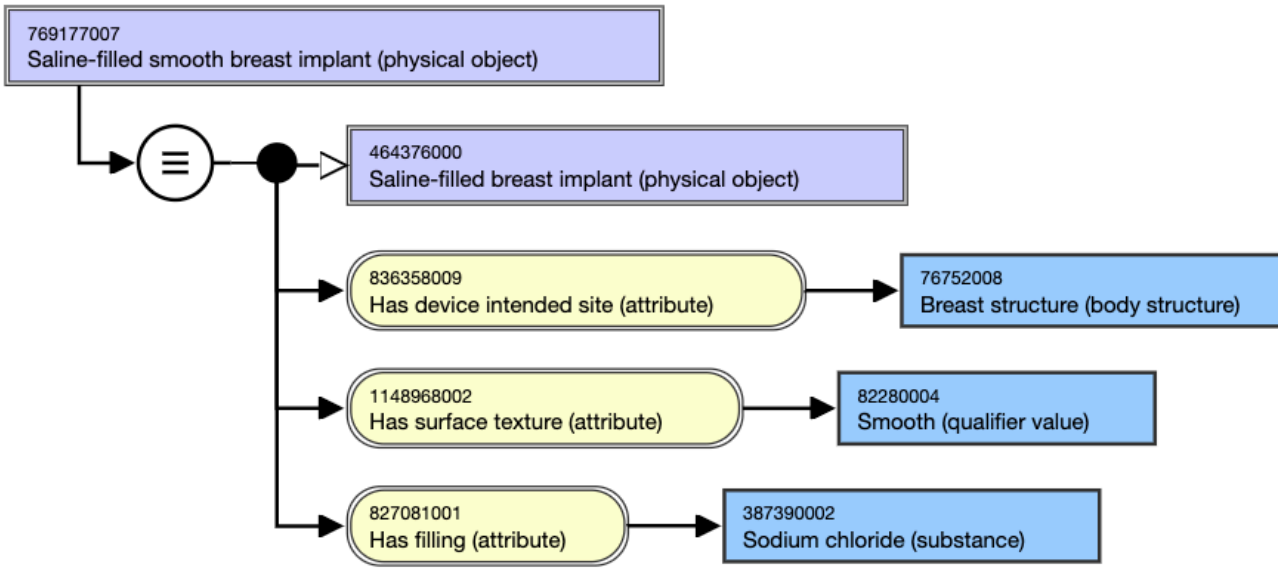
Stated parent concept(s)	14789005 |Prosthetic implant (physical object)|
Semantic tag	(physical object)
Attribute: Has device intended site (attribute)	• Range: <<123037004 |Body structure (body structure)| • NOTE: While the MRCM allowed range includes the top-level concept, 123037004 |Body structure (body structure)|, only the descendants should be used in modeling breast prosthesis concepts. • Cardinality: 0..1
Attribute: Has filling (attribute)	• Range: <<105590001 |Substance (substance)| • NOTE: While the MRCM allowed range includes the top-level concept, 105590001 |Substance (substance)|, only the descendants should be used in modeling breast prosthesis concepts. • Cardinality: 0..*
Attribute: Has surface texture (attribute)	• Range: 82280004 |Smooth (qualifier value)| OR 860647008 | Textured (qualifier value)| • Cardinality: 0..*

Exemplars

The following illustrates the **stated** view for 769177007 |Saline-filled smooth breast implant (physical object)|:



The following illustrates the **inferred** view for 769177007 |Saline-filled smooth breast implant (physical object)|:



Cardiac Valve Prosthesis Naming and Modeling

Naming Guidelines

FSN	Use the following naming pattern for the FSN; align terming and case sensitivity with the FSN for the concepts selected as the attribute values, excluding the semantic tag. [is sterile] [compositional material] [device intended site] cardiac valve prosthesis (physical object) For example, Biologic cardiac valve prosthesis (physical object) Aortic valve prosthesis (physical object)
Preferred Term	Use the following naming pattern for the PT; align terming and case sensitivity with the PT for the concept that is selected as the attribute value. [is sterile] [compositional material] [device intended site] cardiac valve prosthesis For example, Biologic cardiac valve prosthesis Aortic valve prosthesis

Synonym	Synonyms are not generally added for concepts in this hierarchy.
	• Exceptions:
	  • *Heart* in place of *cardiac*, such as in "biologic heart valve prosthesis"
	  • "Bioprosthesis" for biologic cardiac valve prosthesis

Modeling (stated view)

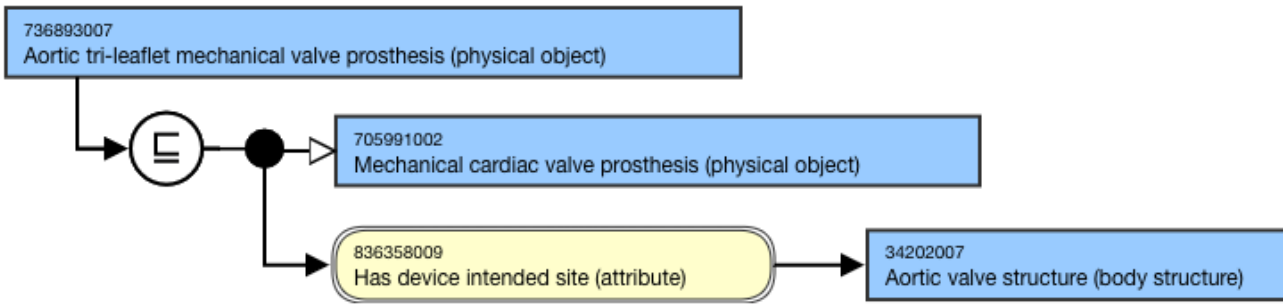
Stated parent concept(s)	14789005 |Prosthetic implant (physical object)| 303619008 |Cardiac implant (physical object)| 705991002 |Mechanical heart valve prosthesis (physical object)|, if applicable 258166002 |Custom made implant (physical object)|, if applicable
Semantic tag	(physical object)

Attribute: Has device intended site (attribute)	• Range: <<123037004 |Body structure (body structure)|
	  • NOTE:
	  • NOTE: While the MRCM allowed range includes the top-level concept, 123037004 |Body structure (body structure)|, only the descendants should be used in modeling cardiac valve prosthesis concepts.
	• Cardinality: 0..1

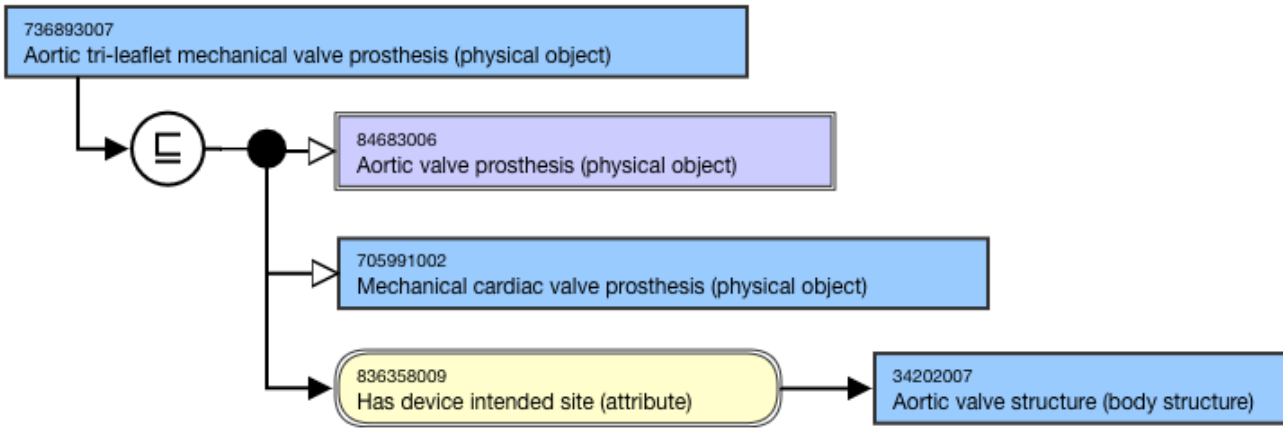
Attribute: Has compositional material (attribute)	• Range: <<105590001 |Substance (substance)| • NOTE: While the MRCM allowed range includes the top-level concept, 105590001 |Substance (substance)|, only the descendants should be used in modeling cardiac valve prosthesis concepts. • Cardinality: 0..*
Attribute: Is sterile (attribute)	• Range: 31874001 |True (qualifier value)| OR 64100000 |False (qualifier value) • Cardinality: 0..1

Exemplars

The following illustrates the **stated** view for 736893007 |Aortic tri-leaflet mechanical valve prosthesis (physical object)|:



The following illustrates the **inferred** view for 736893007 |Aortic tri-leaflet mechanical valve prosthesis (physical object)|:



Shunt Naming and Modeling

Naming Guidelines

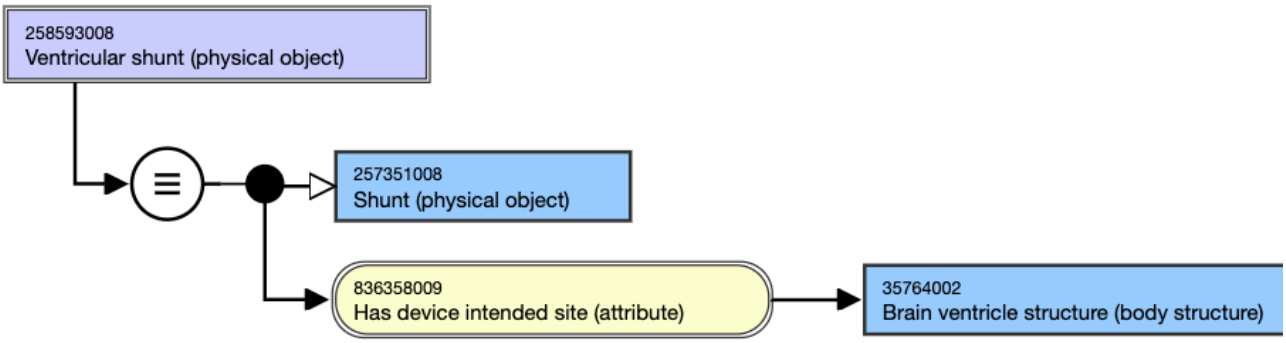
FSN	Use the following naming pattern for the FSN; align terming and case sensitivity with the FSN for the concepts selected as the attribute values, excluding the semantic tag. [compositional material] [body structure] shunt (physical object) For example, • Ventricular shunt (physical object) • Pleuroperitoneal shunt (physical object)
Preferred Term	Use the following naming pattern for the PT; align terming and case sensitivity with the PT for the concept that is selected as the attribute value. [compositional material] [body structure] shunt For example, • Ventricular shunt • Pleuroperitoneal shunt
Synonym	Synonyms are not generally added for concepts in this hierarchy.

Modeling (stated view)

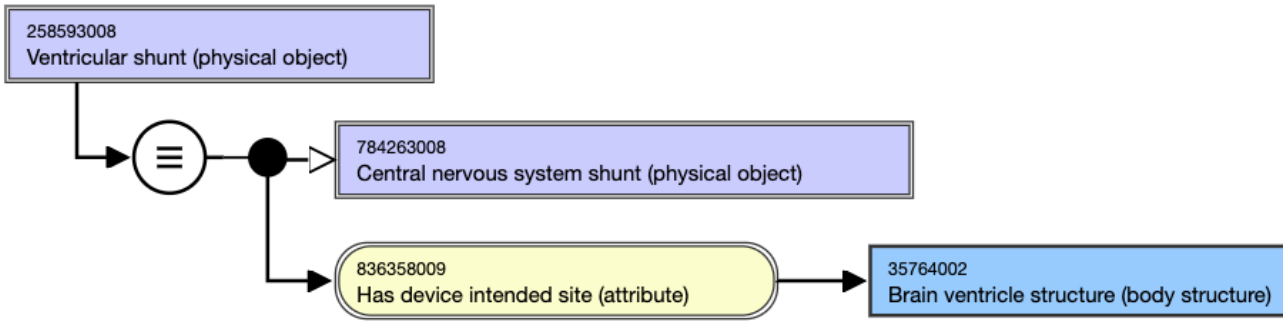
Stated parent concept(s)	257351008 |Shunt (physical object)| Additional parent, if applicable: • 258166002 |Custom made implant (physical object)
Semantic tag	(physical object)
Attribute: Has device intended site	• Note this attribute is used to model the proximal site of the shunt only. • Range: <<123037004 |Body structure (body structure)| • NOTE: While the MRCM allowed range includes the top-level concept, 123037004 |Body structure (body structure)|, only the descendants should be used in modeling shunt concepts. • Cardinality: 0..1
Attribute: Has compositional material	• Range: <<105590001 |Substance (substance)| • NOTE: While the MRCM allowed range includes the top-level concept, 105590001 |Substance (substance)|, only the descendants should be used in modeling shunt concepts. • Cardinality: 0..*

Exemplars

The following illustrates the **stated** view for 258593008 |Ventricular shunt (physical object)|:



The following illustrates the **inferred** view for 258593008 |Ventricular shunt (physical object)|:



Stent Naming and Modeling

Naming Guidelines

FSN	Use the following naming pattern for the FSN; align terming and case sensitivity with the FSN for the concepts selected as the attribute values, excluding the semantic tag. [is sterile] [absorbability] [compositional material] [coating] [device intended site] stent (physical object) For example, • Custom-made bioabsorbable vaginal stent (physical object) • Bare metal renal artery stent (physical object) • Silicon carbide coated intracranial vascular stent (physical object) • Sterile polymer coated metal esophageal stent (physical object)

Preferred Term	Use the following naming pattern for the PT; align terming and case sensitivity with the PT for the concept that is selected as the attribute value. For multiple ingredient drug products, the active ingredients must be in alphabetical order and separated by the word “and”. [is sterile] [absorbability] [compositional material] [coating] [device intended site] stent For example, • Custom-made bioabsorbable vaginal stent • Bare metal renal artery stent • Silicon carbide coated intracranial vascular stent • Sterile polymer coated metal esophageal stent
Synonym	Synonyms are not generally added for concepts in this hierarchy.

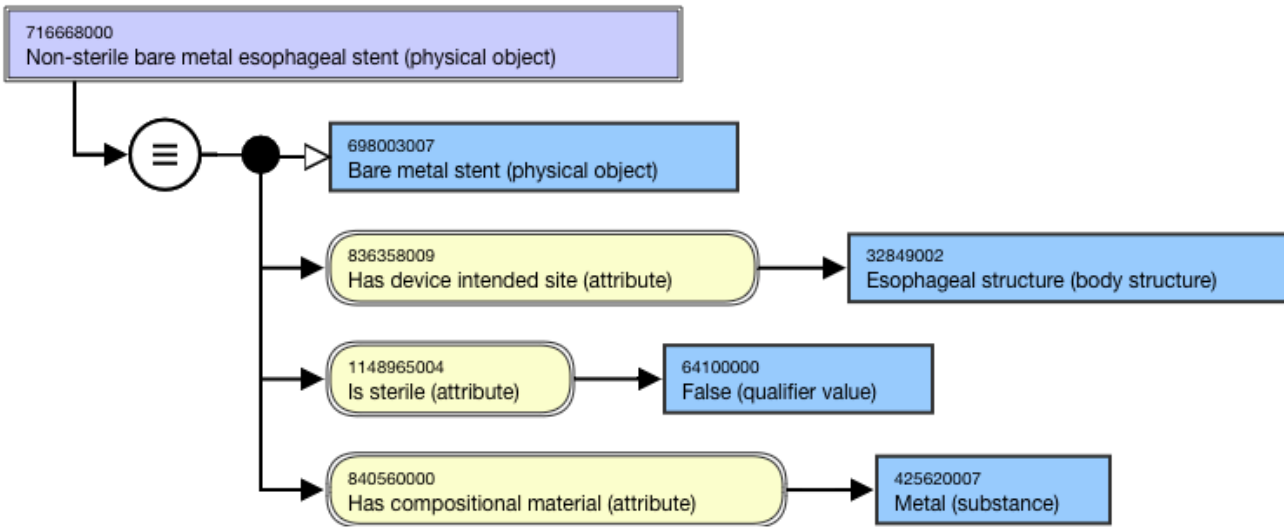
Modeling (stated view)

Stated parent concept	65818007 |Stent (physical object)| 258166002 |Custom made implant (physical object)|, if applicable Exception: 411114003 |Drug coated stent (product)| is modeled with an additional stated parent of 411115002 |Drug-device combination product (product)|
Semantic tag	(physical object)
Attribute: Has absorbability	• Range: 860574003 |Bioabsorbable (qualifier value)| OR 863965006 |Nonbioabsorbable (qualifier value)| OR 863968008 |Partially bioabsorbable (qualifier value)| • Cardinality: 0..1
Attribute: Has coating material	• Range: < 105590001 |Substance (substance)| • Cardinality: 0..1
Attribute: Has compositional material	• Range: <<105590001 |Substance (substance)| • NOTE: While the MRCM allowed range includes the top-level concept, 105590001 |Substance (substance)|, only the descendants should be used in modeling stent concepts. • Cardinality: 0..*

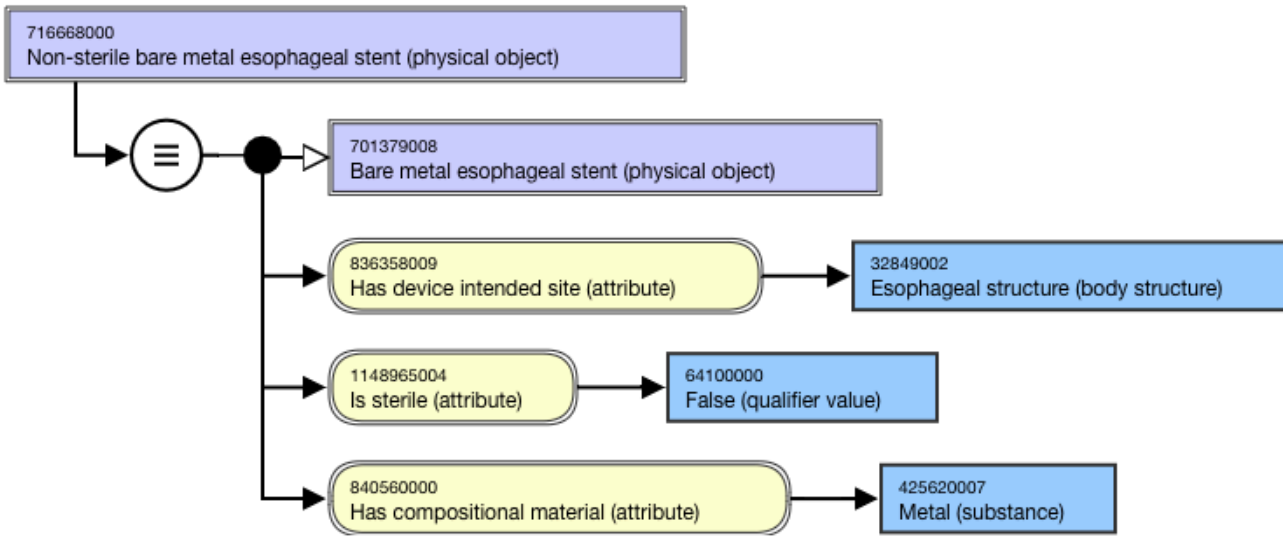
Attribute: Has device intended site	• Range: <<123037004 |Body structure (body structure)| • NOTE: While the MRCM allowed range includes the top-level concept, 123037004 |Body structure (body structure)|, only the descendants should be used in modeling stent concepts. • Cardinality: 0..1
Attribute: Is sterile	• Range: 31874001 |True (qualifier value)| OR 64100000 |False (qualifier value) • Cardinality: 0..1

Exemplars

The following illustrates the **stated** view for 716668000 |Non-sterile bare metal esophageal stent (physical object)|:



The following illustrates the **inferred** view for 716668000 |Non-sterile bare metal esophageal stent (physical object)|:



3.8.11 Procedure

Definition	Examples
• Procedure: activities performed in the provision of health care (includes medical history-taking, physical examination, diagnostic and therapeutic interventions, training and education, and counseling) • Regime/therapy (subtype of procedure): set of procedures focused on a single purpose on one patient over time (e.g. repeated administration of drug in a small dose for an indefinite period of time)	• 54321008 | Cardiac flow imaging (procedure)|[1080] • 367428009 | Desensitization therapy (regime/therapy)|[1081]

3.8.11.1 Procedure concepts

Procedure concepts represent activities performed in the provision of health care. This *hierarchy* represents a broad variety of activities, including but not limited to:

- Invasive procedures, e.g. 77018005 \| Excision of lesion of intracranial artery (procedure)\|[1082]
- Administration of medicines, e.g. 39343008 \| Pertussis vaccination (procedure)\|[1083]
- Imaging procedures, e.g. 47079000 \| Ultrasonography of breast (procedure)\|[1084]
- Education procedures, e.g. 183063000 \| Low salt diet education (procedure)\|[1085]
- Administrative procedures, e.g. 305212007 \| Medical records transfer (procedure)\|[1086]

1080 http://snomed.info/id/54321008
1081 http://snomed.info/id/367428009
1082 http://snomed.info/id/77018005
1083 http://snomed.info/id/39343008
1084 http://snomed.info/id/47079000
1085 http://snomed.info/id/183063000
1086 http://snomed.info/id/305212007

3.8.11.2 Procedure Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM). In addition, 386053000 | Evaluation procedure (procedure)|[1087] , 387713003 | Surgical procedure (procedure)|[1088] , and 1285465008 | Administration via specific route (procedure)|[1089] each have unique defining attributes as seen in their separate tables below.

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Domain Information for 71388002 | Procedure (procedure)|[1090]	
Domain Constraint[1091]	<< 71388002 |Procedure (procedure)|[1092]
Parent Domain	-
Proximal Primitive Constraint	<< 71388002 |Procedure (procedure)|[1093]
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 71388002 | Procedure (procedure)|[1094]

Attribute[1095]	Grouped[1096]	Cardinality[1097]	In Group Cardinality[1098]	Range Constraint[1099]
260507000 |Access (attribute)|[1100]	1	0..*	0..1	<< 309795001 |Surgical access values (qualifier value)|[1101]

1087 http://snomed.info/id/386053000
1088 http://snomed.info/id/387713003
1089 http://snomed.info/id/1285465008
1090 http://snomed.info/id/71388002
1091 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1092 http://snomed.info/id/71388002
1093 http://snomed.info/id/71388002
1094 http://snomed.info/id/71388002
1095 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1096 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1097 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1098 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1099 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1100 http://snomed.info/id/260507000
1101 http://snomed.info/id/309795001

363699004 |Direct device (attribute)|[1102]	1	0..*	0..1	<< 49062001 |Device (physical object)|[1103]
363700003 |Direct morphology (attribute)|[1104]	1	0..*	0..1	<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[1105]
363701004 |Direct substance (attribute)|[1106]	1	0..*	0..1	<< 105590001 |Substance (substance)|[1107] OR << 373873005 |Pharmaceutical / biologic product (product)|[1108]
363702006 |Has focus (attribute)|[1109]	1	0..*	0..1	<< 404684003 |Clinical finding (finding)|[1110] OR << 71388002 |Procedure (procedure)|[1111]
363703001 |Has intent (attribute)|[1112]	1	0..*	0..1	<< 363675004 |Intents (nature of procedure values) (qualifier value)|[1113]
363710007 |Indirect device (attribute)|[1114]	1	0..*	0..1	<< 49062001 |Device (physical object)|[1115]
363709002 |Indirect morphology (attribute)|[1116]	1	0..*	0..1	<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[1117]
260686004 |Method (attribute)|[1118]	1	0..*	0..1	<< 129264002 |Action (qualifier value)|[1119]
246454002 |Occurrence (attribute)|[1120]	1	0..*	0..1	<< 282032007 |Periods of life (qualifier value)|[1121]
260870009 |Priority (attribute)|[1122]	1	0..*	0..1	<< 272125009 |Priorities (qualifier value)|[1123]

1102 http://snomed.info/id/363699004
1103 http://snomed.info/id/49062001
1104 http://snomed.info/id/363700003
1105 http://snomed.info/id/49755003
1106 http://snomed.info/id/363701004
1107 http://snomed.info/id/105590001
1108 http://snomed.info/id/373873005
1109 http://snomed.info/id/363702006
1110 http://snomed.info/id/404684003
1111 http://snomed.info/id/71388002
1112 http://snomed.info/id/363703001
1113 http://snomed.info/id/363675004
1114 http://snomed.info/id/363710007
1115 http://snomed.info/id/49062001
1116 http://snomed.info/id/363709002
1117 http://snomed.info/id/49755003
1118 http://snomed.info/id/260686004
1119 http://snomed.info/id/129264002
1120 http://snomed.info/id/246454002
1121 http://snomed.info/id/282032007
1122 http://snomed.info/id/260870009
1123 http://snomed.info/id/272125009

405815000 |Procedure device (attribute)|[1124]	1	0..*	0..*	<< 49062001 |Device (physical object)|[1125]
405816004 |Procedure morphology (attribute)|[1126]	1	0..*	0..*	<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[1127]
363704007 |Procedure site (attribute)|[1128]	1	0..*	0..*	<< 442083009 |Anatomical or acquired body structure (body structure)|[1129]
405813007 |Procedure site - Direct (attribute)|[1130]	1	0..*	0..1	<< 442083009 |Anatomical or acquired body structure (body structure)|[1131]
405814001 |Procedure site - Indirect (attribute)|[1132]	1	0..*	0..1	<< 442083009 |Anatomical or acquired body structure (body structure)|[1133]
370131001 |Recipient category (attribute)|[1134]	1	0..*	0..1	<< 125676002 |Person (person)|[1135] OR << 133928008 |Community (social concept)|[1136] OR << 35359004 |Family (social concept)|[1137] OR << 389109008 |Group (social concept)|[1138]
246513007 |Revision status (attribute)|[1139]	1	0..*	0..1	<< 255231005 |Revision - value (qualifier value)|[1140] OR << 257958009 |Part of multistage procedure (qualifier value)|[1141] OR << 261424001 |Primary operation (qualifier value)|[1142]
425391005 |Using access device (attribute)|[1143]	1	0..*	0..1	<< 49062001 |Device (physical object)|[1144]

1124 http://snomed.info/id/405815000
1125 http://snomed.info/id/49062001
1126 http://snomed.info/id/405816004
1127 http://snomed.info/id/49755003
1128 http://snomed.info/id/363704007
1129 http://snomed.info/id/442083009
1130 http://snomed.info/id/405813007
1131 http://snomed.info/id/442083009
1132 http://snomed.info/id/405814001
1133 http://snomed.info/id/442083009
1134 http://snomed.info/id/370131001
1135 http://snomed.info/id/125676002
1136 http://snomed.info/id/133928008
1137 http://snomed.info/id/35359004
1138 http://snomed.info/id/389109008
1139 http://snomed.info/id/246513007
1140 http://snomed.info/id/255231005
1141 http://snomed.info/id/257958009
1142 http://snomed.info/id/261424001
1143 http://snomed.info/id/425391005
1144 http://snomed.info/id/49062001

424226004 |Using device (attribute)|[1145]	1	0..*	0..*	<< 49062001 |Device (physical object)|[1146]
424244007 |Using energy (attribute)| [1147]	1	0..*	0..1	<< 78621006 |Physical force (physical force)| [1148]
424361007 |Using substance (attribute) |[1149]	1	0..*	0..1	<< 105590001 |Substance (substance)|[1150]

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Domain Information for 386053000 | Evaluation procedure (procedure)|[1151]	
Domain Constraint[1152]	<< 386053000 |Evaluation procedure (procedure)|[1153]
Parent Domain	71388002 |Procedure (procedure)|[1154]
Proximal Primitive Constraint	<< 71388002 |Procedure (procedure)|[1155]
Proximal Primitive Refinement	[[1..*]] 260686004 |Method|[1156] = [[+id(<< 129265001 |Evaluation - action|[1157])]]

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Author View of Attributes and Ranges for 386053000 | Evaluation procedure (procedure)|[1158]

1145 http://snomed.info/id/424226004
1146 http://snomed.info/id/49062001
1147 http://snomed.info/id/424244007
1148 http://snomed.info/id/78621006
1149 http://snomed.info/id/424361007
1150 http://snomed.info/id/105590001
1151 http://snomed.info/id/386053000
1152 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1153 http://snomed.info/id/386053000
1154 http://snomed.info/id/71388002
1155 http://snomed.info/id/71388002
1156 http://snomed.info/id/260686004
1157 http://snomed.info/id/129265001
1158 http://snomed.info/id/386053000

Attribute[1159]	Grouped[1160]	Cardinality[1161]	In Group Cardinality[1162]	Range Constraint[1163]
246093002 |Component (attribute)|[1164]	1	0..*	0..1	<< 105590001 |Substance (substance)|[1165] OR << 123037004 |Body structure (body structure)|[1166] OR << 123038009 |Specimen (specimen)|[1167] OR << 260787004 |Physical object (physical object)|[1168] OR << 373873005 |Pharmaceutical / biologic product (product)|[1169] OR << 410607006 |Organism (organism)|[1170] OR << 419891008 |Record artifact (record artifact)|[1171]
116686009 |Has specimen (attribute)|[1172]	1	0..*	0..1	<< 123038009 |Specimen (specimen)|[1173]
370129005 |Measurement method (attribute)|[1174]	1	0..*	0..1	<< 127789004 |Laboratory procedure categorized by method (procedure)|[1175]
370130000 |Property (attribute)|[1176]	1	0..1	0..1	<< 118598001 |Property (qualifier value)|[1177]

1159 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1160 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1161 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1162 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1163 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1164 http://snomed.info/id/246093002
1165 http://snomed.info/id/105590001
1166 http://snomed.info/id/123037004
1167 http://snomed.info/id/123038009
1168 http://snomed.info/id/260787004
1169 http://snomed.info/id/373873005
1170 http://snomed.info/id/410607006
1171 http://snomed.info/id/419891008
1172 http://snomed.info/id/116686009
1173 http://snomed.info/id/123038009
1174 http://snomed.info/id/370129005
1175 http://snomed.info/id/127789004
1176 http://snomed.info/id/370130000
1177 http://snomed.info/id/118598001

370132008 |Scale type (attribute)|[1178]	1	0..1	0..1	<< 117362005 |Nominal value (qualifier value)|[1179] OR << 117364006 |Narrative value (qualifier value)|[1180] OR << 117444000 |Text value (qualifier value)|[1181] OR << 26716007 |Qualitative (qualifier value)|[1182] OR < 398195001 |Measurement scales (qualifier value)|[1183]
370134009 |Time aspect (attribute)|[1184]	1	0..1	0..1	<< 7389001 |Time frame (qualifier value)|[1185]

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Domain Information for 387713003 | Surgical procedure (procedure)|[1186]	
Domain Constraint[1187]	<< 387713003 |Surgical procedure (procedure)|[1188]
Parent Domain	71388002 |Procedure (procedure)|[1189]
Proximal Primitive Constraint	<< 71388002 |Procedure (procedure)|[1190]
Proximal Primitive Refinement	[[1..*]] 260686004 |Method|[1191] = [[+id(<< 129284003 |Surgical action (qualifier value)|[1192])]]

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1178 http://snomed.info/id/370132008
1179 http://snomed.info/id/117362005
1180 http://snomed.info/id/117364006
1181 http://snomed.info/id/117444000
1182 http://snomed.info/id/26716007
1183 http://snomed.info/id/398195001
1184 http://snomed.info/id/370134009
1185 http://snomed.info/id/7389001
1186 http://snomed.info/id/387713003
1187 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1188 http://snomed.info/id/387713003
1189 http://snomed.info/id/71388002
1190 http://snomed.info/id/71388002
1191 http://snomed.info/id/260686004
1192 http://snomed.info/id/129284003

Author View of Attributes and Ranges for 387713003 | Surgical procedure (procedure)|[1193]				
Attribute[1194]	Grouped[1195]	Cardinality[1196]	In Group Cardinality[1197]	Range Constraint[1198]
424876005 |Surgical approach (attribute)|[1199]	1	0..*	0..1	<< 103379005 |Procedural approach (qualifier value)|[1200]

HRCM 2023-12-01

Domain Information for 1285465008 | Administration via specific route (procedure)|[1201]	
Domain Constraint[1202]	<< 1285465008 |Administration via specific route (procedure)|[1203]
Parent Domain	71388002 |Procedure (procedure)|[1204]
Proximal Primitive Constraint	<< 71388002 |Procedure (procedure)|[1205]
Proximal Primitive Refinement	[[1..*]] 260686004 |Method|[1206] = [[+id(<< 129445006 |Administration - action (qualifier value)|[1207])]], [[1..*]] 410675002 |Route of administration (attribute)|[1208] = [[+id(<< 284009009 |Route of administration value (qualifier value)|[1209])]], [[1..*]] 363701004 |Direct substance (attribute)|[1210] = [[+id(<< 105590001 |Substance (substance)|[1211])]]

1193 http://snomed.info/id/387713003
1194 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1195 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1196 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1197 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1198 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1199 http://snomed.info/id/424876005
1200 http://snomed.info/id/103379005
1201 http://snomed.info/id/1285465008
1202 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1203 http://snomed.info/id/1285465008
1204 http://snomed.info/id/71388002
1205 http://snomed.info/id/71388002
1206 http://snomed.info/id/260686004
1207 http://snomed.info/id/129445006
1208 http://snomed.info/id/410675002
1209 http://snomed.info/id/284009009
1210 http://snomed.info/id/363701004
1211 http://snomed.info/id/105590001

HRCM 2023-12-01

Author View of Attributes and Ranges for 1285465008 | Administration via specific route (procedure)|[1212]				
Attribute[1213]	Grouped[1214]	Cardinality[1215]	In Group Cardinality[1216]	Range Constraint[1217]
410675002 |Route of administration (attribute)|[1218]	1	0..*	0..1	<< 284009009 |Route of administration value (qualifier value)|[1219]

3.8.11.3 Procedure Defining Attributes

The following contain the defining attributes for Procedure concepts. Evaluation, Surgical, and Administration of Substance via Specific Route procedures each have unique defining attributes.

- Procedure, General(see page 424)
- Evaluation Procedure(see page 433)
- Surgical Procedure(see page 438)
- Administration via Specific Route Procedure(see page 438)

Procedure, General

The following defining attributes correspond to the *Procedure Attributes Summary* table from the HRCM.

Self-grouped Attributes

The following attributes are self-grouped, meaning they are not grouped with any other attributes:

- **Priority**
- **Has focus**

Access

Access (attribute) describes the route used to access the site of a procedure. It distinguishes open, closed, and percutaneous procedures.

For example,

1212 http://snomed.info/id/1285465008
1213 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1214 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1215 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1216 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1217 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1218 http://snomed.info/id/410675002
1219 http://snomed.info/id/284009009

- 174572001 | Open removal of bile duct stent (procedure)|[1220] has Access of Open approach - access (qualifier value)

Direct device

Direct device (attribute) represents the device on which the method directly acts.

For example,

- 431698006 | Adjustment of gastric banding using fluoroscopic guidance (procedure)|[1221] has Direct device of Surgical band (physical object)

Subtypes of Surgical repair (procedure) that include a prosthetic device should be modeled using the DIRECT DEVICE attribute when the value is <<53350007 |Prosthesis, device (physical object)|

Direct morphology

Direct morphology (attribute) describes the morphologically abnormal structure that is the direct object of the Method action.

For example,

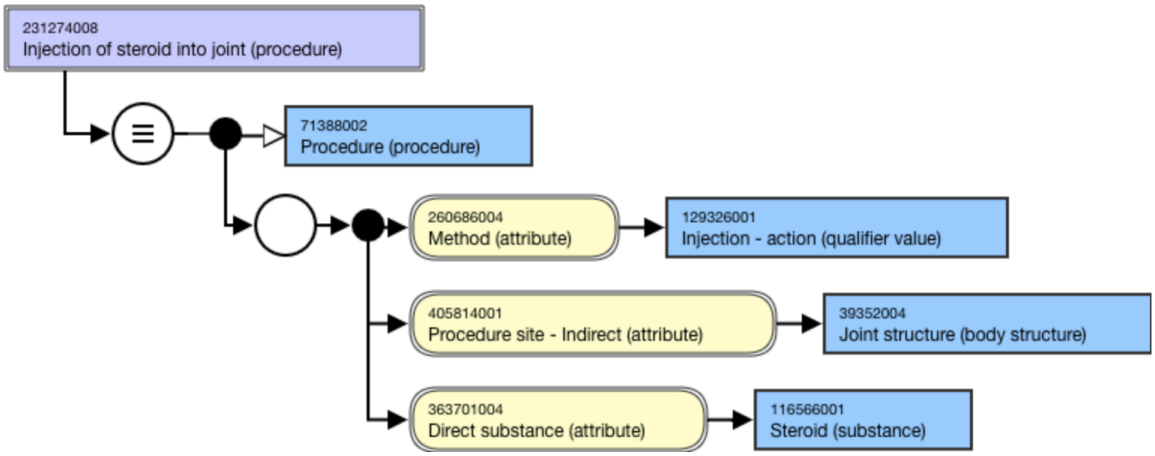
- 31512000 | Shaving of benign lesion with chemical cauterization (procedure)|[1222] has the Direct morphology of Lesion (morphologic abnormality)

Direct substance

Direct substance (attribute) describes the Substance or Pharmaceutical/biologic product on which the procedure's method directly acts.

For example,

- 231274008 |Injection of steroid into joint (procedure)| has Direct substance (attribute) of Steroid (substance)



1220 http://snomed.info/id/174572001
1221 http://snomed.info/id/431698006
1222 http://snomed.info/id/31512000

Figure 1: Stated view of 231274008 |Injection of steroid into joint (procedure)| with Direct substance (attribute) of Steroid (substance)

Pharmaceutical / biologic product

Although Pharmaceutical / biologic product (product) and its descendants are considered valid values for the Direct substance (attribute) by the MRCM, they are not currently used as values for this attribute in the International Release. The only exception is 787859002 |Vaccine product (medicinal product)| and its descendants, which can be used as valid values for this attribute.

Has focus

Has focus (attribute) specifies the Clinical finding or Procedure which is the focus of a procedure. This attribute is self-grouped.

For example,

- 385941006 | Wound care assessment (procedure)|[1223] Has focus of Wound care (regime/therapy)

Has intent

The Has intent attribute is used when a procedure may be performed for various reasons, described with subtypes of 363675004 |Intents (nature of procedure values) (qualifier value)|, such as diagnostic, palliative, preventive, therapeutic, etc. These intents are not used to define procedures with intents that are inherent to the procedure; such as biopsies that are by definition diagnostic, or fracture fixations which are always therapeutic.

The Has intent attribute should be grouped with other attributes that represent the procedure with that intent.

For example,

- 108249004 | Audiologic AND/OR audiometric test including vestibular function (procedure)|[1224] is inherently diagnostic, so it would not be modeled with a Has intent (attribute) of Diagnostic intent (qualifier value).
- 274432006 | Therapeutic aspiration of ovary (procedure)|[1225] and 274389009 | Diagnostic aspiration of ovary (procedure)|[1226] are both modeled with the Has intent (attribute), as the aspiration of ovary procedure can be either therapeutic or diagnostic.

Indirect device

Indirect device (attribute) represents action on something that is located in or on a device, but is not directly on the device itself. This attribute is infrequently needed. When modeling, carefully consider its use.

For example,

- 232762008 | Excision of vegetations from implanted mitral valve (procedure)|[1227] has Indirect device of Mitral valve prosthesis device (physical object).

1223 http://snomed.info/id/385941006
1224 http://snomed.info/id/108249004
1225 http://snomed.info/id/274432006
1226 http://snomed.info/id/274389009
1227 http://snomed.info/id/232762008

In this example, the vegetation is being excised. The mitral valve prosthesis device is where the vegetation is located, but the mitral valve prosthesis, itself, is not excised. Thus, the mitral valve prosthesis device is the Indirect device.

Indirect morphology

Indirect morphology (attribute) describes the morphology that is acted upon, but is not the direct object of the Method action. This means the procedure acts directly on something else, e.g. a device, substance, or anatomical structure.

For example,

- 404205006 | Removal of mesh from wound (procedure)|[1228] has Indirect morphology of Wound (morphologic abnormality)

Method

Method (attribute) represents the action being performed to accomplish the procedure.

For example,

- 10255001 | Incision of ureter (procedure)|[1229] has Method (attribute) of Incision - action (qualifier value)

Procedures with a Method (attribute) can be described using an action verb that corresponds to the method. The direct object/s of the action verb should be represented using one or more of the four direct-object attributes, depending on whether the direct object on which the method acts is an:

- Anatomical structure: Procedure site - Direct
- Morphologic abnormality: Direct morphology
- Device: Direct Device
- Substance: Direct Substance

If the anatomical structure, device, or substance of the direct object is indeterminate, do not use the direct-object attributes.

When modeling procedures where the Method is *Removal - action* (qualifier value) or one of its subtypes, e.g. Excision, Surgical biopsy, etc., for removal of:

- Structures, grafts, and tissue lesions (e.g. cysts, tumors, etc. are considered removal of the site), use *Procedure site - Direct.*
- Devices, calculi, thrombi, foreign bodies, and other non-tissue entities from the structure, use *Procedure site - Indirect.*

For example,

- 43748006 |Removal of urinary bladder catheter (procedure)| has a Method (attribute) of Removal - action (qualifier value). Because a device is being removed, use Procedure site - Indirect (attribute) with a value of Bladder and outflow structure (body structure)

Method (attribute) does not describe

- surgical approach, e.g. translumbar
- equipment, e.g. sutures
- physical force, e.g. laser energy

Method attribute grouping

1228 http://snomed.info/id/404205006
1229 http://snomed.info/id/10255001

Attributes should be grouped with the Method (attribute) to which they apply. In the absence of a Method (attribute), related attributes should be grouped together.

Exception,

- Recipient category (attribute)
  - A single procedure concept should not be precoordinated when more than one Recipient Category is involved. Such complex statements should have two or more procedure concepts that are placed into an appropriately structured electronic health application.
  - See separate attribute entry for *Recipient category* below.

No relationship group can contain more than one Method (attribute). If a procedure has more than one method, each Method (attribute) serves as the anchor of a separate relationship group that will contain any defining relationships that represent a direct object (and, where relevant, indirect object) of the Method's action. This is true even if the different Methods each act on the same direct object. Each relationship group can be thought of as representing a component of the procedure that involves a particular action.

Occurrence

Occurrence (attribute) is applied to procedures during a period of life. For example, procedures related to the gravid uterus should be modeled by the combination of the occurrence of the maternal pregnancy period and the uterus.

Priority

Priority (attribute) is used when a procedure concept specifies a priority. This attribute is self-grouped.

For example,

- 708932005 | Emergency hemodialysis (procedure)|[1230] has Priority of Emergency (qualifier value)
- 177141003 | Elective cesarean section (procedure)|[1231] has Priority of Elective (qualifier value)

260870009 | Priority (attribute)|[1232] is most often used to differentiate elective and emergency subtypes of a procedure that can be performed on either basis. With the exception of Cardiopulmonary resuscitation (procedure), this attribute is normally used only to define concepts whose FSNs specify a priority, not for modeling procedures that imply an emergency priority, such as |Heimlich maneuver (procedure)| or those that are inherently elective, such as |Augmentation mammoplasty (procedure)|.

Procedure device

Procedure device (attribute) is used to model devices associated with a procedure. This attribute is used to define high-level, general concepts that aggregate procedures according to the device involved.

Procedure device subsumes the more specific attributes, Direct Device, Indirect Device, Using Device, and Using Access Device. The more specific attributes should be used instead of Procedure Device, if possible.

For example,

- 276272002 | Catheter procedure (procedure)|[1233] has Procedure device of Catheter, device (physical object)

Procedure device

1230 http://snomed.info/id/708932005
1231 http://snomed.info/id/177141003
1232 http://snomed.info/id/260870009
1233 http://snomed.info/id/276272002

The attribute values in the Procedure Device hierarchy include Device (physical object) and its descendants.
There are a limited number of drug delivery devices in SNOMED CT. These concepts descend from Drug-device combination product (product) which is a descendant of both Device (physical object) and Pharmaceutical / biologic product (product). Although they carry the hierarchy tag of (product), they are acceptable values for attributes in the Procedure Device attribute hierarchy.

Procedure morphology

Procedure morphology (attribute) is used to specify the morphology, or abnormal structure, involved in a procedure. It is used when defining general concepts that subsume direct and indirect morphology. It subsumes the more specific attributes, Direct and Indirect Morphology. These should be used, if possible.

Morphologically abnormal structures

Hematoma, calculus, foreign body, blood clot, embolus, and some other morphologies are not strictly body structures. But, they are included in the body structure hierarchy under morphologically abnormal structure and are valid values for the Procedure Morphology attributes.

Procedure site

Procedure site (attribute) describes the body site acted on or affected by a procedure. The Procedure site (attribute) is

- used to model the site for high-level grouping-type procedure concepts
- most often used for concepts that do not require a 260686004 | Method (attribute)|[1234] and 129264002 | Action (qualifier value)|[1235] pair
- not required in order for the classifier to work properly

363704007 | Procedure site (attribute)|[1236] subsumes the more specific attributes, 405813007 | Procedure site - Direct (attribute)|[1237] , which is the site *directly* acted upon, and 405814001 | Procedure site - Indirect (attribute)|[1238] , which is the site *indirectly* acted upon. The more specific attributes should be used if possible (see separate entries for *Procedure site - Direct* and *Procedure site - Indirect*).

For example,

- 118839001 | Procedure on colon (procedure)|[1239] has Procedure site of Colon structure (body structure)

When modeling procedures where the Method is *Removal - action* (qualifier value) or one of its subtypes, e.g. Excision, Surgical biopsy, etc., for removal of:

- Structures, grafts, and tissue lesions (e.g. cysts, neoplasms, abscesses, wounds, warts, aneurysms, herniations, oral clefts, etc.) are considered removal of the site, use *Procedure site - Direct.*
- Devices, calculi, thrombi, foreign bodies, and other non-tissue entities from the structure, use *Procedure site - Indirect.*

Procedure site

1234 http://snomed.info/id/260686004
1235 http://snomed.info/id/129264002
1236 http://snomed.info/id/363704007
1237 http://snomed.info/id/405813007
1238 http://snomed.info/id/405814001
1239 http://snomed.info/id/118839001

Procedures are not necessarily categorized by site.

Use of Structure of <anatomical structure> vs. Entire <anatomical structure> as value of the Procedure site attributes
Structure of <anatomical structure> rather than Entire <anatomical structure> should be used as the value for procedure site attributes, except where the procedure FSN explicitly specified that the entire structure is the object of the procedure.

For example,

- 23968004 | Excision of colon (procedure)|[1240] has 405813007 | Procedure site - Direct (attribute)|[1241] of 71854001 | Colon structure (body structure)|[1242]
- 26390003 | Total colectomy (procedure)|[1243] has 405813007 | Procedure site - Direct (attribute)|[1244] of 302508007 | Entire colon (body structure)|[1245]

Procedure site - direct

Procedure site - Direct (attribute) is used when the action of the procedure is directly aimed at anatomical or acquired body structure or site, rather than something else located there (e.g. a device), i.e. when the 260686004 | Method (attribute)|[1246] is 129303008 | Removal - action (qualifier value)|[1247] or one of its subtypes (Excision, Surgical biopsy, or etc.).

For example,

- 54321008 | Cardiac flow imaging (procedure)|[1248] has 405813007 | Procedure site - Direct (attribute)|[1249] of Coronary artery structure (body structure)

Tissue lesions (cysts, neoplasms, abscesses, wounds, warts, aneurysms, herniations, oral clefts, etc.) are considered part of the procedure site and should also use 405813007 | Procedure site - Direct (attribute)|[1250] .

For example,

- Repair of rectocele (procedure) has a Procedure site - Direct (attribute) of Rectum structure and a Direct morphology (attribute) of Herniated structure
- Closure of skin wound (procedure) has a Procedure site - Direct (attribute) of Skin structure and a Direct morphology (attribute) of Wound
- Fixation of fracture (procedure) has a Procedure site - Direct (attribute) of Bone structure and a Direct morphology (attribute) of Fracture

Procedure site - indirect

Procedure site - Indirect (attribute) specifies the anatomical location but is not the direct focus of the procedure. The direct object of the action may be a device, a substance, or a morphologic abnormality that is not a part of the tissue structure of the anatomical site in which it is located, such as a calculus, thrombus, or foreign

1240 http://snomed.info/id/23968004
1241 http://snomed.info/id/405813007
1242 http://snomed.info/id/71854001
1243 http://snomed.info/id/26390003
1244 http://snomed.info/id/405813007
1245 http://snomed.info/id/302508007
1246 http://snomed.info/id/260686004
1247 http://snomed.info/id/129303008
1248 http://snomed.info/id/54321008
1249 http://snomed.info/id/405813007
1250 http://snomed.info/id/405813007

body. Thus, 405814001 | Procedure site - Indirect (attribute)|[1251] is typically found in a relationship group with a second, "direct" attribute-value relationship, such as a Direct morphology, Direct substance, or Direct device.

For example,

- 405433000 | Removal of catheter from brachial vein (procedure)|[1252] has:
  - Method of Removal - action (qualifier value)
  - Procedure site - Indirect of Structure of brachial vein (body structure)
  - Direct device of Venous catheter (physical object)

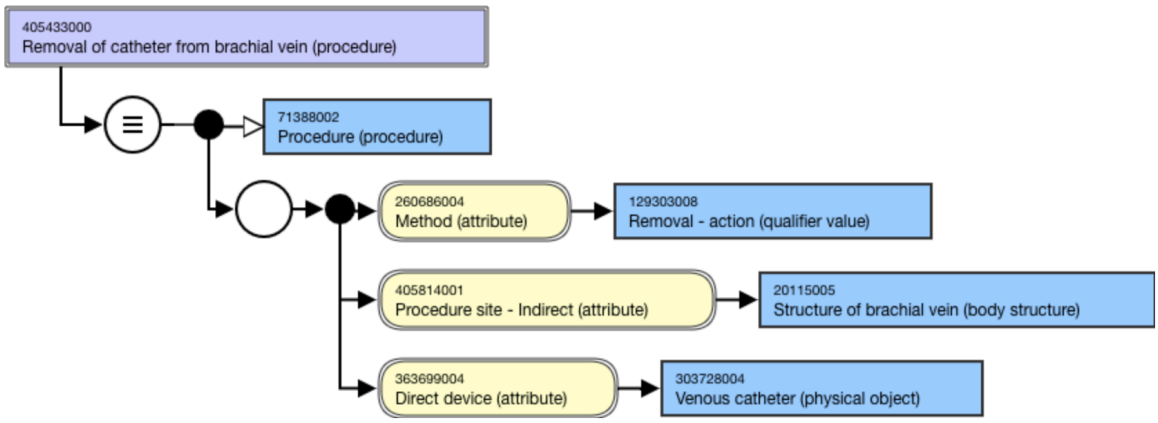


Figure 2: Stated view of 405433000 |Removal of catheter from brachial vein (procedure)|

- 371005009 | Removal of calculus of urinary bladder (procedure)|[1253] has:
  - Direct morphology of Calculus (morphologic abnormality)
  - Method of Removal - action (qualifier value)
  - Procedure site - Indirect of Urinary bladder structure (body structure)

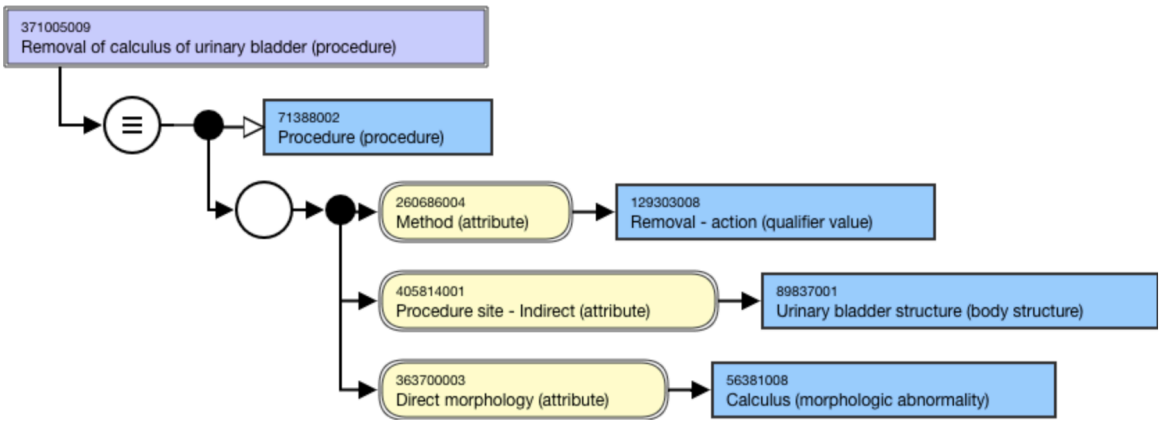


Figure 2: Stated view of 371005009 |Removal of calculus of urinary bladder (procedure)|

1251 http://snomed.info/id/405814001
1252 http://snomed.info/id/405433000
1253 http://snomed.info/id/371005009

Recipient category

Recipient category (attribute) specifies the type of individual or group upon which the action of the procedure is performed.

For example,

- 105455006 | Donor for medical or surgical procedure (person)|[1254] has Recipient Category (attribute) of Donor if the subject of the record is the Blood product donor (person).

  This can be used in blood banking procedures to differentiate the donor vs the recipient of blood products.

Recipient category

It is not used for a procedure where the subject of the procedure is someone other than the subject of record.

Revision status

Revision status (attribute) refers to another procedure performed on the same site for the same condition. A procedure without a revision status is considered to be performed for the first time. A revision procedure can be modeled with a Revision status (attribute) of Revision - value (qualifier value).

For example,

- 128323000 | Revision of implant (procedure)|[1255] has a Revision status (attribute) of Revision - value (qualifier value)

Using access device

Using access device (attribute) specifies the instrument or equipment used to access the site of a procedure.

For example,

- 274323008 | Endoscopic biopsy of colon (procedure)|[1256] has a Using access device (attribute) of Colonoscope, device (physical object)

Endoscopes

Many procedures can be carried out using tools attached to or operated via channels within the endoscope. In some cases the device IS used for access (such as endoscopy of the GI tract), e.g. ERCP in particular allows you to both visualize and operate upon the sphincter of Oddi/ampulla of Vater using cutting devices (knives or wires etc.) and then passing a basket up into the CBD to remove stones. The correct attribute for the device is USING ACCESS DEVICE.

Using device

Using device (attribute) refers to the instrument or equipment utilized to execute an action. It is used when the device is actually used to carry out the action, that is the focus of the procedure. If the device is simply the means to access the site of the procedure, then *Using access device* is the appropriate attribute.

For example,

1254 http://snomed.info/id/105455006
1255 http://snomed.info/id/128323000
1256 http://snomed.info/id/274323008

- 51064005 | Core needle biopsy of larynx (procedure)|[1257] has a Using device (attribute) of Core biopsy needle, device (physical object)

Endoscopes

When an Incision role group is included in the concept model, then |Using device| attribute is appended to the Inspection role group. For example, access to either the abdominal cavity or a joint capsule is achieved by an ordinary incision using a scalpel blade. The laparoscope or arthroscope is then introduced into the cavity through the incision, i.e. the endoscope is not the *access* device.

Using energy

Using energy (attribute) refers to the energy used to execute an action.

For example,

- 65952009 | Gamma ray therapy (procedure)|[1258] has Using energy of Gamma radiation (physical force)

Using substance

Using substance (attribute) describes the Substance used to execute the action of a procedure. It is not the substance on which the procedure's method directly acts, the Direct substance.

For example,

- 285754008 | Contrast radiography of esophagus (procedure)|[1259] has Using substance of Contrast media (substance)

Evaluation Procedure

The following defining attributes are unique in the context of the 386053000 |Evaluation procedure (procedure)| subhierarchy. Many of these attributes (e.g., Component, Scale type) are used to define Observable entity concepts. Evaluation procedures may use the attributes below in addition to those attributes allotted to the 71388002 | Procedure (procedure)|[1260] hierarchy (see *Procedure Attributes Summary* page). All of the attributes for Evaluation procedure concepts should be grouped. However, current modeling does not reflect this guidance, and examples used on this page are inconsistent with current guidance. The future of this hierarchy in relation to the observable entity hierarchy is under review. See 'Observable Entity vs. Evaluation Procedure' at Observable Entity[1261].

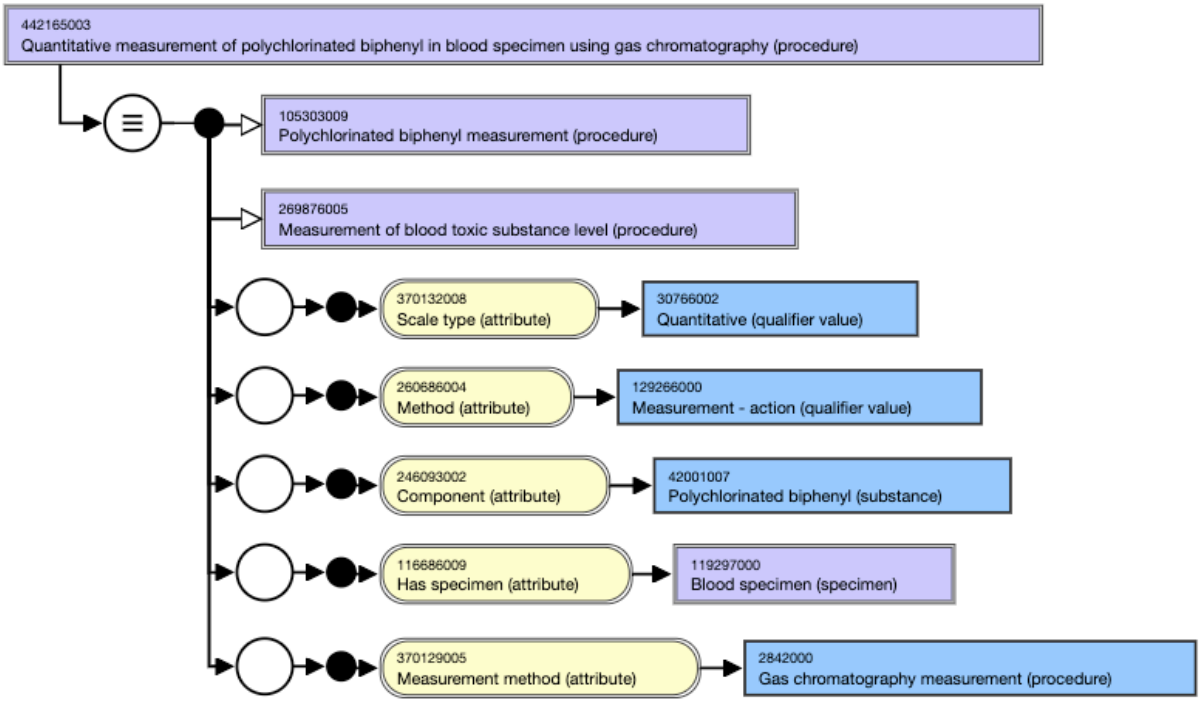
Component

Component refers to what is being observed or measured by a procedure.

For example,

- 442165003 | Quantitative measurement of polychlorinated biphenyl in blood specimen using gas chromatography (procedure)|[1262] has 246093002 | Component (attribute)|[1263] of 42001007 | Polychlorinated biphenyl (substance)|[1264]

1257 http://snomed.info/id/51064005
1258 http://snomed.info/id/65952009
1259 http://snomed.info/id/285754008
1260 http://snomed.info/id/71388002
1261 https://confluence.ihtsdotools.org/display/WIPEG/Observable+Entity
1262 http://snomed.info/id/442165003
1263 http://snomed.info/id/246093002
1264 http://snomed.info/id/42001007



Although Pharmaceutical / biologic product (product) and its descendants are considered valid values for the Component (attribute), they are not currently used as values for this attribute in the International Release. The only exception is 787859002 |Vaccine product (medicinal product)| and its descendants, which are used as valid values for this attribute.

Has specimen

Has Specimen indicates the type of specimen on which a measurement or observation is performed.

For example,

- 442165003 | Quantitative measurement of polychlorinated biphenyl in blood specimen using gas chromatography (procedure)|[1265] uses 116686009 | Has specimen (attribute)|[1266] of 119297000 | Blood specimen (specimen)|[1267]

1265 http://snomed.info/id/442165003
1266 http://snomed.info/id/116686009
1267 http://snomed.info/id/119297000

Measurement method

Measurement Method specifies the method by which an evaluation procedure is performed. It provides additional specificity. For measurement procedures, the 260686004 | Method (attribute)|[1268] is given the value 129266000 | Measurement - action (qualifier value)|[1269] . No concept can be defined with a 370129005 | Measurement method (attribute)|[1270] unless it is being used to refine a 260686004 | Method (attribute)|[1271] that has a value of 129266000 | Measurement - action (qualifier value)|[1272] or one of its subtypes that is also specified in the concept definition. That is, use of 370129005 | Measurement method (attribute)|[1273] must be **in addition** to a 260686004 | Method (attribute)|[1274] of 129266000 | Measurement - action (qualifier value)|[1275] or one of its subtypes. Also, the 370129005 | Measurement method (attribute)|[1276] and its value must be grouped with the 260686004 | Method (attribute)|[1277] and its value of the concept or subtype of 129266000 | Measurement - action (qualifier value)|[1278] .

For example,

- 442165003 | Quantitative measurement of polychlorinated biphenyl in blood specimen using gas chromatography (procedure)|[1279] has a 370129005 | Measurement method (attribute)|[1280] of 2842000 | Gas chromatography measurement (procedure)|[1281]

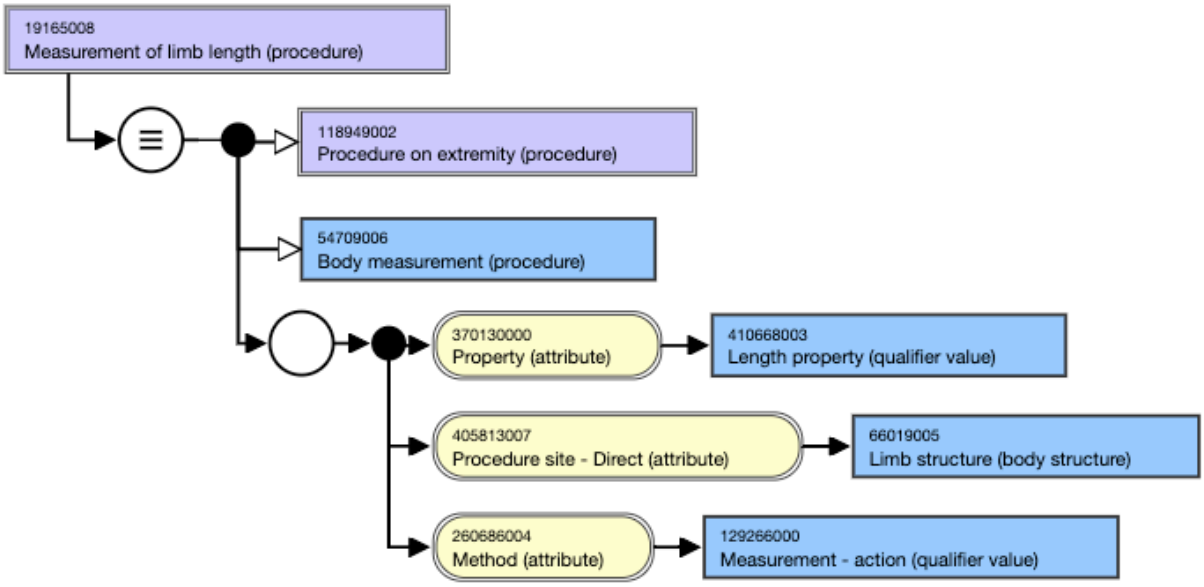
Property

Property specifies the kind of property (quality or characteristic) being measured.

For example,

- 19165008 | Measurement of limb length (procedure)|[1282] has a 370130000 | Property (attribute)|[1283] of 410668003 | Length property (qualifier value)|[1284]

1268 http://snomed.info/id/260686004
1269 http://snomed.info/id/129266000
1270 http://snomed.info/id/370129005
1271 http://snomed.info/id/260686004
1272 http://snomed.info/id/129266000
1273 http://snomed.info/id/370129005
1274 http://snomed.info/id/260686004
1275 http://snomed.info/id/129266000
1276 http://snomed.info/id/370129005
1277 http://snomed.info/id/260686004
1278 http://snomed.info/id/129266000
1279 http://snomed.info/id/442165003
1280 http://snomed.info/id/370129005
1281 http://snomed.info/id/2842000
1282 http://snomed.info/id/19165008
1283 http://snomed.info/id/370130000
1284 http://snomed.info/id/410668003



Scale type

Scale Type refers to the scale of the result of an observation of a diagnostic test.

For example,

- 442165003 | Quantitative measurement of polychlorinated biphenyl in blood specimen using gas chromatography (procedure)|[1285] has 370132008 | Scale type (attribute)|[1286] of 30766002 | Quantitative (qualifier value)|[1287]

Time aspect

Time Aspect specifies temporal relationships for a measurement procedure. While this attribute has been approved, guidelines for its implementation await development.

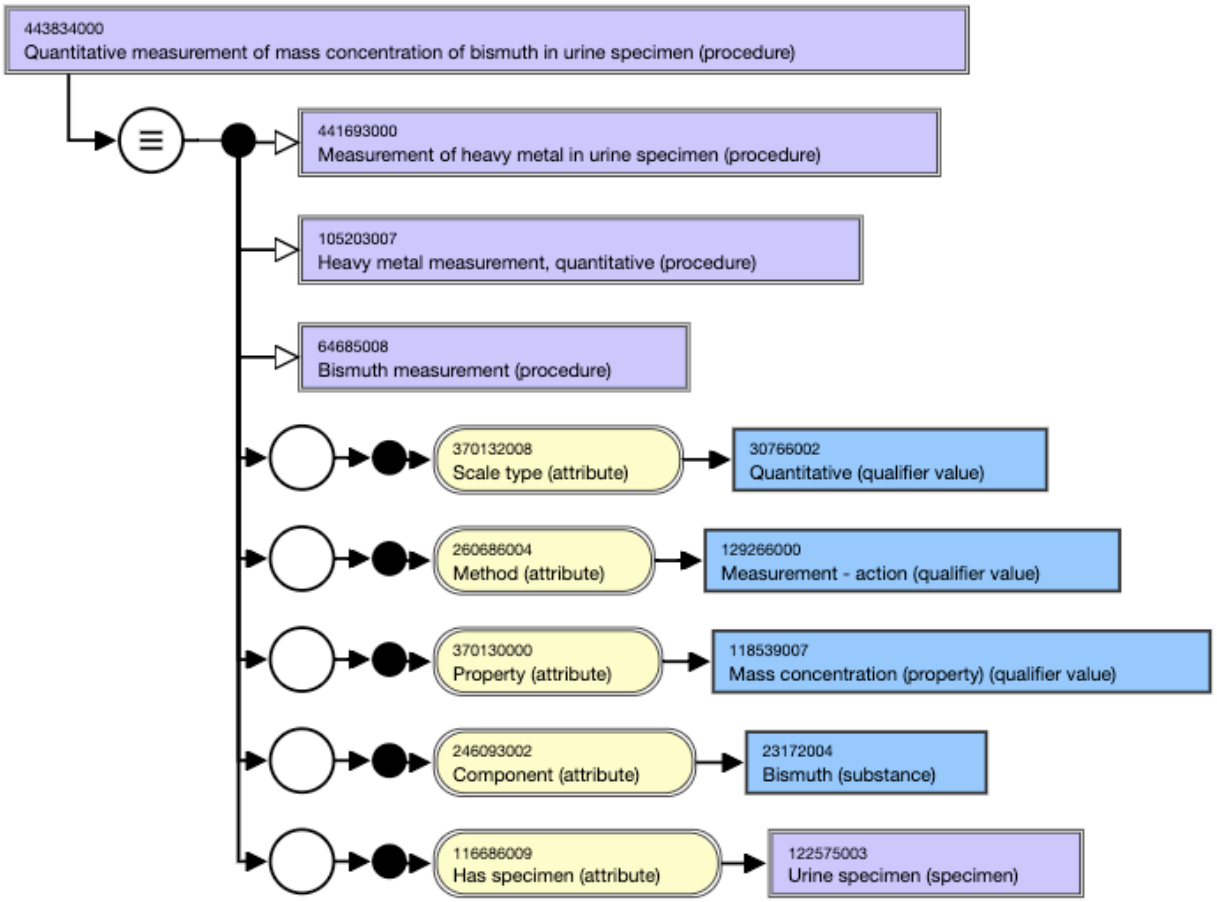
Further clarification

An evaluation procedure may evaluate a property of a component, or a property may be the sole focus of the method. In the latter case, component isn't included since only the property is being evaluated.

For example of an evaluation procedure evaluating a property of a component,

- 443834000 | Quantitative measurement of mass concentration of bismuth in urine specimen (procedure)|[1288] has 370130000 | Property (attribute)|[1289] of 118539007 | Mass concentration (property) (qualifier value)|[1290] and 246093002 | Component (attribute)|[1291] of 23172004 | Bismuth (substance)|[1292]

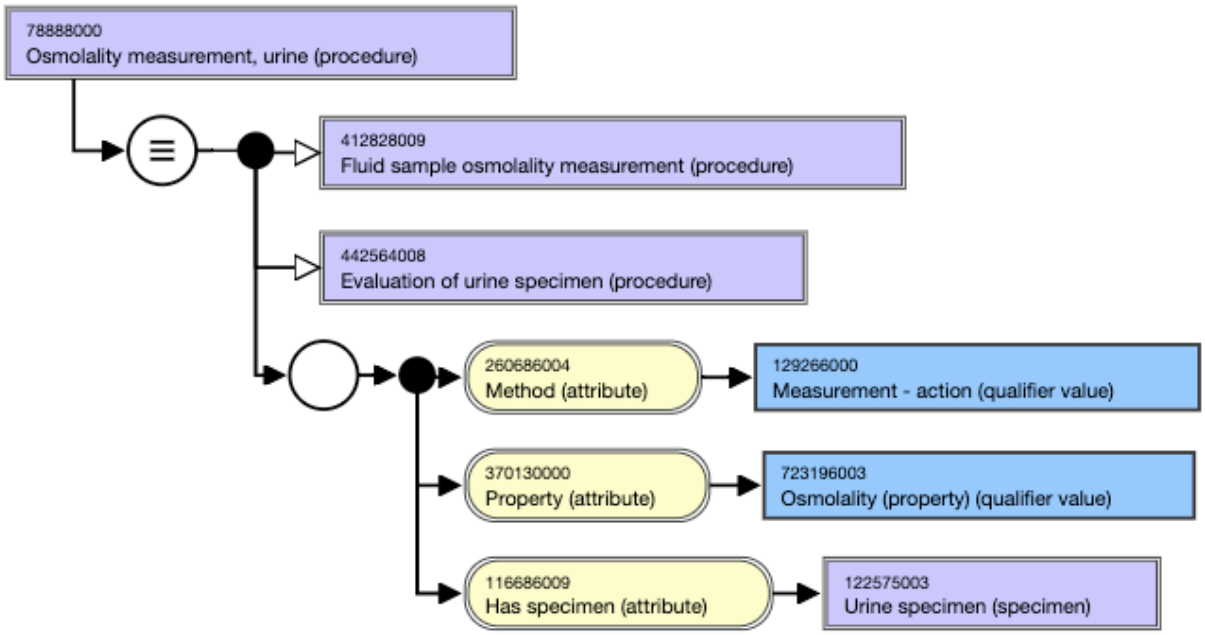
1285 http://snomed.info/id/442165003
1286 http://snomed.info/id/370132008
1287 http://snomed.info/id/30766002
1288 http://snomed.info/id/443834000
1289 http://snomed.info/id/370130000
1290 http://snomed.info/id/118539007
1291 http://snomed.info/id/246093002
1292 http://snomed.info/id/23172004



For example where property may be the sole focus of the method,

- 78888000 | Osmolality measurement, urine (procedure)|[1293]

1293 http://snomed.info/id/78888000



Surgical Procedure

The following defining attribute is unique to Surgical procedures. Surgical procedures may also use the attributes in the *Procedure Attributes Summary* table from the HRCM (see also *Procedure Defining Attributes* page).

Surgical approach

Surgical Approach specifies the directional, relational, or spatial access to the site of a surgical procedure. The range for Surgical Approach is descendants of 103379005 |Procedural approach (qualifier value)|[1294]

- 172883004 | Intranasal ethmoidectomy (procedure)|[1295] has Surgical approach, Intranasal approach (qualifier value)

Administration via Specific Route Procedure

In addition to attributes applicable to general procedures, the subhierarchy of |Administration via specific route (procedure)| also includes the |Route of administration (attribute)|.

Route of administration

Route of administration represents the route by which a procedure introduces a substance into the body. The domain for this attribute is descendants of 1285465008 | Administration via specific route (procedure)|[1296]. The range involves subtypes of 284009009 |Route of administration value (qualifier value)|. When using this attribute, an additional attribute of |Procedure site - indirect| should be modeled and grouped with the |Route of administration (attribute)|.

For example,

1294 http://snomed.info/id/103379005
1295 http://snomed.info/id/172883004
1296 http://snomed.info/id/1285465008

- 410572008 | Injection of steroid via intravitreal route (procedure)|[1297] has the | Route of administration (attribute)|[1298] of Intravitreal route (qualifier value)

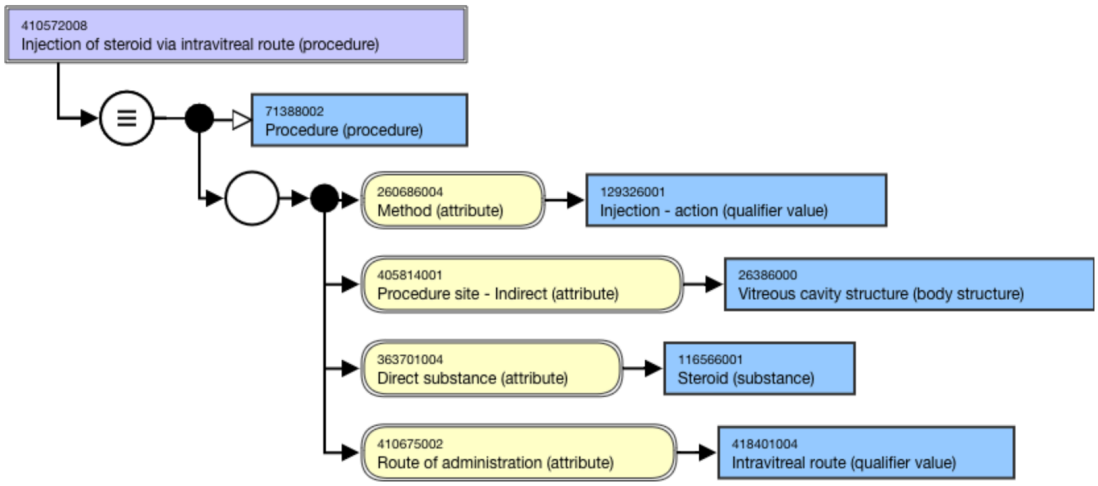


Figure 1: Stated view of 410572008 |Injection of steroid via intravitreal route (procedure)|

While the values for the |Procedure site - Indirect| and |Route of administration| attributes may be similar and seem redundant, their presence is necessary for consistent subsumption.

For example,

Route of administration (qualifier value)	Body structure value of Procedure site - Indirect
Intravenous route	Venous structure
Oral route	Mouth region structure

Table 1: Examples of complementary values of Route of administration and Procedure site - Indirect

3.8.11.4 Procedure Naming Conventions

General rules

The naming pattern for procedures is highly dependent on the attributes used to describe the procedure. However, some general rules apply.

The FSN for a procedure should name the action (the method) of the procedure first, and then the object that the action directly acts upon.

For example,

1297 http://snomed.info/id/410572008
1298 http://snomed.org/fictid#

- 261531000 | Excision of rib (procedure)|[1299]

Include the approach where more than one option exists. See the various approaches as subtypes of 103379005 | Procedural approach (qualifier value)|.

For example,

- 386792000 Transurethral resection of neoplasm of bladder (procedure) vs 287726000 Open resection of neoplasm of bladder (procedure)

Because a resection of a neoplasm of the bladder can be performed by transurethral and open approaches, concepts are separately identified with each approach.

Use *via* for route or approach and *using* for device.
For example,
- Administration of sedative *via* nasal route (procedure)
- Internal fixation *using* screw (procedure)

One description, either preferred term or synonym, should match the FSN without the semantic tag. Synonyms and/or preferred terms using the common clinical names of procedures are acceptable.

A common naming pattern for concepts in the procedure hierarchy is:

FSN: <Method (Action)> of <Anatomical or acquired body structure> (procedure)

PT: <Method (Action)> of <Anatomical or acquired body structure>

SYN: [plasty/stomy/ectomy/otomy]

For example,

- 82035006 | Resection of polyp (procedure)|[1300] has a synonym of polypectomy

Please see potential naming patterns:

- Completed or in review: https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project
- Proposed for future review: https://confluence.ihtsdotools.org/display/IHTSDO1/Unreviewed+Patterns+by+Hierarchy

Further refinements can be affected by the various attributes and their values as described in the sections below.

Anatomical site

An *anatomical site* is the direct object of the action. The name of the site should follow the name of the action.

For example,

- 175253007 | Repair of pulmonary artery (procedure)|[1301]

1299 http://snomed.info/id/261531000
1300 http://snomed.info/id/82035006
1301 http://snomed.info/id/175253007

The action is *repair* and the site is *pulmonary artery*. The action is listed first in the description, followed by the site.

Procedure descriptions should follow the naming guidelines for the body structure hierarchy. Concepts describing limbs are frequently found in SNOMED CT, and the use of *upper/lower limb* in the FSN with synonyms of upper/lower extremity, arm/leg should be followed.

For example,

- 179987000 | Replantation of upper limb (procedure)|[1302]

  The description of *upper limb* is used in the FSN while the synonyms refer to *arm* and *upper extremity*.

Device

A *device* is the direct object of the action**.** The word(s) naming the device should follow the word(s) naming the action. If there is a site that is not the direct object of the action, the word(s) naming it should come after the word(s) naming the device.

For example,

- 392247006 | Insertion of catheter into artery (procedure)|[1303] The action is *insertion*, the direct object is *catheter*, and the indirect site is *artery*.

Substance

A *substance* is the direct object of the action**.** The word(s) that name the substance should follow the words that name the action. If there is a site that is not the direct object of the action, the word(s) naming it should follow the word(s) naming the substance.

For example,

- 427258004 | Injection of hormone into subcutaneous tissue (procedure)|[1304] The action is *injection*, the direct object is *hormone*, and the indirect site is *subcutaneous tissue*.

Morphologic abnormality

A *morphologic abnormality* is the direct object of the action. The morphology term should follow the action term. If there is a site, it should follow the morphology term.

For example,

- 41180005 | Excision of cyst of breast (procedure)|[1305] The action is *excision*, the direct object is the morphologic abnormality *cyst*, and the site is *breast*.
- 175376008 | Operation on aneurysm of carotid artery (procedure)|[1306] The action is *operation*, the direct object is the morphologic abnormality *aneurysm*, and the site is *carotid artery.*

Past tense verbs and sentence types

A procedure concept should be a noun phrase that names the procedure. It should not contain information that it was done, or is to be ordered, carried out, or planned.

1302 http://snomed.info/id/179987000
1303 http://snomed.info/id/392247006
1304 http://snomed.info/id/427258004
1305 http://snomed.info/id/41180005
1306 http://snomed.info/id/175376008

- Past tense verbal phrases should not be used to name procedures, since *past tense* invokes a temporal context, i.e. the procedure was done in the past. Any existing concepts with past tense verbs should be moved to the Situation with explicit context hierarchy.
- Sentence function types, i.e. imperative, declarative, interrogative, or exclamatory, are disallowed in procedure concepts.

  Acceptable example,

  - 11227005 | Excision of ganglion of tendon sheath of hand (procedure)|[1307] This is an acceptable FSN expressed with a noun phrase.

  Unacceptable example,

  - *Hand tendon ganglion excised* indicates the procedure was done, as a past tense declarative statement. This should be in the Situation with explicit context hierarchy, not the Procedure hierarchy.

Complexity

Complexity can mean either the amount of effort required, or it can be based on realm-specific definitions (e.g. simple arthrodesis, simple repair, complex repair, etc.). Procedure concepts with modifiers representing complexity are not allowed in the International Release.

Exception

Procedures that use the terms *simple* or *complex* are allowed if defined with reproducible meanings, based on what is done to or for the patient, rather than how much effort is expended.

For example,

- 172043006 | Simple mastectomy (procedure)|[1308] The concept is reproducibly defined as the removal of all breast tissue without removal of axillary contents. This is differentiated from modified radical, radical, skin-sparing, and subcutaneous variants of mastectomy.

Procedures by count

Counts of the number of procedures

Many procedure classifications focus on resources required to complete; this may be for reimbursement or tracking purposes (e.g. placement of one stent versus placement of two stents). This information should be part of patient documentation and is not allowed in the International Release.

Order of procedures

The order of procedures, e.g. primary, first, second, etc. should be excluded.

Chemotherapy Regime Therapy Naming Conventions

Chemotherapy regimens, which are internationally recognized and implemented, are acceptable content and may be added to the (regime/therapy) hierarchy as subtypes of 716872004 | Antineoplastic chemotherapy regimen (regime/therapy)|[1309] .

1307 http://snomed.info/id/11227005
1308 http://snomed.info/id/172043006
1309 http://snomed.info/id/716872004

Trade names, which are indicated by an acronym, e.g. ABVD chemotherapy regimen, where *A* represents trade name Adriamycin®, should not be spelled out but may be referenced in the acronym used to describe the regimen.

Generic drug names are not capitalized; they are lower case. When creating descriptions for generic drug names, the substance described should match the description from the Substance hierarchy.

Examples,

ABVD chemotherapy regimen. *A* represents the trade name Adriamycin® (INN = doxorubicin):

- FSN: Doxorubicin, bleomycin, vinblastine and dacarbazine chemotherapy regimen (regime/therapy)
- PT: ABVD chemotherapy regimen
- Synonym: Doxorubicin, bleomycin, vinblastine and dacarbazine chemotherapy regimen
- Synonym: ABVD chemotherapy protocol

R-CHOP chemotherapy regimen. *H* represents the non-INN generic name hydroxydaunomycin (INN = doxorubicin) and *O* represents the trade name Oncovin® (INN = vincristine):

- FSN: Rituximab, cyclophosphamide, doxorubicin, vincristine and prednisone chemotherapy regimen (regime/therapy)
- PT: R-CHOP chemotherapy regimen
- Synonym: Rituximab, cyclophosphamide, doxorubicin, vincristine and prednisone chemotherapy regimen
- Synonym: R-CHOP chemotherapy protocol

Clinical Imaging Procedure Naming Conventions

Almost all imaging procedures can be unambiguously expressed in a number of ways. There is a balance between flexibility in language and efficiency in terminology maintenance. Consequently, all variants for imaging modalities are not routinely included in SNOMED CT. Submissions for additional descriptions must be justified explicitly.

At a minimum, procedures are ordinarily expressed with the modality and body site. Existing content may have inconsistencies, but new content should following the naming conventions that follow.

The use of *near synonyms* is acceptable for clinical imaging procedures:
For example,
- 79516005 | Renal arteriography (procedure)|[1310] has the synonym renal angiography
- 726077005 | Computed tomography arteriography of bronchial artery (procedure)|[1311] has the synonym CT *angiography* of bronchial artery
- 709552006 | Computed tomography angiography of iliac artery (procedure)|[1312] has the synonym CT *angiogram* of iliac artery

- Imaging Adjustments for View, Projection, or Technique(see page 444)
- Diagnostic Imaging for Multiple Body Sites(see page 444)
- Nuclear Medicine - Radionuclide Imaging(see page 444)
- Multi-modality Imaging: PET, CT and SPECT, CT(see page 445)
- Single Photon Emission Computed Tomography - SPECT(see page 446)
- Positron Emission Tomography - PET(see page 446)
- Fluoroscopy and Fluoroscopic Imaging(see page 446)

1310 http://snomed.info/id/79516005
1311 http://snomed.info/id/726077005
1312 http://snomed.info/id/709552006

- Imaging Guided Procedure Naming(see page 448)
- Contrast for Imaging(see page 450)
- Magnetic Resonance Imaging - MRI(see page 451)
- Computed Tomography - CT(see page 452)
- Ultrasonography(see page 454)
- X-ray(see page 455)

Imaging Adjustments for View, Projection, or Technique

It may be important, from both clinical and administrative perspectives, to capture variations or modifications of imaging technique. The variations may impact correct acquisition and interpretation of images.

Examples of modifications include:

- Axial (qualifier value)
- Skyline projection (qualifier value)
- Decubitus (qualifier value)

Post-coordination

Though these examples are qualifying values in *SNOMED CT*, they are not allowable for post-coordination of diagnostic imaging procedures.

Diagnostic Imaging for Multiple Body Sites

Adjacent structures
Concepts which describe adjacent structures, imaged in one procedure, are acceptable.

For example,

- 432672003 | Magnetic resonance imaging of pelvis and hip (procedure)|[1313]

Unacceptable

Multiple procedures or a combination of different procedures in one concept are unacceptable.

Unacceptable examples,

- Computed tomography angiography of aorta, abdomen, pelvis and lower limb
- Ultrasonography of abdomen and ultrasonography of pelvis with transrectal ultrasonography
- Ultrasonography of pelvis and obstetric ultrasonography with transvaginal ultrasonography
- Ultrasonography of knee and Doppler ultrasonography of vein of lower limb

Nuclear Medicine - Radionuclide Imaging

Nuclear medicine imaging uses radionuclides or radioisotopes.

Radionuclide scan

- FSN: Radionuclide scan of X (procedure)
- PT: Radionuclide scan of X
- SYN: Radioisotope scan of X

For example,

1313 http://snomed.info/id/432672003

- 710313004 | Radionuclide scan of peritoneal cavity (procedure)|[1314]
  - FSN: Radionuclide scan of peritoneal cavity (procedure)
  - PT: Radionuclide scan of peritoneal cavity
  - SYN: Radioisotope scan of peritoneal cavity

Radionuclide scan using isotopes (with other agents)

- FSN: Radionuclide scan of X using Y (procedure)
- PT: Radionuclide scan of X using Y
- SYN: Radioisotope scan of X using Y

For example,

- 710312009 | Radionuclide scan of perfusion of liver using technetium Tc^99m^ aggregated albumin (procedure)|[1315]
  - FSN: Radionuclide scan of perfusion of liver using technetium Tc^99m^ aggregated albumin (procedure)
  - PT: Radionuclide scan of perfusion of liver using technetium Tc^99m^ aggregated albumin
  - SYN: Radioisotope scan of perfusion of liver using technetium Tc^99m^ aggregated albumin

Multi-modality Imaging: PET, CT and SPECT, CT

There are very few imaging procedures which are truly *multi-modality* procedures. Two procedures are usually conducted in parallel, rather than as one. Positron emission tomography with computed tomography (PET/CT) and Single photon emission computed tomography with computed tomography (SPECT/CT), however, are produced by one piece of equipment, possibly by a single technician, but with multiple imaging energies.

Positron emission tomography with computed tomography

- FSN: Positron emission tomography with computed tomography of X (procedure)
- PT: PET CT of X
- SYN: Positron emission tomography with computed tomography of X

For example,

- 16554361000119106 | Positron emission tomography with computed tomography of brain (procedure)|[1316]
  - FSN: Positron emission tomography with computed tomography of brain (procedure)
  - PT: PET CT of brain
  - SYN: Positron emission tomography with computed tomography of brain

Single photon emission computed tomography with computed tomography

- FSN: Single photon emission computed tomography with computed tomography of X (procedure)
- PT: Single photon emission computed tomography with computed tomography of X
- SYN: SPECT CT of X

For example,

- 16534151000119105 | Single photon emission computed tomography with computed tomography of liver (procedure)|[1317]
  - FSN: Single photon emission computed tomography with computed tomography of liver (procedure)
  - PT: Single photon emission computed tomography with computed tomography of liver
  - SYN: SPECT CT of liver

1314 http://snomed.info/id/710313004
1315 http://snomed.info/id/710312009
1316 http://snomed.info/id/16554361000119106
1317 http://snomed.info/id/16534151000119105

Single Photon Emission Computed Tomography - SPECT

Single photon emission computerized tomography (procedure)
- FSN: Single photon emission computed tomography of X (procedure)
- PT: Single photon emission computed tomography of X
- SYN: SPECT of X

For example,

- 709549003 | Single photon emission computed tomography of heart (procedure)|[1318]
  - FSN: Single photon emission computed tomography of heart (procedure)
  - PT: Single photon emission computed tomography of heart
  - SYN: SPECT of heart

Positron Emission Tomography - PET

Positron emission tomography (procedure)
- FSN: Positron emission tomography of X (procedure)
- PT: PET of X
- SYN: Positron emission tomography of X

For example,

- 702767007 | Positron emission tomography of whole body (procedure)|[1319]
  - FSN: Positron emission tomography of whole body (procedure)
  - PT: PET of whole body
  - SYN: Positron emission tomography of whole body

Fluoroscopy and Fluoroscopic Imaging

Simple fluoroscopy
Simple fluoroscopy is *real time* imaging (usually on TV monitors/image intensifiers) of a body part or system. Only rarely is it an imaging process alone (without some interventional procedure). Fluoroscopy is most often used to guide or direct a primary procedure/purpose. The usual convention in clinical practice is to ignore the fluoroscopic element and refer to a procedure entirely by the primary component, e.g. angiography. However, this is unacceptable in SNOMED CT, where the imaging component must be explicitly described.

- FSN: Fluoroscopy of X (procedure)
- PT: Fluoroscopy of X
- SYN: Fluoroscopy - X

For example,

- 169005008 | Fluoroscopy of esophagus (procedure)|[1320]
  - FSN: Fluoroscopy of esophagus (procedure)
  - PT: Fluoroscopy of esophagus
  - SYN: Fluoroscopy - esophagus

Fluoroscopic guidance
Fluoroscopic X is not necessarily interpreted as *X using fluoroscopic guidance (procedure)*. When modeling a procedure using fluoroscopic guidance, the use of *fluoroscopic x* in the FSN is not sufficient; the FSN must explicitly state *using fluoroscopic guidance* if that is the intent.

1318 http://snomed.info/id/709549003
1319 http://snomed.info/id/702767007
1320 http://snomed.info/id/169005008

The following naming pattern can be used for direct observation:

- FSN: X using fluoroscopic guidance (procedure)
- PT: Fluoroscopy guided X
- SYN: X using fluoroscopic guidance

For example,

- 710293001 | Colonoscopy using fluoroscopic guidance (procedure)|[1321]
  - FSN: Colonoscopy using fluoroscopic guidance (procedure)
  - PT: Fluoroscopy guided colonoscopy
  - SYN: Colonoscopy using fluoroscopic guidance

For example,

- Angioplasty using fluoroscopic guidance with contrast (procedure)
  - FSN: Angioplasty using fluoroscopic guidance with contrast (procedure)
  - PT: Fluoroscopy guided angioplasty with contrast
  - SYN: Angioplasty using fluoroscopic guidance with contrast
  - SYN: Fluoroscopic angioplasty with contrast

Such procedures are subtypes of Fluoroscopy (procedure). See also Imaging-guided procedure modeling guidance[1322].

Fluoroscopic angiography with contrast
Angiography and *angiogram*, as terms on their own, refer to visualization of a blood vessel or vascular structure not specified as an artery or a vein and could refer to either or both. So for clarity, a blood vessel site (X) and the phrase *with contrast* must be included in the concept description.

> **With contrast**
>
> Fluoroscopic angiography always uses contrast. *With contrast* must be explicitly stated in all descriptions.

Fluoroscopic angiography when vessel is not stated
- FSN: Fluoroscopic angiography of X with contrast (procedure)
- PT: Fluoroscopic angiography of X with contrast
- SYN: Fluoroscopic angiogram of X with contrast

Fluoroscopic angiography of artery
- FSN: Fluoroscopic angiography of X artery with contrast (procedure)
- PT: Fluoroscopic angiography of X artery with contrast
- SYN: Fluoroscopic arteriography of X with contrast
- SYN: Fluoroscopic arteriogram of X with contrast

For example,

- FSN: Fluoroscopic angiography of right cervical vertebral artery with contrast (procedure)
- PT: Fluoroscopic angiography of right cervical vertebral artery with contrast
- SYN: Fluoroscopic arteriography of right cervical vertebral artery with contrast
- SYN: Fluoroscopic arteriogram of right cervical vertebral artery with contrast

Fluoroscopic venography
- FSN: Fluoroscopic venography of X with contrast (procedure)
- PT: Fluoroscopic venography of X with contrast
- SYN: Fluoroscopic venogram of X with contrast

1321 http://snomed.info/id/710293001
1322 https://confluence.ihtsdotools.org/display/WIPEG/Imaging-guided+procedures

For example,

- FSN: Fluoroscopic venography of right upper limb with contrast (procedure)
- PT: Fluoroscopic venography of right upper limb with contrast
- SYN: Fluoroscopic venogram of right upper limb with contrast

Fluoroscopic arthrography

- FSN: Fluoroscopic arthrography of X (procedure)
- PT: Fluoroscopic arthrography of X
- SYN: Fluoroscopic arthrogram of X

For example,

- 723775001 | Fluoroscopic arthrography of right sacroiliac joint (procedure)|[1323]
  - FSN: Fluoroscopic arthrography of right sacroiliac joint (procedure)
  - PT: Fluoroscopic arthrography of right sacroiliac joint
  - SYN: Fluoroscopic arthrogram of right sacroiliac joint

Dual energy X-ray photon absorptiometry

- FSN: Dual energy X-ray photon absorptiometry of X (procedure)
- PT: Dual energy X-ray photon absorptiometry of X
- SYN: DXA of X
- SYN: DEXA of X

For example,

- 723193006 | Dual energy X-ray photon absorptiometry of vertebral column (procedure)|[1324]
  - FSN: Dual energy X-ray photon absorptiometry of vertebral column (procedure)
  - PT: Dual energy X-ray photon absorptiometry of vertebral column
  - SYN: DXA of vertebral column
  - SYN: DEXA of vertebral column

Imaging Guided Procedure Naming

There are numerous procedures where the imaging component is considered a supplemental or secondary technique to help accomplish the primary goal. The pattern is:

Procedure using guidance

- FSN: Y (procedure) using (diagnostic imaging modality guidance) (procedure)
- PT: (Diagnostic imaging modality) guided Y (procedure)
- SYN: Y (procedure) using (diagnostic imaging modality guidance)

For example,

- 407971000119109 | Percutaneous needle biopsy of liver using computed tomography guidance (procedure)|[1325]
  - FSN: Percutaneous needle biopsy of liver using computed tomography guidance (procedure)
  - PT: CT guided biopsy of liver
  - SYN: Percutaneous needle biopsy of liver using computed tomography guidance

Computed tomography guided procedure

- FSN: Y using computed tomography guidance (procedure)
- PT: CT guided Y
- SYN: Y using computed tomography guidance

1323 http://snomed.info/id/723775001
1324 http://snomed.info/id/723193006
1325 http://snomed.info/id/407971000119109

For example,

- 431864000 | Injection using computed tomography guidance (procedure)|[1326]
  - FSN: Injection using computed tomography guidance (procedure)
  - PT: CT guided injection
  - SYN: Injection using computed tomography guidance

Fluoroscopy guided procedure

- FSN: Y using fluoroscopic guidance (procedure)
- PT: Fluoroscopy guided Y
- SYN: Y using fluoroscopic guidance

For example,

- 773291002 | Biopsy of abdomen using fluoroscopic guidance (procedure)|[1327]
  - FSN: Biopsy of abdomen using fluoroscopic guidance (procedure)
  - PT: Fluoroscopy guided biopsy of abdomen
  - SYN: Biopsy of abdomen using fluoroscopic guidance

Fluoroscopic guidance

The term *fluoroscopic Y* is interpreted as *Y using fluoroscopic guidance (procedure)*. Procedures such as 432540009 | Biopsy of wrist using fluoroscopic guidance (procedure)|[1328] are subtypes of Fluoroscopy (procedure).

(See also *Fluoroscopy and Fluoroscopic Imaging* page)

Magnetic resonance imaging guided procedure

- FSN: Y using magnetic resonance imaging guidance (procedure)
- PT: MRI guided Y (procedure)
- SYN: Y using magnetic resonance imaging guidance

For example,

- 433008009 | Core needle biopsy of breast using magnetic resonance imaging guidance (procedure)|[1329]
  - FSN: Core needle biopsy of breast using magnetic resonance imaging guidance (procedure)
  - PT: MRI guided core needle biopsy of breast
  - SYN: Core needle biopsy of breast using magnetic resonance imaging guidance

Ultrasonography guided procedure

- FSN: Y using ultrasonographic guidance (procedure)
- PT: Ultrasonography guided Y
- SYN: Y using ultrasonographic guidance
- SYN: Y using ultrasound guidance

For example,

- 431811004 | Biopsy of wrist using ultrasonographic guidance (procedure)|[1330]
  - FSN: Biopsy of wrist using ultrasonographic guidance (procedure)
  - PT: Ultrasonography guided biopsy of wrist
  - SYN: Biopsy of wrist using ultrasonographic guidance
  - SYN: Biopsy of wrist using ultrasound guidance

1326 http://snomed.info/id/431864000
1327 http://snomed.info/id/773291002
1328 http://snomed.info/id/432540009
1329 http://snomed.info/id/433008009
1330 http://snomed.info/id/431811004

X-ray guided procedure

- FSN: Y using X-ray guidance (procedure)
- PT: X-ray guided Y
- SYN: Y using X-ray guidance

For example,

- 718674009 | Injection of steroid using X-ray guidance (procedure)|[1331]
  - FSN: Injection of steroid using X-ray guidance (procedure)
  - PT: X-ray guided steroid injection
  - SYN: Injection of steroid using X-ray guidance

Contrast for Imaging

It is essential to express when contrast is part of a procedure and that descriptions are constructed consistently.

For example,

- 702501008 | Computed tomography of knee with contrast (procedure)|[1332]
  - FSN: Computed tomography of knee with contrast (procedure)
  - PT: CT of knee with contrast
  - SYN: Computed tomography of knee with contrast

The descriptions for all procedure concepts that use contrast must explicitly state 'with contrast.' All procedures that use contrast, including 420040002 |Fluoroscopic angiography with contrast (procedure)|and all subtypes, must include the attribute 424361007 |Using substance (attribute)| and value 385420005 |Contrast media (substance)| in the role group.

It is unnecessary to add the word *media* to contrast.

It is agreed that the linking word to associate the contrast use with the procedure is *with* not *for, or,* etc.

> ⚠ **Contrast**
>
> There is a suggestion that additional concept detail is required when it is necessary to know the more precise nature of contrast (e.g. iodinated with various osmolalities, barium, or gas).

Imaging without contrast

Although considered a negation, this term is used in clinical records. *Without contrast* imaging procedures are acceptable.

For example,

- 566341000119106 | Computed tomography of ankle without contrast (procedure)|[1333]
  - FSN: Computed tomography of ankle without contrast (procedure)
  - PT: CT of ankle without contrast
  - SYN: Computed tomography of ankle without contrast

> ⚠ **Without contrast**
>
> There is a case for explicitly adding a concept qualification when naming procedures that are explicitly performed *without contrast*.

1331 http://snomed.info/id/718674009
1332 http://snomed.info/id/702501008
1333 http://snomed.info/id/566341000119106

In the UK and Australia, it was reported that there are no procedures that specify *without contrast* pre-coordinated in the national subset. With this information, implementation guidance may be provided.

Unacceptable concept qualification

With and without and *With or without* imaging concepts are not acceptable due to ambiguity. Two concepts should be used to express these separately.

Magnetic Resonance Imaging - MRI

Exception

MRI and MR are exceptions to the rule that all abbreviations should have their expanded form in parentheses in descriptions.

Magnetic resonance imaging

Descriptions:

- FSN: Magnetic resonance imaging of X (procedure)
- PT: MRI of X
- SYN: Magnetic resonance imaging of X

For example,

- 6007000 | Magnetic resonance imaging of chest (procedure)|[1334]
  - FSN: Magnetic resonance imaging of chest (procedure)
  - PT: MRI of chest
  - SYN: Magnetic resonance imaging of chest

Magnetic resonance angiography

Descriptions:

- FSN: Magnetic resonance angiography of X (procedure)
- PT: Magnetic resonance angiography of X
- SYN: Magnetic resonance angiogram of X
- SYN: MR angiography of X

For example,

- 432103005 | Magnetic resonance angiography of carotid artery (procedure)|[1335]
  - FSN: Magnetic resonance angiography of carotid artery (procedure)
  - PT: Magnetic resonance angiography of carotid artery
  - SYN: Magnetic resonance angiogram of carotid artery
  - SYN: MR angiography of carotid artery

Magnetic resonance venography

Descriptions:

- FSN: Magnetic resonance venography of X (procedure)
- PT: Magnetic resonance venography of X
- SYN: Magnetic resonance venogram of X
- SYN: MR venography of X

For example,

1334 http://snomed.info/id/6007000
1335 http://snomed.info/id/432103005

- 21101000087100 | Magnetic resonance venography of limb (procedure)[1336]
  - FSN: Magnetic resonance venography of limb (procedure)
  - PT: Magnetic resonance venography of extremity
  - SYN: Magnetic resonance venography of limb

Magnetic resonance arthrography

Descriptions:

- FSN: Magnetic resonance arthrography of X (procedure)
- PT: Magnetic resonance arthrography of X
- SYN: Magnetic resonance arthrogram of X
- SYN: MR arthrography of X

For example,

- 19741000087109 | Magnetic resonance arthrography of right knee (procedure)[1337]
  - FSN: Magnetic resonance arthrography of right knee (procedure)
  - PT: Magnetic resonance arthrography of right knee
  - SYN: MR arthrography of right knee

Magnetic resonance spectroscopy

Descriptions:

- FSN: Magnetic resonance spectroscopy of X (procedure)
- PT: Magnetic resonance spectroscopy of X
- SYN: MR spectroscopy of X

For example,

- 1137352004 | Magnetic resonance spectroscopy of liver (procedure)[1338]
  - FSN: Magnetic resonance spectroscopy of liver (procedure)
  - PT: Magnetic resonance spectroscopy of liver
  - SYN: MR spectroscopy of liver

Computed Tomography - CT

Exception for abbreviation

CT is an exception to the rule that all abbreviations should have their expanded form in parentheses in descriptions.

Axial & Scan

Legacy issues: Existing computerized tomography concepts will be renamed consistently when the Quality Initiative undertakes improvement of the procedure hierarchy.

Axial

Requests for new descriptions with *computerized axial tomography (CAT)* are not acceptable. The *axial* part of the phrase is no longer accurate, because there are other techniques that also create images on multiple planes or axes.

Scan

1336 http://snomed.info/id/21101000087100
1337 http://snomed.info/id/19741000087109
1338 http://snomed.info/id/1137352004

Computed tomography descriptions do not routinely include computed tomography *scan of X.*
The word *scan* is not systematically added in new descriptions and should not be included in preferred terms. However, specific requests to add descriptions with the word *scan* are not denied. *Computerized axial tomography scan of X* is considered obsolete and should not be added as a new description.

Computed tomography
- FSN: Computed tomography of X (procedure)
- PT: CT of X
- SYN: Computed tomography of X

For example,

- 241566009 | Computed tomography of elbow (procedure)|[1339]
  - FSN: Computed tomography of elbow (procedure)
  - PT: CT of elbow
  - SYN: Computed tomography of elbow

With Contrast

CT angiography uses contrast in all cases of the procedure; this must be stipulated in the descriptions.

Computed tomography angiography with contrast
This naming pattern is used when an anatomical location is specified, but the blood vessel is not explicit.

- FSN: Computed tomography angiography of X with contrast (procedure)
- PT: CT angiography of X with contrast
- SYN: Computed tomography angiography of X with contrast

For example,

- 582101000119108 |Computed tomography angiography of head with contrast (procedure)|
  - FSN: Computed tomography angiography of head with contrast (procedure)
  - PT: CT angiography of head with contrast
  - SYN: Computed tomography angiography of head with contrast

Computed tomography arteriography with contrast
- FSN: Computed tomography angiography of [artery] with contrast (procedure)
- PT: CT angiography of [artery] with contrast
- SYN: CT arteriography of [body structure] with contrast
- SYN: Computed tomography arteriography of [body structure] with contrast
- SYN: CT arteriogram of [body structure] with contrast

For example,

- 726077005 Computed tomography angiography of bronchial artery with contrast (procedure)
  - FSN: Computed tomography angiography of bronchial artery with contrast (procedure)
  - PT: CT angiography of bronchial artery with contrast
  - SYN: CT arteriography of bronchial artery with contrast
  - SYN: Computed tomography arteriography of bronchial artery with contrast

Computed tomography venography with contrast
- FSN: Computed tomography venography of X with contrast (procedure)
- PT: CT venography of X with contrast
- SYN: CT venogram of X with contrast

1339 http://snomed.info/id/241566009

- SYN: Computed tomography venography of X with contrast

For example,

- 432842007 |Computed tomography venography of intracranial vein with contrast (procedure)|
  - FSN: Computed tomography venography of intracranial vein with contrast (procedure)
  - PT: CT venography of intracranial vein with contrast
  - SYN: Computed tomography venography of intracranial vein with contrast

> **Venography**
>
> *Venography* may simply be a timing phase of *angiography*. It is agreed that venography may be a useful term in an FSN, i.e. there may be a meaningful technique difference between *simple angiography* and *purposeful venography*.

Computed tomography arthrography

- FSN: Computed tomography arthrography of X (procedure)
- PT: CT arthrography of X
- SYN: CT arthrogram of X
- SYN: Computed tomography arthrography of X

For example,

- 418940000 | Computed tomography arthrography of intratarsal joint (procedure)|[1340]
  - FSN: Computed tomography arthrography of intratarsal joint (procedure)
  - PT: CT arthrogram of intratarsal joint
  - SYN: CT arthrography of intratarsal joint

Ultrasonography

Ultrasonography

- FSN: Ultrasonography of X (procedure)
- PT: Ultrasonography of X
- SYN: Ultrasound scan of X
- SYN: Ultrasound of X

For example,

- 709590000 | Ultrasonography of perineum (procedure)|[1341]
  - FSN: Ultrasonography of perineum (procedure)
  - PT: Ultrasonography of perineum
  - SYN: Ultrasound scan of perineum
  - SYN: Ultrasound of perineum

Doppler ultrasonography

- FSN: Doppler ultrasonography of X (procedure)
- PT: Doppler ultrasonography of X
- SYN: Doppler ultrasound scan of X

For example,

- 710306004 | Doppler ultrasonography of venous structure (procedure)|[1342]
  - FSN: Doppler ultrasonography of venous structure (procedure)
  - PT: Doppler ultrasonography of vein

1340 http://snomed.info/id/418940000
1341 http://snomed.info/id/709590000
1342 http://snomed.info/id/710306004

- SYN: Doppler ultrasound scan of vein

Obstetric ultrasonography
An obstetric ultrasound may require a complex description. However, the same rules apply, as follows:

- FSN: Obstetric ultrasonography of X (procedure)
- PT: Obstetric ultrasonography of X
- SYN: Obstetric ultrasound scan of X
- SYN: Obstetric ultrasound of X

For example,

- 169670003 | Antenatal ultrasound scan at 17-22 weeks (procedure)|[1343]
  - FSN: Antenatal ultrasound scan at 17-22 weeks (procedure)
  - PT: Antenatal ultrasound scan at 17-22 weeks

X-ray

Under revision

There is inconsistency with naming *Radiology of X* vs *X-ray of X* and modeling of X-ray concepts. Preliminary analysis has been completed and a new approach recommended. Remodeling is pending.

Approach 1: Radiography of X
- FSN: Radiography of X (procedure)
- PT: Radiography of X

For example,

- 49345004 | Radiography of hand (procedure)|[1344]

Approach 2: X-ray of X
- FSN: X-ray of X (procedure)
- PT: X-ray of X

For example,

- 426581005 | X-ray of both feet (procedure)|[1345]

Diagnostic radiography
363680008 | Radiographic imaging procedure (procedure) | is at the top-level of the hierarchy of imaging procedures utilizing X-rays. The phrase *diagnostic radiography* is allowed as an FSN of subtypes of radiographic imaging procedure.

For example,

- 66596009 | Diagnostic radiography for foreign body detection and localization (procedure)|[1346]

Inactivated concept

Diagnostic radiologic examination (procedure) had a synonym of *X-ray*. It may have been interpreted more narrowly, because of the potential for a narrower interpretation of *radiologic* vs. *radiographic* and *diagnostic*.

1343 http://snomed.info/id/169670003
1344 http://snomed.info/id/49345004
1345 http://snomed.info/id/426581005
1346 http://snomed.info/id/66596009

Modeling: New content requests

An X-ray concept may have the action, 312254007 | Plain X-ray imaging - action (qualifier value)|[1347] or the broader supertype action, 278110001 | Radiographic imaging - action (qualifier value)|[1348] . A submitter should clearly identify which of the actions is appropriate.

Lateralized Procedure Naming Conventions

Procedure concepts with a body structure that has a left/right side

When creating a lateralized procedure concept, two concepts should be created:

1. concept for the left side
2. concept for the right side

When creating a lateralized procedure concept, if a non-lateralized parent does not exist, then it should be created as well. In other words, do not just create the right and left versions, but also create a concept to represent the laterality-agnostic parent.

For example,

When creating *Excision of left mastoid* and *Excision of right mastoid*, also ensure a concept for *Excision of mastoid* exists.

The acceptable naming pattern for procedures with lateralizable body parts:

- FSN: <Method> of bilateral <anatomical or acquired body structure> (procedure)
- PT: <Method> of bilateral <anatomical or acquired body structure>
- SYN: <Method> of both <anatomical or acquired body structure>

Bilateral procedures should be modeled using two relationship groups, one for each lateralized body structure.

For example,

895470004 | Amputation of bilateral upper limbs (procedure)|[1349]

FSN: Amputation of bilateral upper limbs (procedure)
PT: Amputation of bilateral upper limbs
SYN: Amputation of both upper limbs

1347 http://snomed.info/id/312254007
1348 http://snomed.info/id/278110001
1349 http://snomed.info/id/895470004

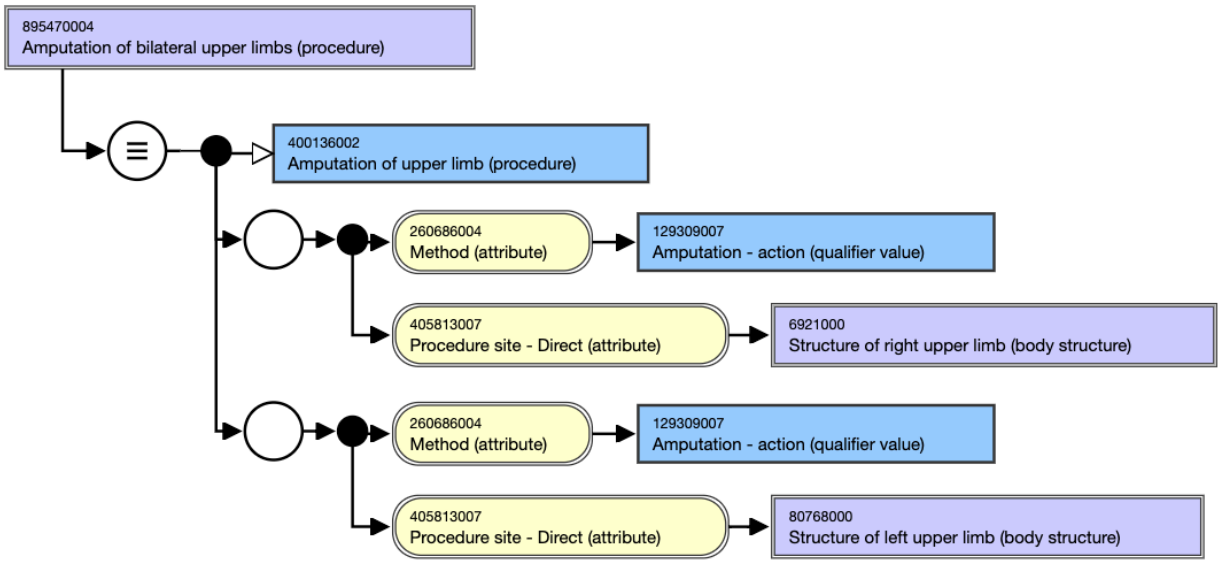


Figure 1: Stated view of 895470004 |Amputation of bilateral upper limbs (procedure)|

Other synonyms may be added if requested, e.g. *Left and right X*; *Bilateral X,* etc.

Measurement Procedure Naming Conventions

SNOMED International is no longer accepting new concepts to the 122869004 |Measurement procedure (procedure)| hierarchy. New requests for content in this area will be created in the 363787002 |Observable entity (observable entity)| hierarchy. Legacy content will be relocated from the Measurement (procedure) hierarchy to the Observable entity hierarchy in the future. Please see Observable Entity[1350] and Observable Entity Naming Conventions[1351] pages for more information.

3.8.11.5 Procedure Modeling

Procedure attribute hierarchies

SNOMED CT has attribute hierarchies for Procedure Site, Procedure Device, and Procedure Morphology. Each has two sub-attributes to represent the *direct* and *indirect objects*. *Procedure Device* also has more specific attributes, *Using Device* and *Using Access Device*.

HRCM 2023-12-01

Author View of Ranges for 363704007 | Procedure site (attribute)|[1352]

Range Constraint[1353]

1350 https://confluence.ihtsdotools.org/display/WIPEG/Observable+Entity
1351 https://confluence.ihtsdotools.org/display/WIPEG/Observable+Entity+Naming+Conventions
1352 http://snomed.info/id/363704007
1353 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint

<< 442083009 |Anatomical or acquired body structure (body structure)|[1354]

HRCM 2023-12-01

Author View of Ranges for 405815000 | Procedure device (attribute)|[1355]

Range Constraint[1356]

<< 49062001 |Device (physical object)|[1357]

HRCM 2023-12-01

Author View of Ranges for 405816004 | Procedure morphology (attribute)|[1358]

Range Constraint[1359]

<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[1360]

Combined procedures

The potential for an endless number of combined procedures that may be performed in the same encounter requires more stringent criteria for addition. Combined procedures acceptable for precoordination are those that represent multiple individual procedures done in sequence or in combination, related to the same focal condition, and performed within the same encounter. These procedures must be sufficiently defined to be added.

Observable entity vs. Evaluation procedure

The observable entity and evaluation procedure hierarchies have some of the same attributes. There is not and should not be a one-to-one correspondence between the two hierarchies.

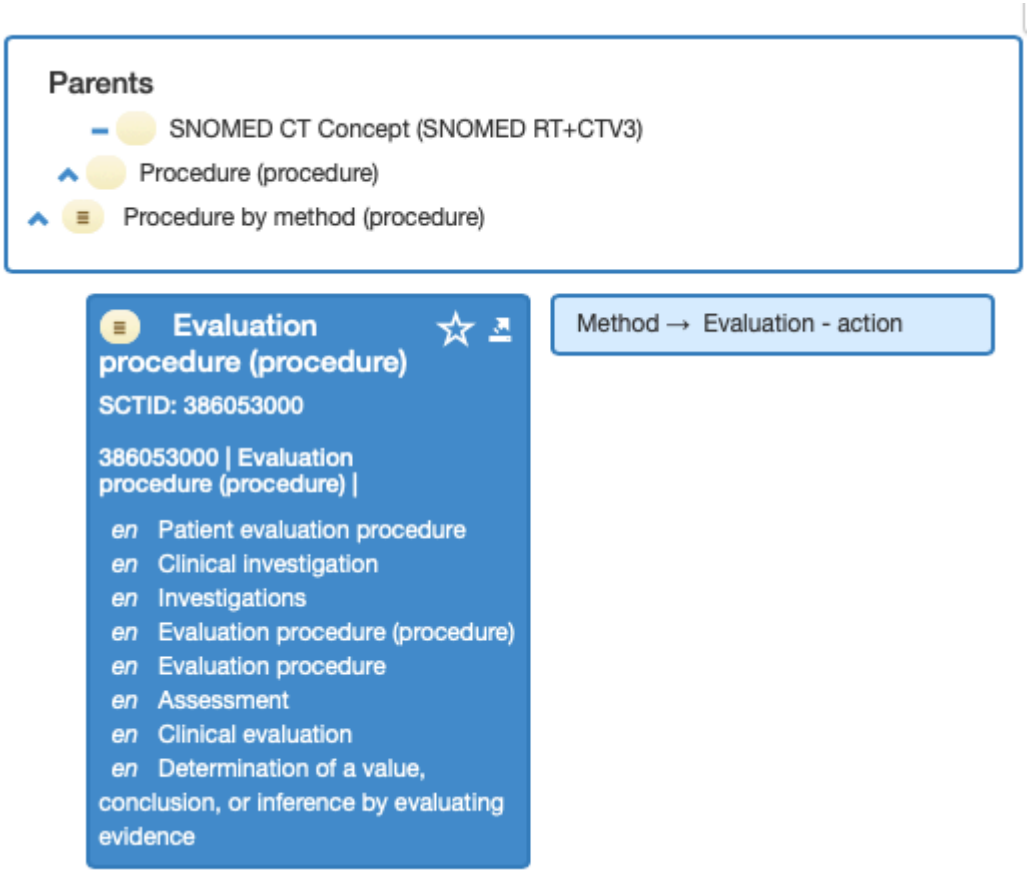
Concepts will not be duplicated between the observable entity hierarchy and procedure hierarchy, and requests for such will not be added. While some users have indicated they want to use a procedure concept for ordering a test and an observable concept for reporting the result, this is not an acceptable use case.

At this time, SNOMED CT contains some concepts in the procedure hierarchy which logically belong in the observable entity hierarchy. It is noted that these concepts will likely move to the observable entity hierarchy in the future. In addition, if we identify existing duplicate concepts between the two hierarchies, this will also be corrected.

The evaluation procedure hierarchy is currently classified under *Procedure by method*, with many immediate children as follows:

1354 http://snomed.info/id/442083009
1355 http://snomed.info/id/405815000
1356 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1357 http://snomed.info/id/49062001
1358 http://snomed.info/id/405816004
1359 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1360 http://snomed.info/id/49755003

- Procedure by method (procedure)
    - Evaluation procedure (procedure); some children include:
        - Imaging (procedure)
        - Measurement procedure (procedure)
        - Physical examination assessment (procedure)



Evaluation procedures can be defined by a Method (attribute) of Evaluation - action (qualifier value).

Subtypes of Evaluation-action (qualifier value) include:

- Examination - action (qualifier value)
- Imaging - action (qualifier value)
- Measurement - action (qualifier value)
- Monitoring - action (qualifier value)
- Spectroscopy - action (qualifier value)

Reason for procedure

In general, the reason for ordering a procedure should not be precoordinated within the procedure concept, i.e. it should not constrain the reporting of results. The reason that a procedure is ordered may influence the interpretation of the results but usually does not influence the *way* the procedure is performed.

Unacceptable example,

- Computed tomography angiography of chest with contrast for evaluation of pulmonary embolus (procedure)

Acceptable example including reason for procedure,

- 66596009 | Diagnostic radiography for foreign body detection and localization (procedure)|[1361]

Study

Procedures with the word *study* are unacceptable. They are ambiguous, as they imply context beyond the execution of the procedure.

Primary vs secondary procedures

The meaning of *primary* and *secondary*, when describing a procedure, is open to interpretation. Consequently, the concepts will be inactivated.

The interpretation of primary may be:

- Not ever done before at this site
- The first of multiple procedures, with two sub-meanings:
  - The first of planned multiple procedures, whether the plan is carried out or not
  - The first of multiple procedures that were not planned or foreseen, i.e. it is only the first of multiple procedures in retrospect

Examples of unacceptable descriptions,

- Primary anterior decompression of cervical spinal cord (procedure)
- Primary anterior excision of cervical intervertebral disc (procedure)
- Primary arthrodesis of interphalangeal joint of toe (procedure)
- Primary anterolateral excision of thoracic intervertebral disc (procedure)

"First" and “Subsequent” Procedures

"First" and “subsequent” procedures are not allowed, as they are inherently ambiguous and relative. While administratively relevant, the additional descriptions of the procedure are not clinically relevant.

Unacceptable examples,

- Antenatal first blood tests (procedure)
- Antenatal subsequent blood tests (procedure)

- Aspiration(see page 461)
- Division, lysis, transection, bisection(see page 462)
- Duplex ultrasonography, Doppler ultrasound, and Doppler ultrasonography(see page 463)
- Encounter(see page 463)
- Endoscopy vs. endoscopic procedure(see page 463)
- Excision, incision, biopsy(see page 464)
- Flap procedures(see page 466)
- Grafting(see page 469)
- Imaging(see page 470)
- Imaging-guided procedure modeling(see page 471)
- Immunization and vaccination(see page 472)
- Monitoring(see page 473)
- Procedure during period of life(see page 473)
- Regimes and therapies(see page 475)
- Revision(see page 476)
- Skeletal system(see page 477)

1361 http://snomed.info/id/66596009

- Surgical procedures(see page 478)

Aspiration

Aspiration is extraction using negative pressure. When modeling aspiration concepts, procedure site distinction is made if the removal is either (1) a substance from within a body structure or specific morphology, or (2) removal of any of the body structure itself (including cells).

1. Removing a substance from within a body structure or specific morphology should be modeled using Procedure site - Indirect (attribute) and/or Indirect morphology (attribute).

For example,

- Paracentesis of skin (procedure) is removing a substance from within the body structure and not the body structure itself, it is modeled using Procedure site - Indirect (attribute) of Skin structure.

2. Removing body structure cells should be modeled with Procedure site - Direct (attribute) and/or Direct morphology (attribute).

For example,

- Fine needle aspiration biopsy of skin (procedure) removes part of the body structure itself, and therefore is modeled using Procedure site - Direct (attribute) of Skin structure.

If it is unknown whether the aspiration is removing either a *substance from within* a body structure or the *body structure* cells themselves, model with the broader Procedure site (attribute) and/or Procedure morphology (attribute).

The nature of some aspirations means the procedure site will inherently be modeled as either direct or indirect regardless of whether the FSN states a substance is being removed.

Example procedures using Procedure site - Direct (attribute):

- Fine needle aspiration biopsy
- Bone marrow aspiration
- Suction assisted lipectomy/Liposuction

Example procedures using Procedure site - Indirect (attribute):

- Centesis
- Aspiration of [space or cavity]
- Suction of [space or cavity]
- Barbotage
- Aspiration of device
- Aspiration of [space or cavity] contents
- Tap

Substance aspirated

If the substance being aspirated is not stated in the FSN, do not model it, even if it might be implied.

- *Exception*: Aspiration of abscess can use Direct substance = Pus (substance).

Abscesses can be either septic (due to infection) or sterile (not due to infection). Most abscesses are septic; however, pus is characteristic of an abscess - whether septic or sterile. Model with Indirect morphology (attribute) of Abscess (morphologic abnormality) and the Direct substance (attribute) of Pus (substance). Pus does not have to be stated in the FSN.

Centesis

Centesis may be defined as the act of puncturing a body cavity or space with a hollow needle and drawing out fluid. Each centesis procedure involves both a puncture action and a needle aspiration action. It is correct to have two relationship groups for centesis procedures.

One group has a Method (attribute) of Puncture - action (qualifier value) and a Procedure site - Direct (attribute) of the structure being punctured.

A second group has a Method (attribute) of Aspiration - action (qualifier value) and a Procedure site - Indirect (attribute) of the space being aspirated.

For example,

- 91602002 |Thoracentesis (procedure)|[1362] has:
  - Role group 1:
    - Method = Puncture - action
    - Procedure site - Direct (attribute) = Pleural membrane structure (body structure)
    - Using device = Needle, device
  - Role group 2:
    - Method = Aspiration - action
    - Procedure site - Indirect (attribute) = Pleural cavity structure (body structure)
    - Using device = Needle, device

Division, lysis, transection, bisection

Division and lysis

Division - action (qualifier value) is a subtype of Incision - action (qualifier value). This does not mean that all procedures, that include the word *division*, should necessarily be modeled with Method (attribute) of Division - action (qualifier value), like those where the division is accomplished using *blunt dissection*, not incision.

For example,

- *Division of adhesion* concepts, like 173269002 |Division of adhesions of lip (procedure)|[1363], should be modeled the same as *lysis of adhesion* concepts, like 45602008 |Lysis of adhesions of peritoneum (procedure)|[1364]

Both use *Dissection - action (qualifier value)*. Adhesions are *broken down* by blunt dissection, often without incising them. This does not exclude procedures that may also involve division by incision.

The preferred name of *division of adhesions* concepts can be changed to *lysis of adhesions* for consistency. The use of *lysis of adhesions* also helps with correct modeling and avoidance of interpreting *divisions* as necessarily being kinds of incision.

Transection and bisection

Transection is defined as a division across the longitudinal axis of a structure by cutting. *Bisection* is defined as division into two parts by cutting. Transection - action (qualifier value) is a subtype of Bisection - action (qualifier value), which is a subtype of Division - action (qualifier value) and Incision - action (qualifier value).

For example,

1362 http://snomed.info/id/91602002
1363 http://snomed.info/id/173269002
1364 http://snomed.info/id/45602008

- 53176004 |Transection of muscle of eye (procedure)|[1365]
- 60158005 |Bilateral bisection of ovary (procedure)|[1366]

Duplex ultrasonography, Doppler ultrasound, and Doppler ultrasonography

Duplex ultrasonography, Doppler ultrasound, and Doppler ultrasonography procedures were previously modeled with the Using device (attribute) with a value of 43770009 |Doppler device (physical object)| and a Method (attribute) of 278292003 |Ultrasound imaging - action (qualifier value)| or 302204005 |Ultrasound - action (qualifier value)|. It was not possible to sufficiently model duplex procedures to make them distinct from Doppler scans, and modeling of Doppler procedures was inconsistent with other imaging procedures where the modality was represented in the Method.

The concept model is now updated to be consistent with other imaging procedures. The Using device (attribute) has been removed, and the respective imaging modality has been added as a value for the Method (attribute), i.e. |Doppler ultrasound imaging - action (qualifier value)| and |Duplex ultrasound (qualifier value)|.

Doppler ultrasonography of x (procedure)

For example,

- 713683001 |Doppler ultrasonography of subclavian vein (procedure)|
  - Method (attribute) = |Doppler ultrasound imaging - action (qualifier value)|
  - Procedure site - Direct (attribute) = |Structure of subclavian vein (body structure)|

Duplex ultrasonography of X (procedure)

For example,

- 1178980000 |Duplex ultrasonography of carotid artery (procedure)|
  - Method (attribute) = |Duplex ultrasound (qualifier value)|
  - Procedure site - Direct (attribute) = |Carotid artery structure (body structure)|

Encounter

An *encounter* is defined as an in-person meeting between a patient and a healthcare provider for the purpose of the provision of healthcare services to the patient. 308335008 |Patient encounter procedure (procedure)| is a subtype of Procedure (procedure).

For example,

- 185349003 |Encounter for check up (procedure)|[1367]

An *indirect encounter* occurs without a face-to-face meeting. 185316007 |Indirect encounter (procedure)| is a subtype of 308335008 |Patient encounter procedure (procedure)|.

For example,

- 386473003 | Telephone follow-up (procedure)|[1368]

Endoscopy vs. endoscopic procedure

Endoscopic procedures are distinguished from *endoscopy* procedures. The distinction depends on the Action (qualifier value) of the Method (attribute).

1365 http://snomed.info/id/53176004
1366 http://snomed.info/id/60158005
1367 http://snomed.info/id/185349003
1368 http://snomed.info/id/386473003

In an endoscopy, the Method is *Inspection - action (qualifier value)*. For these procedures, *Endoscope, device (physical object)* is the value for *Using device (attribute).*

For example,

- 427595003 |Capsule endoscopy (procedure)|[1369] has the Relationship group
  - Using device = Video capsule endoscopy system capsule (physical object)
  - Procedure site - Direct = Gastrointestinal tract structure (body structure)
  - Method = Inspection - action (qualifier value)

In an endoscopic procedure, the Method (attribute) has some other action. It is accomplished by gaining access to the procedure site via an endoscope. For these procedures *Endoscope device (physical object)* is the value for *Using Access Device (attribute).* This specifies that the endoscope is used to access the site.

For example,

- 53767003 |Endoscopic biopsy (procedure)|[1370] has the Relationship group
  - Using access device = Endoscope, device (physical object)
  - Method = Biopsy - action (qualifier value)

Endoscope selection

Naming individual scopes for procedures involving multiple body sites leads to inconsistent inferences. For procedures involving multiples sites or where it is known there are a number of appropriate scopes that could be employed, use 37270008 |Endoscope, device (physical object)| e.g. see 76009000 |Esophagogastroduodenoscopy (procedure)|.

Excision, incision, biopsy

Excision, incision, and biopsy may be difficult to interpret. They are organized according to the following general structure.

Excision

Organ excision. Any excisional act involving the organ; usually *(organ)-ectomy,* or similar, is a synonym. *Organ excision*, itself, does not specify whether it is complete or partial, nor does it specify what is excised.

For example,

- 23968004 |Excision of colon (procedure)|[1371] or one of the synonyms, Colectomy

Complete or total excision

Concepts may include *complete* or *total* to indicate complete removal or excision of the organ.

For example,

- 63016009 |Total resection of urinary bladder (procedure)|[1372] with the synonyms Complete cystectomy, Total excision of bladder, and etc

1369 http://snomed.info/id/427595003
1370 http://snomed.info/id/53767003
1371 http://snomed.info/id/23968004
1372 http://snomed.info/id/63016009

Partial excision

Concepts may include *partial* to indicate removal or excision of part of the organ. Specifying *partial excision* does not differentiate between a partial excision *of* or *from* the organ.

For example,

- 708929007 |Laparoscopic partial excision of kidney using robotic assistance (procedure)|[1373] or one of the synonyms, Partial nephrectomy, laparoscopic with robot assistance

Lesion or tissue

Concepts may indicate removal of a lesion or tissue; excision of a lesion or tissue from an organ may be complete or partial.

For example,

- 72106008 |Excision of lesion of liver (procedure)|[1374]
- 69031006 |Excision of breast tissue (procedure)|[1375]

Lesion modeling

The word *lesion* can be used to refer to both structural and functional abnormalities. If a *procedure* refers to a lesion that is a structural abnormality, then model with a 405816004 |Procedure morphology (attribute)|[1376] of << 52988006 |Lesion (morphologic abnormality)|[1377].

Excision(al) biopsy

Excisional biopsy of organ generally means that *tissue* or a *lesion* or *suspected lesion* is necessarily entirely excised, not the entire organ. It is a partial excision of (from) the organ. This is true even when small polyps are removed.

For example,

- 116237003 |Excisional biopsy of lesion of rectum by transanal approach (procedure)|[1378]

Incision

An organ incision is any incisional act involving the organ; usually *(organ)-otomy,* or similar, is a synonym

For example,

- 45558009 |Incision of lung (procedure)|[1379] or the synonym, pneumonotomy

Any *incision* procedure that does not necessarily involve division (as opposed to ordinarily does not involve division) remains primitive without an available negation operator

1373 http://snomed.info/id/708929007
1374 http://snomed.info/id/72106008
1375 http://snomed.info/id/69031006
1376 http://snomed.info/id/405816004
1377 http://snomed.info/id/52988006
1378 http://snomed.info/id/116237003
1379 http://snomed.info/id/45558009

Incisional biopsy

Incisional biopsy of organ; incisional biopsy of lesion of organ; usually with open approach. Incisional biopsy of [organ] necessarily implies incision and removal of a lesion, and is by definition a *partial excision*, since the site is the organ, and an excision is done, but the entire lesion is not necessarily removed.

For example,

- 237378001 |Incisional biopsy of breast (procedure)|[1380]

A *biopsy* may not be an excision.

For example,

- 445713002 |Brush biopsy of endocervix (procedure)|[1381]
- 48426002 |Fine needle biopsy of kidney (procedure)|[1382]

Modeling biopsies

Biopsies, like other removal procedures, may have two direct objects, the *morphology* and the *site*. It is permissible to use Procedure site - Direct (attribute) for biopsies, even if subtypes might have a direct object that is a morphology.

Flap procedures

The concept model for flap procedures is based on three attributes in a role group as outlined below:

363701004 |Direct substance (attribute)|

- 363701004 |Direct substance (attribute)| must have a value from the 256683004 |Flap (substance)| subhierarchy, and indicate the direct flap substance composition, and its blood supply.
- 363701004 |Direct substance (attribute)| must be used for flap procedures (and **not** 424361007 |Using substance (attribute)|).
- Flap substances exist for free flaps and pedicle flaps (<<261238005 |Free flap (substance)| and << 261235008 |Pedicle flap (substance)|) and reflect the fact that whether a flap is free or pedicle is also a function of its blood supply (i.e. completely unattached from its original blood supply, or still attached via a vascular pedicle).
- Also see Flap (substance) editorial guidance.

260686004 |Method (attribute)|

- For flap reconstruction procedure, 260686004 |Method (attribute)| must have a value from the 360032005 |Flap reconstruction - action (qualifier value)| subhierarchy and indicate the flap procedure technique, for example, advancement or rotation of flap.
- For free flap procedures, the method is 1193839003 |Distant flap reconstruction - action (qualifier value)|
- The proximity of the flap donor site to the flap recipient site (local flap/distant flap) must be modeled as part of the methodology of the procedure (and is no longer a characteristic of the flap substance).

For example,

1380 http://snomed.info/id/237378001
1381 http://snomed.info/id/445713002
1382 http://snomed.info/id/48426002

1193839003 |Distant flap reconstruction - action (qualifier value)| relates to the remote distance between the donor site and the recipient site.

- When the donor site is indicated in the FSN, for a flap reconstruction procedure for example, then an additional role group is added including the 260686004 |Method (attribute)| with a value of 1193917004 |Flap creation - action (qualifier value)|. The donor site may be stated by the use of 'from x body structure' in the FSN, or if the donor site is indicated by the flap substance (See Example 2 below).

405813007 |Procedure site - Direct (attribute)|

- If it is known where on the body the procedure to perform the flap reconstruction, or flap creation, or other flap procedure is performed, then 405813007 |Procedure site - Direct (attribute)| is used (do not use 405814001 |Procedure site - Indirect (attribute)|).
- Do not include 405813007 |Procedure site - Direct (attribute)| if no location on the body is specified.
- Do not include general value 442083009 |Anatomical or acquired body structure (body structure)| if no body site is stated.

Example 1: 304093002 |Reconstruction using local subcutaneous pedicle osteomyocutaneous flap (procedure)|

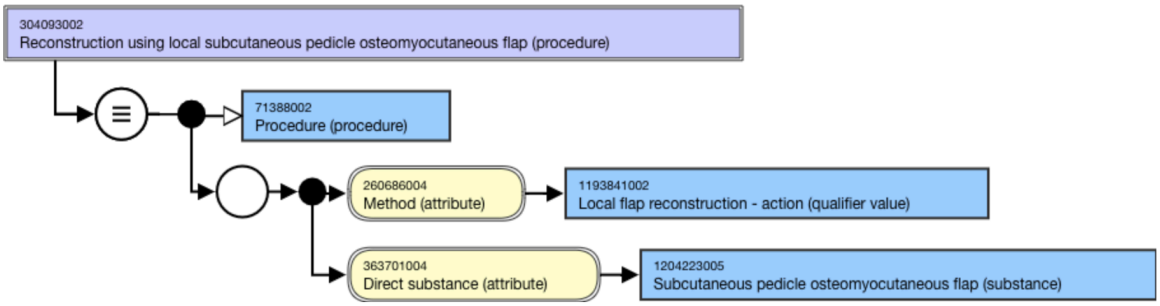


Figure 1: Stated diagrammatic view of 304093002 |Reconstruction using local subcutaneous pedicle osteomyocutaneous flap (procedure)|

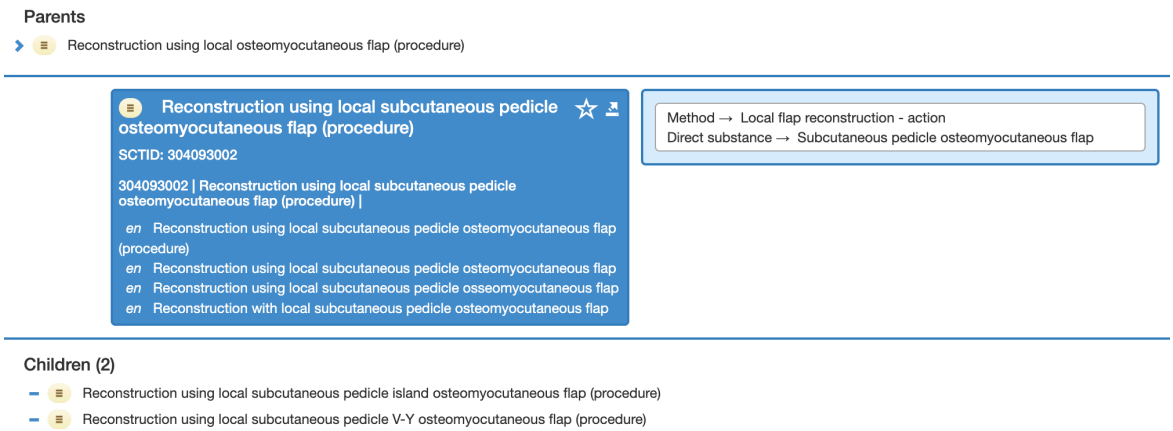


Figure 2: Inferred browser view of 304093002 |Reconstruction using local subcutaneous pedicle osteomyocutaneous flap (procedure)|

Example 2: 14390001000004103 |Reconstruction of mouth using pectoralis major myocutaneous flap (procedure)|

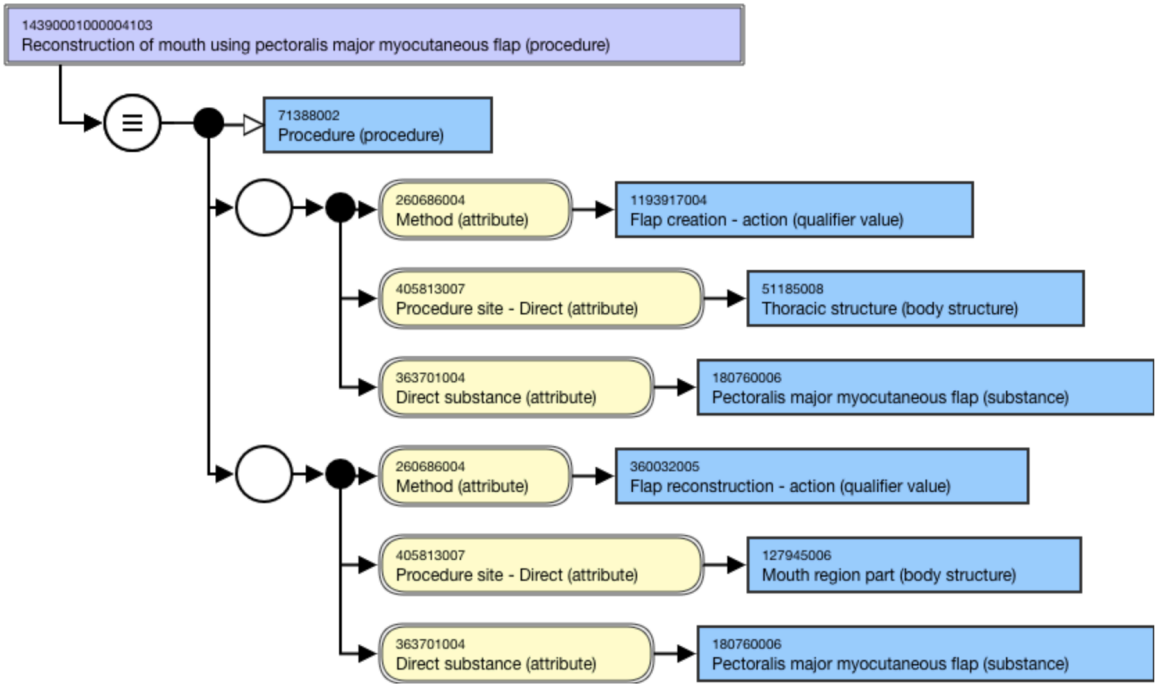


Figure 3: Stated diagrammatic view of 14390001000004103 |Reconstruction of mouth using pectoralis major myocutaneous flap (procedure)|

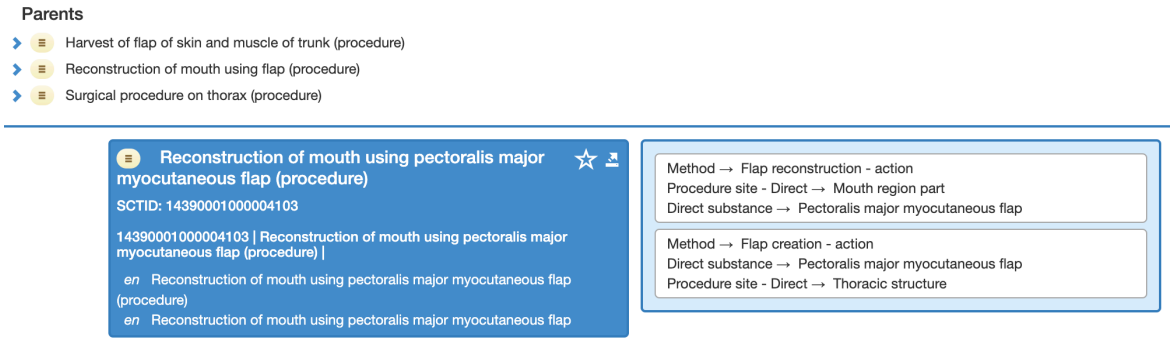


Figure 4: Inferred browser view of 14390001000004103 |Reconstruction of mouth using pectoralis major myocutaneous flap (procedure)|

Flap procedure naming

Simple procedure terming

FSN: Reconstruction using flap (procedure)

PT: Reconstruction using flap

SYN: Reconstruction with flap

SYN: Flap reconstruction [optional]

For example,

FSN: Reconstruction using free flap (procedure)

PT: Reconstruction using free flap

SYN: Reconstruction with free flap

SYN: Free flap reconstruction [optional]

Flap reconstruction 2

FSN: Reconstruction of x body structure using y flap (procedure)

PT: Reconstruction of x body structure using y flap

SYN: Reconstruction of x body structure with y flap

SYN: y flap reconstruction of x body structure [optional]

For example,

FSN: Reconstruction of breast using pedicle transverse rectus abdominis myocutaneous flap (procedure)

PT: Reconstruction of breast using pedicle transverse rectus abdominis myocutaneous flap

SYN: Reconstruction of breast with pedicle transverse rectus abdominis myocutaneous flap

SYN: Breast reconstruction using pedicle transverse rectus abdominis myocutaneous flap [optional]

Existing flap procedure concepts may not align with this new terming. No new 'flap graft' procedures should be added going forward.

Grafting

Although the use of terminology may vary across specialties, in general, grafting is where tissue is completely separated from its source of origin or donor, without its own blood supply, then affixed to a recipient site. The recipient site provides the vascularity.

Graft of skin is

- A section of skin with variable size, thickness, and origin
- Completely detached from its original site and moved to cover the area to be repaired without the benefit of any blood supply

For grafting, the recipient site is represented with the Procedure site - Direct (attribute), and the graft is represented with the Direct substance (attribute).

Fixation or attachment of tissue involves skin, bone, cartilage, or fat, rather than whole organs. The term can also be used for fixation or attachment of synthetic materials (e.g., a bioengineered skin graft is a manufactured skin graft grown in the laboratory from the patient's own cells, other allogeneic or xenogeneic sources, and/or synthetic materials; for example, silicone graft).

For example,

- 783285007 |Full thickness graft of skin to skin of neck (procedure)|[1383]
  - Proximal primitive Is a (attribute) value is 71388002 Procedure (procedure)
  - A single relationship group consists of:
    - 260686004 |Method (attribute)|[1384] = 129407005 |Grafting - action (qualifier value)|[1385]
    - 405813007 |Procedure site - Direct (attribute)|[1386] = 43081002 |Skin structure of neck (body structure)|[1387]
    - 363701004 |Direct substance (attribute)|[1388] = 782792007 |Full thickness graft of skin (substance)|[1389]
      - Values for direct substance should be from the 420934007 |Graft of skin (substance)|[1390] hierarchy that include the origin of the material in the description.

Imaging

When an imaging procedure involves visualization of a device and/or a morphologic abnormality in addition to an anatomic site, all of these are direct objects of imaging and therefore are represented using Direct morphology, Direct device, and Procedure site Direct attributes.

For example,

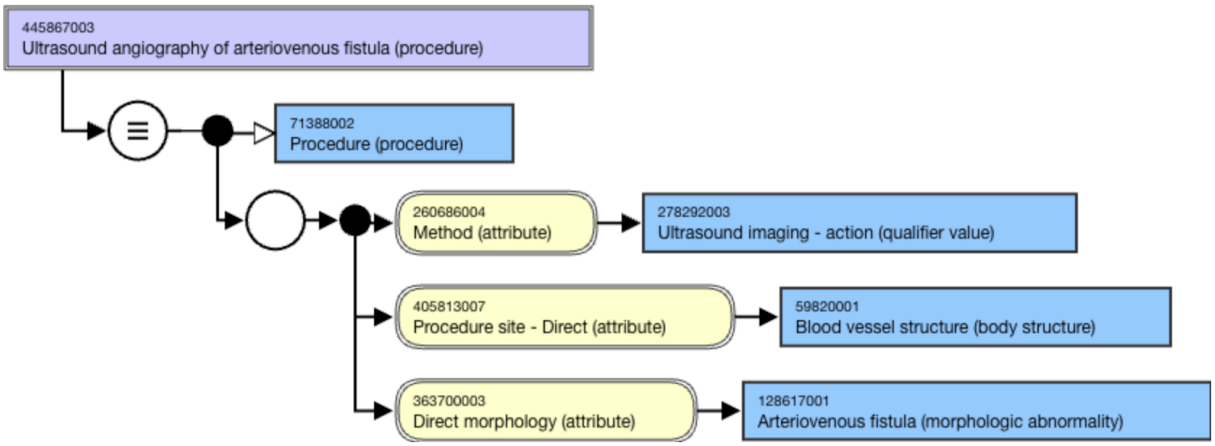


Figure 1: Stated view of 445867003 |Ultrasound angiography of arteriovenous fistula (procedure)|

1383 http://snomed.info/id/783285007
1384 http://snomed.info/id/260686004
1385 http://snomed.info/id/129407005
1386 http://snomed.info/id/405813007
1387 http://snomed.info/id/43081002
1388 http://snomed.info/id/363701004
1389 http://snomed.info/id/782792007
1390 http://snomed.info/id/420934007

Imaging-guided procedure modeling

Imaging guidance can be modeled using the *Has intent (attribute)*. The concept 429892002 |Guidance intent (qualifier value)|[1391], a child of 363675004 |Intents (nature of procedure values) (qualifier value)|[1392], is the value for the Has intent (attribute) for imaging-guided procedures.

For example,

- 432666003 |Biopsy of brain using computed tomography guidance (procedure)|[1393] has two relationship groups:
  - Group 1:
    - Method (attribute) of Biopsy - action (qualifier value)
    - Procedure Site - Direct (attribute) of Brain structure (body structure)
  - Group 2:
    - Procedure Site - Direct (attribute) of Brain structure (body structure)
    - Method (attribute) of Computed tomography imaging - action (qualifier value)
    - Has intent (attribute) of Guidance intent (qualifier value)

Biopsy of brain using CT guidance

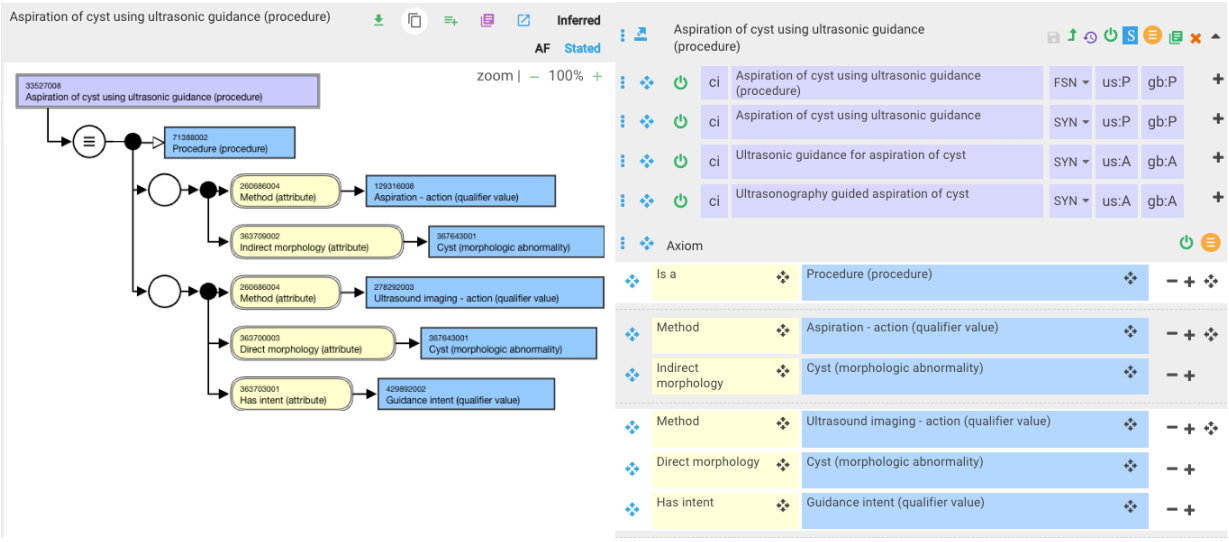
432666003 |Biopsy of brain using computed tomography guidance (procedure)|[1394] is subsumed by 702707005 |Biopsy of head (procedure)|[1395] and by 34227000 |Computerized axial tomography of brain (procedure)|[1396].

Where the procedure involves a device and/or morphology as the object of the action for which imaging guidance is being performed, that morphology, device, and/or anatomic structure in/on which the procedure is being performed are all the direct object of the imaging action. The direct device or direct morphology is included in the imaging role group.

For example,

In Aspiration of cyst using ultrasonic guidance (procedure), the Ultrasound imaging role group will include a Direct morphology (attribute) of Cyst (morphologic abnormality).

1391 http://snomed.info/id/429892002
1392 http://snomed.info/id/363675004
1393 http://snomed.info/id/432666003
1394 http://snomed.info/id/432666003
1395 http://snomed.info/id/702707005
1396 http://snomed.info/id/34227000



Fluoroscopic guidance

X using fluoroscopic guidance (procedure) is a subtype of Fluoroscopy (procedure).

For example,

- 710291004 |Endoscopy using fluoroscopic guidance (procedure)|[1397] has the following relationship groups
  - Group 1:
    - Using device (attribute) of Endoscopic device (physical object)
    - Method (attribute) of Inspection - action (qualifier value)
  - Group 2:
    - Method (attribute) of Fluoroscopic imaging - action (qualifier value)
    - Has intent (attribute) of Guidance intent (qualifier value)

> See also *Clinical imaging procedure naming conventions* section

Immunization and vaccination

Immunization may be active (introduction of a vaccine) or passive (introduction of immunoglobulin/antibodies). A *vaccine* is a substance that can induce active immunity. *Vaccination*, by definition, is the introduction of a vaccine, and is, therefore, synonymous with active immunization. Some descriptions include the word *vaccination*, where it is clear that vaccination is intended. Other descriptions have preferred terms with the word *vaccination*, and synonyms with the word *immunization*, to include both active and passive immunization.

For example,

- 38598009 |Measles-mumps-rubella vaccination (procedure)|[1398] has *vaccination* in all descriptions
- 86198006 |Influenza vaccination (procedure)|[1399] has the synonym, influenza *immunization*

1397 http://snomed.info/id/710291004
1398 http://snomed.info/id/38598009
1399 http://snomed.info/id/86198006

Monitoring

Monitoring of any type is not a notion to be included in SNOMED CT, as it is not really an orderable and clearly not a resultable concept. There are 530 monitoring concepts <239516002 |Monitoring procedure (regime/therapy)| that will eventually be inactivated; new concepts with this label are not to be added.

Procedure during period of life

Where a procedure is undertaken during a specific period of life, such as in the maternal pregnancy period, the descriptions may include the term *during*. However, the concept is modeled with Occurrence (attribute) with a value of <282032007 |Periods of life (qualifier value)|.

For example,

- 1287360000 | Injection of epidural anesthesia during maternal intrapartum period (procedure)| has an Occurrence (attribute)| of 1156682000 |Maternal intrapartum period (qualifier value)|.

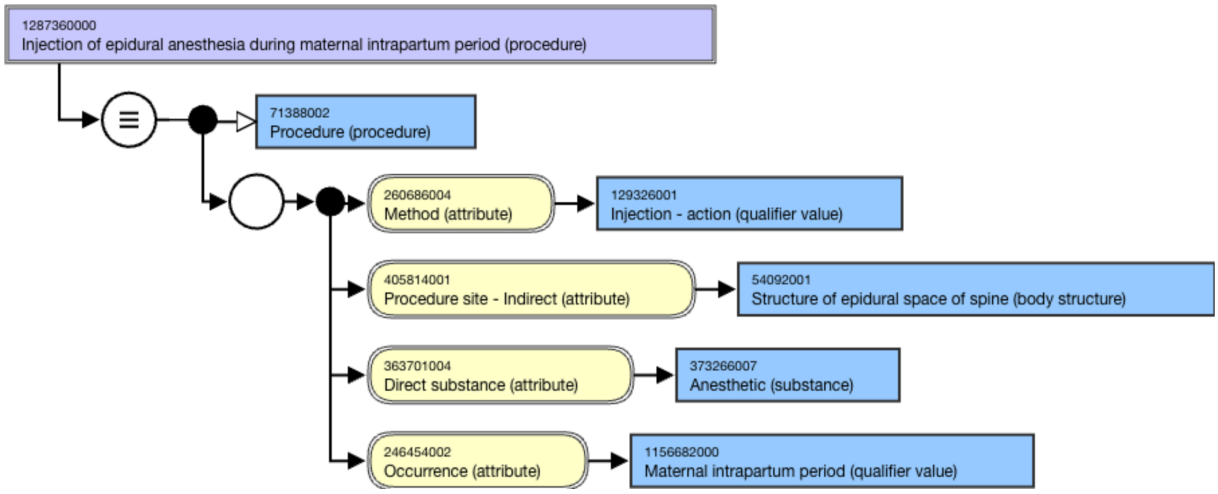


Figure 1: Stated view of 1287360000 |Injection of epidural anesthesia during maternal intrapartum period (procedure)|

Obstetric procedures

Obstetric procedure (procedure) is modeled with two GCI axioms using the Occurrence (attribute) with a value of either Maternal perinatal period (qualifier value) or Pregnancy time period (qualifier value).

There are two modeling patterns for procedures containing *obstetric* in descriptions.

Maternal period *cannot* be determined
For procedures containing *obstetric* in descriptions, but a specific maternal period *cannot* be determined, concepts should be modeled using |Obstetric procedure| as the primitive parent concept and fully defined by a specific method.

For example,
Obstetric operation (procedure) is fully defined by the parent |Obstetric procedure| and the Method (attribute) of Surgical action (qualifier value).

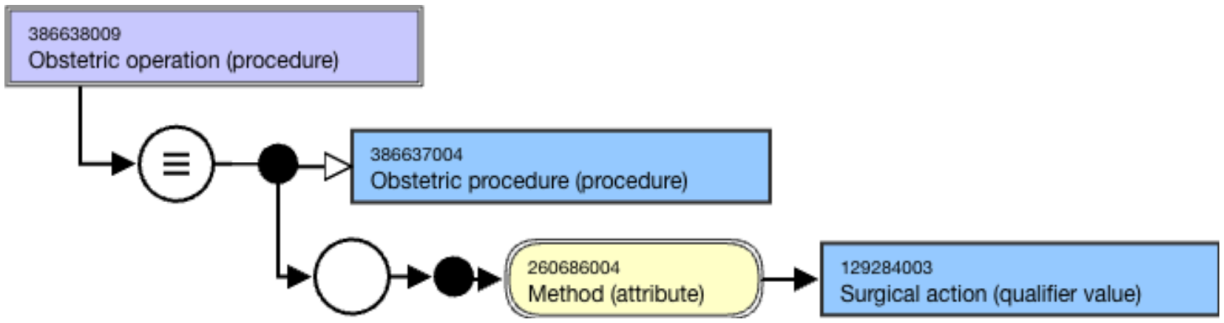


Figure 2: Stated view of 386638009 |Obstetric operation (procedure)|

Maternal period *can* be determined
For procedures which a specific maternal period *can* be determined, the primitive parent is |Procedure| with Occurrence of either <<Maternal perinatal period (qualifier value) or <<Pregnancy time period (qualifier value).

For example,
Diagnostic ultrasound of gravid uterus (procedure) can be fully defined by |Procedure| and Ultrasound imaging of the Uterus with Occurrence of Maternal antenatal and/or intrapartum time period (qualifier value).

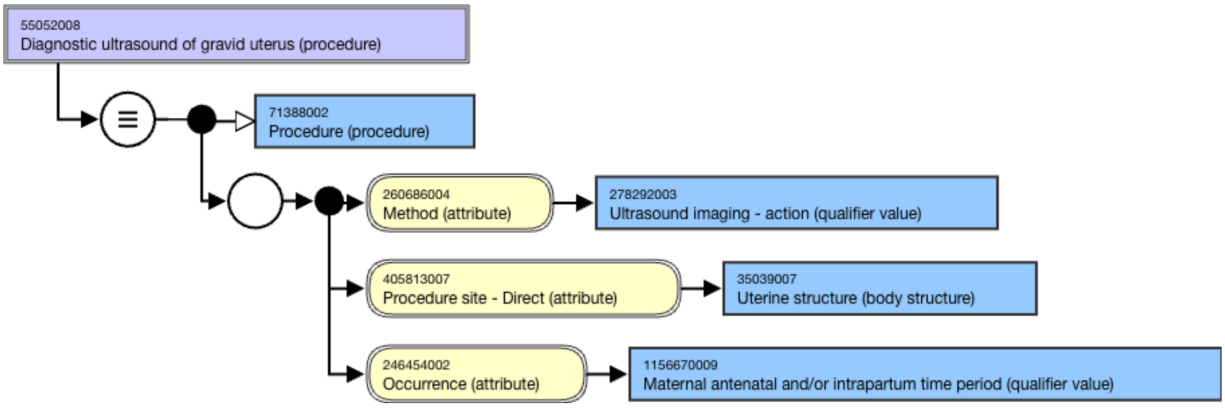


Figure 3: Stated view of 55052008 |Diagnostic ultrasound of gravid uterus (procedure)|

The generic 35039007 |Uterine structure (body structure)| should be used, because 9258009 |Gravid uterus structure (body structure)| cannot return the complete substructures of the uterus.

Fetal procedures

Fetal procedures are fully defined by an Occurrence (attribute) of <<Fetal period (qualifier value). Generic body structures, for example, kidney, head, etc., should be used for procedure sites, unless the structure is unique to a fetus. Structures *not* unique to a fetus, such as, fetal head, fetal kidney, etc., will be inactivated in future releases, so they should not be used for modeling fetal procedures.

For example,
Ultrasonography of fetal head (procedure) can be fully defined by |Procedure| and Ultrasound imaging of the Head with the Occurrence (attribute) of Fetal period (qualifier value).

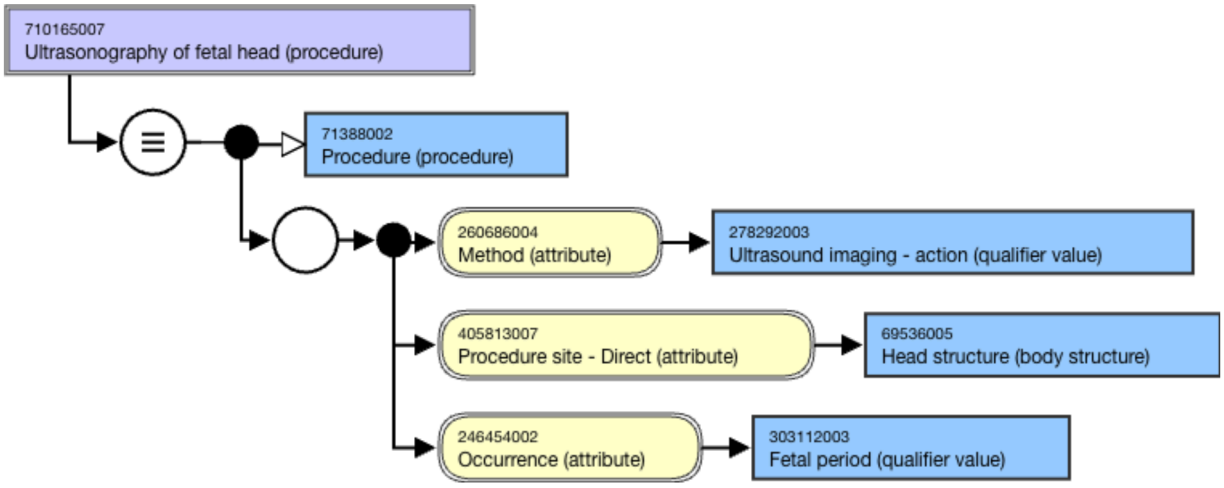


Figure 4: Stated view of 710165007 |Ultrasonography of fetal head (procedure)|

The generic 69536005 |Head structure (body structure)| should be used, because the 54527006 |Fetal head structure (body structure)| cannot return the complete substructures of the head.

Regimes and therapies

A regime/therapy is a set, sequence, or group of procedures. 243120004 |Regimes and therapies (regime/therapy)| is a subtype of Procedure (procedure). As a subtype of procedure, Regimes and therapies have the same attributes and use the same concept model as general procedures.

Regime and therapies are either repeated multiple times or performed over an extended period of time.

For example,

- 716872004 |Antineoplastic chemotherapy regimen (regime/therapy)|[1400]

  This regime/therapy might include individual instances of administration of chemotherapy agents; the instances are at separate, predetermined periods of time.

- 229586001 |Rest, ice, compression and elevation treatment program (regime/therapy)|[1401]

  This regime/therapy refers to repeated rest, ice, compression and elevation (RICE) for an indefinite period of time.

Regime and therapies are focused on a single purpose but do not have any single sub-procedure as a necessary part.

For example,

1400 http://snomed.info/id/716872004
1401 http://snomed.info/id/229586001

- 385695003 |Cast care (regime/therapy)|[1402], The sub-procedures are all done for the purpose of properly monitoring and maintaining an orthopedic cast, but the sub-procedures may vary from one cast, patient, or healthcare setting to the next. Sub-procedures may include inspecting the cast, checking the skin, reinforcing padding, etc. There is not a single sub-procedure as a necessary part, although the purpose of the sub-procedures is to take care of a cast.
- It is possible to have a regime/therapy as an *instance* of care. An instance of *cast care* could be the specific care for Mr. Smith's cast on the morning of April 23rd, consisting of the set of procedures: examining the cast; examining his arm; asking about his symptoms; and cleaning the skin.

Has focus

Regime/therapy may be the value for the *Has focus (attribute)*.
For example,

- 385978009 |Cardiac rehabilitation assessment (procedure)|[1403] has a Has focus (attribute) of Cardiac rehabilitation (regime/therapy)

Revision

A *revision procedure* may or may not be a subtype of the original procedure. Revision procedure concepts should be in the 118635009 |Revision (procedure)|[1404] sub-hierarchy.

For example,

171839006 |Re-release of carpal tunnel (procedure)|[1405] is modeled as follows:

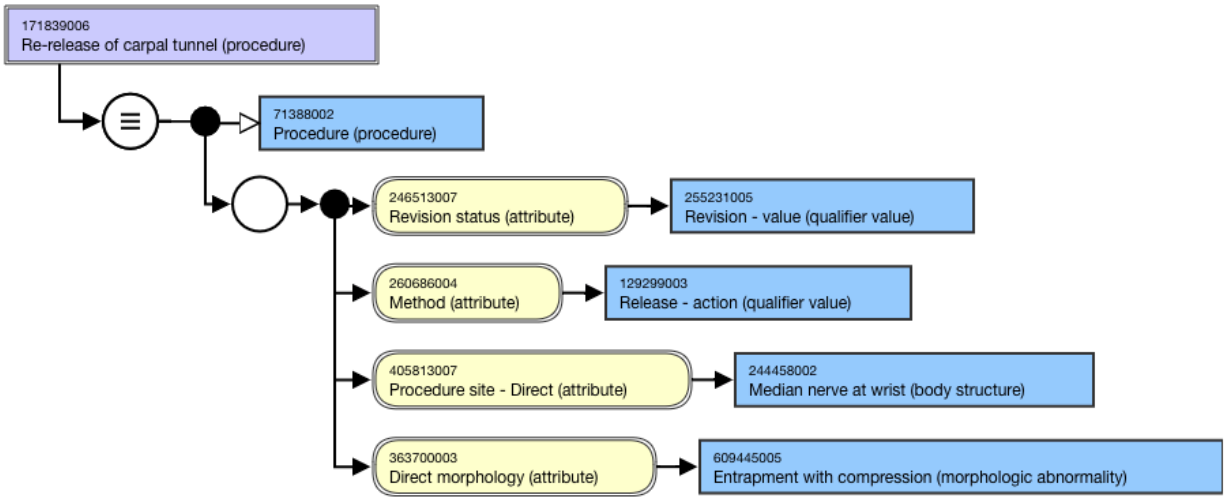


Figure 1: Stated view of 171839006 |Re-release of carpal tunnel (procedure)|

1402 http://snomed.info/id/385695003
1403 http://snomed.info/id/385978009
1404 http://snomed.info/id/118635009
1405 http://snomed.info/id/171839006

Skeletal system

Since the skeletal system includes bones and cartilage, it is possible to have a procedure on the skeletal system, i.e. on cartilage, that is not a procedure on bone.

For example,

- 77825002 |Division of cartilage of wrist (procedure)|[1406] is a procedure on the skeletal system (procedure)

> **Skeletal system subdivision**
>
> SNOMED CT considers the *skeletal system subdivision* part of the entire bone (system). This may change if there are procedures on cartilaginous skeleton that involve skeletal system subdivisions.

Osteotomy

O*steotomy* is defined as *cutting into or through a bone*; there are 3 meanings in SNOMED CT:

1. Cutting into a bone, regardless of whether the bone is divided (incision, general meaning). Model using Method, Incision - action (qualifier value), and Procedure site - Direct (attribute), bone structure (or subtypes).

   For example,

   - 118483001 |Incision of rib (procedure)|[1407]
2. Cutting through a bone and dividing it (division by cutting). Model using Method, Division - action (qualifier value), and Procedure site - Direct (attribute), bone structure (or subtypes).

   For example,

   - 447867002 |Division of ulna (procedure)|[1408]
3. Cutting into a bone without cutting through it and therefore without dividing it (incision without division).

   This is unnecessary; procedures that do not explicitly involve division are modeled simply as *Incision*.

Reduction and fixation of fractures

Reduction and fixation has two actions by two different means; open reduction of a fracture and insertion of an orthopedic fixation device. This provides an opportunity for general concept inclusion axioms (GCIs) in order to fully represent the meanings without heavy postcoordination modeling. *Open reduction of a fracture* necessarily involves open manipulation of the fracture and *internal fixation of a fracture* necessarily involves the insertion of an orthopedic internal fixation device.

For example,

- 74011006 |Open reduction of fracture of tibia and fibula with internal fixation (procedure)|[1409]

1406 http://snomed.info/id/77825002
1407 http://snomed.info/id/118483001
1408 http://snomed.info/id/447867002
1409 http://snomed.info/id/74011006

Surgical procedures

A *surgical procedure* is defined as a procedure that involves intentional non-transient alteration of structures of the body, and/or a procedure that necessarily involves cutting into the body. This definition includes all procedures defined by *Method* (attribute) with Surgical action (qualifier value).

SNOMED CT classifies concepts as surgical procedures if their methods are *surgical actions* based on the action hierarchy. The surgical action hierarchy distinguishes surgical from non-surgical actions based on the definition above. Note the *Or* in the sentence; actions that do not involve cutting or incision, but do involve the intentional non-transient alteration of anatomy, are still surgical.

Operation

In SNOMED CT, *operation* is synonymous with surgical procedure.

Surgical procedures are not defined simply as procedures done by a surgeon (despite some dictionary definitions). Surgeons can perform many non-surgical actions and surgical procedures need not necessarily be performed by a surgeon, i.e. if a non-surgeon performs a surgical procedure, it is still a surgical procedure.

Medical procedure

The use of the term *medical procedure* is deprecated, i.e. not recommended, because it lacks reproducible meaning. It might be defined as *a procedure done by a physician*, but even that is deprecated, because it is provider-specific.

Surgical repair

The definition of *surgical repair* is restoring, to the extent possible, an anatomical structure, using a surgical action. *Repair* is an objective or intended accomplishment, not a means (e.g. suturing, transplanting, etc.) nor a need (e.g. normal functioning, cosmetic appearance, pain relief, etc.).

Surgery that restores structure is usually intended to restore function and appearance. Restoring function, however, is not necessary for a procedure to be considered a repair. It is also possible for surgery to restore function without restoring structure (e.g. surgery to attach a prosthetic limb after amputation). This type of surgery would not be strictly categorized as a repair.

The *Method* (attribute) is used to model both the objective of a procedure and the means used to accomplish it. If a procedure requires both a repair action and another type of action, then two relationship groups should be used.

Fistula
Closure action is a kind of *repair* action. All fistula closures use the *closure* action and are classified as kinds of repair procedures.

For example,

- 79433000 |Closure of colon fistula (procedure)|[1410] has Method (attribute), Closure - action (qualifier value) with a parent, Repair of colon (procedure)

Plastic repair
Surgery that accomplishes a *repair* (a structural restoration) often uses the suffix *-plasty*. The term *plastic repair* is also used. In order to avoid redundancy, the following terms are used*:*

- *Prosthetic repair*, using external (non-body) materials
- *Plastic repair,* reshaping the body

1410 http://snomed.info/id/79433000

-plasty

The suffix *-plasty* is widely used in concepts that apply to prosthetic repairs (e.g. total hip arthroplasty). So *-plasty* may refer to any general repair (prosthetic, plastic, or other) and not just plastic repairs.

Surgical vs. non-surgical

As mentioned in the initial Surgical procedures page, the definition of surgical procedure includes *intentional non-transient alteration of structures of the body and/or necessarily involves cutting into the body*.

Non-surgical actions do not significantly or non-transiently alter anatomy and do not necessarily involve cutting or incision.

For example,

- Fine needle biopsy (procedure) or brush biopsy (procedure)
- Phlebotomy, a synonym for venipuncture for blood test (procedure)
- Aspiration (procedure)
- Closed reduction of dislocation (procedure)

Closed procedure naming

- The general pattern <open, closed> <procedure> is accepted
- When a procedure is specified as closed, the closed procedure should be fully described, e.g. fine needle biopsy, endoscopic, etc.

Under revision

48635004 |Fine needle biopsy (procedure)|[1411] could be viewed as a kind of *centesis*, but the former is non-surgical and the latter is surgical. *Sampling - action (qualifier value)*, in general, is not necessarily a surgical action. If sampling involves the surgical removal of part of something, then *Surgical biopsy (procedure)* should be the action.

3.8.12 Qualifier Value

Definition	Examples
Qualifier values include a wide range of concepts that provide attribute values used in the definitions of other concepts. These values can also be used in expressions to refine the meaning of a concept, or in the appropriate fields of a health record to add additional information.	• Action, Numbers, Clinical specialty, Context values, Mode of transmission, Type of diagnosis, Scale type, Sport, Technique, Time frame, World languages • There are also many Qualifier value subtypes relating to the pharmaceutical realm: Additional dosage instructions, Basic dose form, Route of administration value, etc.

The 362981000 | Qualifier value (qualifier value)|[1412] hierarchy contains concepts used as the target value of an attribute in a defining relationship.

For example,

1411 http://snomed.info/id/48635004
1412 http://snomed.info/id/362981000

- 18639004 | Left kidney structure (body structure)|[1413] has a Laterality (attribute) of Left (qualifier value)

The use of qualifiers varies greatly according to the domain to which they are applied. Thus, guidance in their use is often found within the guidance of the respective domain. So for the above example, information regarding the laterality/left attribute-value pair, see the Laterality guidance[1414] found within the Body structure domain. The range of values for a particular attribute is provided in the specific concept model of the domain. For further information on the range of values for a specific domain, see the different content types and rules in the MRCM maintenance tool at https://browser.ihtsdotools.org/mrcm.

Changes cannot be made to the Qualifier Value hierarchy without permission from the Chief Terminologist

3.8.12.1 Specific information on a few select subhierarchies can be found below:

- Disposition(see page 480)
- International System of Units - derived unit of volume(see page 481)
- International System of Units - unit of mass(see page 481)

3.8.12.2 Disposition

The 726711005 | Disposition (disposition)|[1415] hierarchy is required to support the remodeling of the 105590001 | Substance (substance)|[1416] hierarchy. These concepts are used as the attribute values for the 726542003 | Has disposition (attribute)|[1417] . The (disposition) semantic tag is used to differentiate concepts in this hierarchy from similar concepts in other hierarchies.

Concepts representing Disposition	
FSN	**X (disposition)** For example, • Coagulation factor inhibitor (disposition) • Acute phase reactant (disposition) • Human immunodeficiency virus fusion inhibitor (disposition)
PT	**X** For example, • Coagulation factor inhibitor • Acute phase reactant • HIV fusion inhibitor

Modeling

Techniques, as qualifier values, should include the word *technique* in their FSNs.

1413 http://snomed.info/id/18639004
1414 https://confluence.ihtsdotools.org/display/WIPEG/Laterality
1415 http://snomed.info/id/726711005
1416 http://snomed.info/id/105590001
1417 http://snomed.info/id/726542003

For example,

- 702658000 | Microbial culture technique (qualifier value)|[1418]

3.8.12.3 International System of Units - derived unit of volume

The 282115005 | International System of Units-derived unit of volume (qualifier value)|[1419] hierarchy contains concepts representing metric units of volume.

Concepts representing Derived Unit of Volume	
FSN	**X** metric unit of volume (qualifier value) For example, • 258771000 |Deciliter (qualifier value)| • 258773002 |Milliliter (qualifier value)| • 258770004 |Liter (qualifier value)|
PT	**X** metric unit of volume abbreviated without the expanded form* **This is an exception to the SNOMED CT standard of requiring abbreviations to be accompanied by the expanded term or phrase.* For example, • dL • mL • L
SYN	**X** metric unit of volume For example, • deciliter • milliliter • liter

3.8.12.4 International System of Units - unit of mass

The 258681007 | International System of Units unit of mass (qualifier value)|[1420] hierarchy contains concepts representing metric units of mass.

Concepts representing Unit of Mass

1418 http://snomed.info/id/702658000
1419 http://snomed.info/id/282115005
1420 http://snomed.info/id/258681007

FSN	**X** metric unit of mass
PT	**X** metric unit of mass abbreviated without the expanded form* **This is an exception to the SNOMED CT standard of requiring abbreviations to be accompanied by the expanded term or phrase.*
SYN	**X** metric unit of mass

3.8.13 Record Artifact

Definition	Examples
Clinical documents, or parts thereof	• 422813005 | Document section (record artifact)|[1421] • 416575001 | Perioperative record (record artifact)|[1422]

A *record artifact* is an entity that is created by a person or persons for the purpose of providing other people with information about events or states of affairs.

In general, a record is *virtual*, that is, it is independent of its particular physical instantiation/s. It consists of information elements (usually words, phrases and sentences, but also numbers, graphs, and other information elements).

Record artifacts need not be complete reports or records. They can be parts of a larger Record artifact.

For example,

- A 184225006 \| Computer record of patient (record artifact)\|[1423] is a Record artifact that also may contain other Record artifacts in the form of individual documents or reports, e.g. 726738003 \| Cytology report (record artifact)\|[1424] . These may, in turn, contain more finely granular Record artifacts, such as sections, and even section headers e.g. 422813005 \| Document section (record artifact)\|[1425] .

1421 http://snomed.info/id/422813005
1422 http://snomed.info/id/416575001
1423 http://snomed.info/id/184225006
1424 http://snomed.info/id/726738003
1425 http://snomed.info/id/422813005

3.8.14 Situation with Explicit Context

Definition	Examples
• Concepts that include *context* information; a subtype of the situation to which it applies, with an attribute associating it with the relevant clinical finding or procedure	• 183982006 | Herniotomy planned (situation) |[1426] • 1269455000 | Caregiver able to administer subcutaneous injection (situation) |[1427]

3.8.14.1 Variable meanings according to context

Depending on context, concepts can be used in many different ways with various meanings.

A *disorder* concept can represent:

- Possible diagnosis or part of a differential diagnosis
- Diagnosis applied to a family member or some other contact person
- Diagnosis explicitly excluded
- Diagnosis, now known to be incorrect, but which was the basis for a particular course of treatment
- Absent feature of a related disorder
- Diagnosis that the patient believes or fears they have

A *procedure* concept can represent:

- Requested, recommended or planned procedure
- Procedure for which consent has been given or withheld
- Procedure that is contraindicated
- Procedure that has been canceled or postponed
- Procedure for which follow up is now being arranged
- Procedure which caused a complication

A *symptom* concept can represent:

- Confirmed absence of a symptom
- Symptom deduced and reported by a third party as a witness of a clinical event
- Inability or failure to obtain information about a symptom
- Symptom which the patient is advised to respond to in a particular manner

A *finding* concept can represent:

- Absence of a finding
- Inability or failure to check for a finding
- Finding which, if present, is to trigger a particular change in clinical management
- Finding which is the goal or target of a treatment

A *product* concept can represent:

- Allergy or other contraindication to a product
- Assertion that a product caused a particular side effect
- Various therapeutic activities of a product
- Instructions given to a patient for use of a non-prescription medication
- Clinical authorization of a prescription

1426 http://snomed.info/id/183982006
1427 http://snomed.info/id/1269455000

- Issuing of a prescription for a course of treatment
- Supply (dispensing) of a specified quantity of a product
- Administration of a single dose of a product
- Change of a product dosage
- Discontinuation of a product
- Specialist's recommendation to use a particular product, if certain circumstances apply

3.8.14.2 Situation with Explicit Context Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 243796009 | Situation with explicit context (situation)|[1428]	
Domain Constraint[1429]	<< 243796009 |Situation with explicit context (situation)|[1430]
Parent Domain	-
Proximal Primitive Constraint	<< 243796009 |Situation with explicit context (situation)|[1431]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 243796009 | Situation with explicit context (situation)|[1432]				
Attribute[1433]	Grouped[1434]	Cardinality[1435]	In Group Cardinality[1436]	Range Constraint[1437]

1428 http://snomed.info/id/243796009
1429 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1430 http://snomed.info/id/243796009
1431 http://snomed.info/id/243796009
1432 http://snomed.info/id/243796009
1433 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1434 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1435 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1436 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1437 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint

408732007 |Subject relationship context (attribute)|[1438]	1	0..*	0..1	<< 125676002 |Person (person)|[1439]
408731000 |Temporal context (attribute)|[1440]	1	0..*	0..1	<< 410510008 |Temporal context value (qualifier value)|[1441]

HRCM 2023-12-01

Author View of Attributes and Ranges for 413350009 \| Finding with explicit context (situation)\|[1442]

Attribute[1443]	Grouped[1444]	Cardinality[1445]	In Group Cardinality[1446]	Range Constraint[1447]
246090004 |Associated finding (attribute)|[1448]	1	0..*	0..1	<< 272379006 |Event (event)|[1449] OR << 404684003 |Clinical finding (finding)|[1450]
408729009 |Finding context (attribute)|[1451]	1	0..*	0..1	<< 410514004 |Finding context value (qualifier value)|[1452]

HRCM 2023-12-01

Author View of Attributes and Ranges for 129125009 \| Procedure with explicit context (situation)\|[1453]

Attribute[1454]	Grouped[1455]	Cardinality[1456]	In Group Car	Range Constraint[1458]

1438 http://snomed.info/id/408732007
1439 http://snomed.info/id/125676002
1440 http://snomed.info/id/408731000
1441 http://snomed.info/id/410510008
1442 http://snomed.info/id/413350009
1443 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1444 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1445 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1446 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1447 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1448 http://snomed.info/id/246090004
1449 http://snomed.info/id/272379006
1450 http://snomed.info/id/404684003
1451 http://snomed.info/id/408729009
1452 http://snomed.info/id/410514004
1453 http://snomed.info/id/129125009
1454 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1455 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1456 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1458 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint

			dinality [1457]	
363589002 |Associated procedure (attribute)| [1459]	1	0..*	0..1	<< 71388002 |Procedure (procedure)| [1460]
408730004 |Procedure context (attribute)| [1461]	1	0..*	0..1	<< 288532009 |Context values for actions (qualifier value)| [1462]

3.8.14.3 Situation with Explicit Context Defining Attributes

The following defining attributes correspond to the *Situation with Explicit Context Attributes Summary* table.

Associated finding and *Finding context* are used with Findings with Explicit Context.

Associated finding

This attribute links concepts in the Situation with explicit context hierarchy to their related Clinical finding or Event. It specifies the Clinical finding or Event concept whose context is being modified.

When Associated finding is used in post-coordinated expressions, its range is broader than when used in pre-coordinated content. Associated finding should not reference concepts that already have precoordinated context.

For example,

- 443999008 | Risk of exposure to communicable disease (situation)| [1463] with Associated finding, Exposure to communicable disease (event)

For example, to create the concept, History of thyroid disease in father,

- Subject relationship context (attribute) with the value, father (person)
- Associated finding (attribute), with the value, Disorder of thyroid gland (disorder)

Incorrect example,

- Using Family history with explicit context (situation),
  - Subject relationship context (attribute) with the value, father (person)
  - Associated finding with value, Family history: Thyroid disorder (situation)

Finding context

This attribute represents a situation in which a Clinical finding or Event is known or unknown. If known, whether it is present, absent, or uncertain (possible). It also represents that the finding is not actual, but anticipated or possible in the future.

For example,

- 161922009 | No cough (situation)| [1464] with Associated finding, Cough (finding) and Finding context, Known absent (qualifier value)

1457 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1459 http://snomed.info/id/363589002
1460 http://snomed.info/id/71388002
1461 http://snomed.info/id/408730004
1462 http://snomed.info/id/288532009
1463 http://snomed.info/id/443999008
1464 http://snomed.info/id/161922009

Subject relationship context and *Temporal context* are used with Situations, Findings, and Procedures with Explicit Context.

Subject relationship context

This attribute is used to specify the subject of the Clinical finding or Procedure being recorded, in relation to the subject of the record.

For example,

- 161077003 | Father smokes (situation)|[1465] with Associated finding, Smoker (finding) and Subject relationship context, Father of subject (person)

> Observables about someone other than the subject of record are included in the Observable entity hierarchy, not the Situation with explicit context hierarchy, e.g,. 443722004 |Educational level of parent of subject (observable entity).

Temporal context

This attribute indicates the *time* of the procedure or finding. It may be *actual,* i.e occurred in the present, in the past, at a specified time; or in the future, i.e. it is planned or expected. The most general value is simply Current or past (actual), meaning that the concept was actual (not planned or expected), but not specifying anything further about the time. The word *specified* in the Temporal context| means that there is a date or time stamp associated with the concept in the record. The date and/or time is a point and/or interval, that applies to the concept.

For example,

- 161550001 | History of hematuria (situation)|[1466] with Associated finding, Blood in urine (finding) and Temporal context, In the past (qualifier value)

Associated procedure and *Procedure context* are used with Procedures with Explicit Context.

Associated procedure

This attribute links concepts in the Situation with explicit context hierarchy to concepts in the Procedure hierarchy for which there is additional context.

For example,

- 183976008 | Operative procedure planned (situation)|[1467] with Associated procedure, Surgical procedure (procedure)

Procedure context

This attribute indicates the degree of completion, or status, of a Procedure, as well as its possible future states, prior to it being initiated or completed.

For example,

- 183976008 | Operative procedure planned (situation)|[1468] with Procedure context, Planned (qualifier value)

1465 http://snomed.info/id/161077003
1466 http://snomed.info/id/161550001
1467 http://snomed.info/id/183976008
1468 http://snomed.info/id/183976008

3.8.14.4 Situation with Explicit Context Naming Conventions

For information on precoordinated naming patterns that have been reviewed or are currently in review, see Pre-coordination Naming Patterns project[1469]. Unreviewed patterns for the Situation with explicit context hierarchy can be found here[1470]. New content should conform with the naming patterns; however, legacy content may not.

For example,

Acceptable naming pattern

FSN: <procedure> declined (situation)

PT: <procedure> declined

SYN: <procedure> refused (This is optional.)

- 736013005 |Body weight measurement declined (situation)|

The following naming patterns are no longer accepted for addition to the International Edition:

Procedure offered

Procedure not offered

Procedure done

Procedure not done

Note that 385658003 |Done (qualifier value)|[1471] (a descendent of 410523001 |Post-starting action status (qualifier value)|[1472]) remains in use as the target value of the 408730004 |Procedure context (attribute)|[1473] in *History of <procedure>* concepts.

Not every naming pattern is found in the Pre-coordination Naming Pattern project. Some naming patterns can be prescribed in templates(see page 113). Others can come from trackers or fast track documents, such as the examples below.

716186003 |No known allergy (situation)|[1474]

FSN: No known allergy (situation)

PT: No known allergy

SYN: NKA - No known allergy

428197003 |No known insect allergy (situation)|[1475]

FSN: No known insect allergy (situation)

PT: No known insect allergy

1469 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project
1470 https://confluence.ihtsdotools.org/display/IHTSDO1/Situation+with+explicit+context
1471 http://snomed.info/id/385658003
1472 http://snomed.info/id/410523001
1473 http://snomed.info/id/408730004
1474 http://snomed.info/id/716186003
1475 http://snomed.info/id/428197003

History of finding or disorder occurring in past pregnancy

For concepts relating to a history of a finding, disorder, procedure, or event occurring in a past pregnancy of the subject of the record, use an FSN and PT of |Past pregnancy history of X (situation)|. These concepts are subtypes of 271903000 |History of pregnancy (situation)|.

For example,

161804005 |Past pregnancy history of antepartum hemorrhage (situation)| is a subtype of 271903000 |History of pregnancy (situation)|

For content relating to *family* history, this must be specified in both the FSN and preferred term to distinguish between past pregnancy of the subject of the medical record.

For example,

|*Past pregnancy history* of neonatal death (situation)| versus |*Family history* of neonatal death (situation)|

3.8.14.5 Situation with Explicit Context Modeling

SNOMED CT contains concepts that include *context* information, and concepts that are regarded as *context-free*. A concept includes *context* information if the name of the concept explicitly represents information that might otherwise be represented by another less *context-rich* concept in a particular place within an electronic health record or EHR.

In SNOMED CT, *context* describes the effects of embedding a concept in a clinical situation, i.e. when it is used in an EHR.

For example,

- When the concept 22298006 | Myocardial infarction (disorder)|[1476] is used in an EHR, it takes on a specific contextualized meaning. The meaning might be an assertion by the person entering the information, that on a given date, the patient was diagnosed with a *myocardial infarction.* Or, it may be used to document a complication of smoking, a protocol for chest pain, a medication contraindication, a part of a patient's medical history, a possible diagnosis justifying a diagnostic test, a diagnosis excluded by a diagnostic test, a patient's family history, etc.
- The concept for *breast cancer*, 254837009 | Malignant neoplasm of breast (disorder)|[1477] , might be used to indicate either a current diagnosis of breast cancer, a family history of breast cancer, or a past history of breast cancer. Each of these three meanings differs in regard to the *context* in which breast cancer is described.
  - Current diagnosis of breast cancer indicates that the breast cancer is present now, and in this patient.
  - Family history of breast cancer refers to breast cancer occurring in a family member of a patient.
  - Past history of breast cancer indicates that the breast cancer occurred in the patient, at some time in the past, and it is not necessarily present now.

  Not only are the differences significant relative to a patient's health record, but they are also important to population-based data retrieval; e.g. it is incorrect to retrieve those who have a family history of breast cancer when searching for patients with a diagnosis of breast cancer.

1476 http://snomed.info/id/22298006
1477 http://snomed.info/id/254837009

Default context

When a SNOMED CT concept appears in an EHR without any explicitly stated context, that concept is considered to have a *default context*. However, the information in the health record structure or information model, can override the default context.

Default context for a *Clinical finding* concept implies that the finding is present (vs. being absent), that it applies to the subject of the record (the patient), and that it is current (or at a specified time in the past, linked to the concept).

Default context for a *Procedure* concept implies that the procedure was completed, that it was performed on the subject of the record (the patient), and that it was done at the present time (or at a specified time in the past, linked to the concept).

Explicit context

Concepts in the Situation hierarchy (given the appropriate record structure) have explicit context and can represent Clinical findings and Procedures that:

Have not yet occurred

For example,

- 165137000 | Endoscopy arranged (situation)|[1478]

Refer to someone other than the patient

For example,

- 160303001 | Family history: Diabetes mellitus (situation)|[1479]
- 395083002 | Discussed with next of kin (situation)|[1480]

Have occurred at some time prior to the time of the current entry in the record

For example,

- 161514008 | History of aortic aneurysm (situation)|[1481]

Attributes

These attributes are used to represent *Clinical finding* and *Procedure* concepts within the Situation hierarchy:

	Clinical Finding	**Procedure**
Attributes	Associated finding	Associated procedure
	Finding context	Procedure context
	Subject relationship context	Subject relationship context

1478 http://snomed.info/id/165137000
1479 http://snomed.info/id/160303001
1480 http://snomed.info/id/395083002
1481 http://snomed.info/id/161514008

	Temporal context	Temporal context

Expressing context

Context typically alters the meaning of a concept, i.e. the resulting concept is no longer a subtype of the original concept.

Precoordinated expression. Clinical context is specified in the description and entered into a field in a patient's EHR.

For example,

- The precoordinated expression 266897007 | Family history: Myocardial infarction (situation)|[1482] might be put directly in a blank field in a patient's EHR. A family history of myocardial infarction is not a *subtype* of myocardial infarction, so *family history* modifies the context.
- The precoordinated expression 54355006 | Intracranial injury, without skull fracture (disorder)|[1483] might be put directly in a blank field in a patient's EHR. The disorder Intracranial injury, without skull fracture is not a *subtype* of skull fracture, so *without* modifies the context.

Postcoordinated expression. Clinical context is specified by combining concepts.

For example,

- 281666001 | Family history of disorder (situation)|[1484] , combined with 246090004 | Associated finding (attribute)|[1485] = 22298006 | Myocardial infarction (disorder)|[1486] . These two concepts indicate a family history of myocardial infarction.

Concept or expression in an EHR field. A concept is placed in a field with a predefined meaning in an electronic health record. The meaning is conveyed by the context in which it is recorded.

For example,

- *Hip replacement planned* might be represented as 397956004 | Prosthetic arthroplasty of the hip (procedure)|[1487] within a section of a patient's health record called *Planned actions*. A planned hip replacement is not a kind of hip replacement, so the *Planned actions* record section modifies the context
- 2004005 | Normal blood pressure (finding)|[1488] might be placed in a field labeled as *Goal* in a patient's EHR. A goal of normal blood pressure is not a kind of Normal blood pressure (finding), so the *Goal* field in the EHR modifies context.

Concepts in medical records

When a user places a concept from SNOMED CT in a patient's health record, it transforms the concept from a theoretical representation of a clinical notion to an actual instance of the concept.

For example,

- If the concept 192644005 | Meningococcal meningitis (disorder)|[1489] is entered in a patient's EHR, it usually indicates that the patient has had an instance of this disease. Similarly the

1482 http://snomed.info/id/266897007
1483 http://snomed.info/id/54355006
1484 http://snomed.info/id/281666001
1485 http://snomed.info/id/246090004
1486 http://snomed.info/id/22298006
1487 http://snomed.info/id/397956004
1488 http://snomed.info/id/2004005
1489 http://snomed.info/id/192644005

entry of 38102005 | Cholecystectomy (procedure)|[1490] would imply that the patient has undergone this procedure.

The placement of a concept in an EHR field may:

- Affect the quality of the meaning, but not the instance. The placement of 194828000 | Angina (disorder)|[1491] in a field labeled *Current problems*, *Past medical history*, or *History of* indicates that an instance of angina has occurred in the patient. The specific field affects the *quality* of the meaning, but not the instance. The adopted context is compatible with the *default context*.
- Critically affect the meaning and the instance. The placement of 49049000 | Parkinson's disease (disorder)|[1492] in a *Family history* field or 41339005 | Coronary angioplasty (procedure)|[1493] in a *Planned procedures* field does not indicate that an instance of the disorder or the procedure has occurred in the patient. The adopted context is incompatible with the *default context* (In these circumstances, the electronic health application programmer needs to identify the appropriate context values from a authoritative list and link them to the concepts placed in the fields to substitute for their default contexts).

When a *Situation with explicit context* concept is used in an EHR, it should contain all of the context attributes and applicable values in order to guarantee accurate meaning if that concept (plus context) is subsequently transferred to another record environment.

Elaboration: changing concept meaning

Elaboration in SNOMED CT refers to any addition to or change of the meaning of a concept that may be brought about when it is embedded in a clinical situation. Embedding a concept in a clinical situation may *elaborate* the semantic interpretation of a concept in one of the following ways:

1. Subtype qualification
2. Axis modification
3. Affirmation or Negation
4. Combination

Subtype qualification

A subtype qualification refines the meaning of a concept. *Subtype qualification* is elaboration that results in a concept that is a subtype of the original unelaborated *focus concept*. A focus concept is the part of a SNOMED CT expression that represents a clinical finding, observation, event, or procedure. It may be given context by a surrounding *context wrapper* and may be made more specific by a *refinement*.

For example,

- A past history of replacement of the left hip may be represented by a SNOMED CT expression in which the focus concept, hip replacement, is refined by *laterality, left* and enclosed in a context wrapper representing *past history*.

Subtype qualification

Subtype qualification has also been called a *qualifier* (e.g. ENV136060, GEHR, CTV3) or a *secondary status term* (e.g. NHS Context of Care). In SNOMED CT, the term *subtype* expresses more clearly the distinctive property of a qualifier. This is helpful because the meaning of *modify* and *qualify* are synonymous in many dictionaries and by some International Organization of Standardization (ISO) authorities.

1490 http://snomed.info/id/38102005
1491 http://snomed.info/id/194828000
1492 http://snomed.info/id/49049000
1493 http://snomed.info/id/41339005

Axis modification

The attributes used to define situation concepts permit explicit (rather than default) representation of various contexts. These attributes can change the meaning of a *Clinical finding* or *Procedure* concept in a way that changes the hierarchy (or axis) of the concept from Clinical finding or Procedure to *Situation with explicit context*. The resulting modified meaning is not a subtype of the original meaning of the concept, and therefore the axis-modifying attributes are not used to qualify the concept, but instead are used to qualify a Situation concept.

For example,

- The concept 22298006 | Myocardial infarction (disorder)|[1494] may be elaborated by including it in a clinical record specifying *family history*. A record of a f*amily history of myocardial infarction* does not imply that the patient has had any type of *myocardial infarction*. Therefore, *family history* changes the focus from the default context to a specified context.
- The concept 52734007 | Total replacement of hip (procedure)|[1495] may be elaborated by stating that the procedure is planned for some future date. A record of planned total hip replacement does not imply that the patient has actually had a total hip replacement, i.e. it is not the default context for a procedure.
- The concept 167272007 | Urine protein test not done (situation)|[1496] uses the context-modifying attribute Procedure context (attribute) and a value of Not done (qualifier value). This concept is not a subtype of 167271000 | Urine protein test (procedure)|[1497] , because its axis (hierarchy) is modified. Note that |<Procedure> not done| is no longer allowed. See the list disallowed naming patterns at Pre-coordination Naming Patterns Project[1498].

> **Axis modification**
>
> *Axis modification* is not the same as *affirmation* (present) or *negation* (not present) of a concept, where the essential characteristics of the concept are unchanged.

Affirmation and Negation

Depending on perspective, *affirmation* and *negation* may simply be viewed as the inversion of meaning of an unelaborated concept that represents a *Clinical finding*. A concept may be stated in the *negative* in a clinical situation (e.g. *meningism not present*). This creates the potential for a concept to represent two meanings, one of which is the inverse of the other. However, the effects of negation on interpretation are far-reaching and distinct from other elaborations.

Negation, like axis modification, results in a concept that is not a subtype of the unelaborated concept. However, negation explicitly rules out the unelaborated concept.

For example,

- *Family history of myocardial infarction* does not imply that a patient had a myocardial infarction.
- *No headache* implies that *patient has headache* is untrue. A negative statement may expand further in the opposite direction of a positive statement. If *headache* is a subtype of pain then *patient has headache* implies *patient has pain*. However, *patient has no headache* does not imply *patient has no pain*. Conversely, *patient has headache* does not imply *patient has occipital headache*, *but patient has no headache* implies *patient does not have occipital headache*.

1494 http://snomed.info/id/22298006
1495 http://snomed.info/id/52734007
1496 http://snomed.info/id/167272007
1497 http://snomed.info/id/167271000
1498 https://confluence.ihtsdotools.org/display/IHTSDO1/Pre-coordination+Naming+Patterns+Project

Negation

The representation of negation within SNOMED CT that arises from restrictions imposed by the existing description logics results in the hierarchy being inverted e.g., coronary heart disease not present is NOT properly a subtype of "Heart disease not present", which is clearly incorrect. An initial attempt was made to move negated content into the situation hierarchy so that the content remained available but SNOMED International recommends handling negation outside of SNOMED CT by the EHR vendor rather than try and represent it incorrectly within the terminology.

A *concept* may be stated to be possible in a clinical situation. Statements that explicitly indicate uncertainty can be considered in two possible ways:

- Somewhere between affirmation and negation
- As a type of elaboration

Combination

Two or more concepts may be embedded in a clinical situation in a way that links them together. Linkages may include:

- Simple combination of concepts
- Combination of a concept that is present and another that is absent

Context shift

Once a concept has *context-shifted* and become *context-dependent*, it should not be used in an expression that once again shifts context. In other words, when one context attribute is given an axis modifying value, the other context attributes are fixed.

For example,

- The model for 430679000 | Family history of diabetes mellitus type 2 (situation)|[1499] *IS A* Situation with explicit context (situation) with:
  - Subject relationship context of Person in family of subject (person)
  - Associated finding of Diabetes mellitus type 2 (disorder)
  - Finding context of Known present (qualifier value)
  - Temporal context of Current or past (actual) (qualifier value)

Even though the *Family* part of the concept results in an explicit axis shift of the Subject relationship context only, SNOMED CT requires default values for Finding context and Temporal context, rather than allowing them to be unspecified.

To negate a *concept* with Finding context (attribute) of Known present (qualifier value), the Finding context (attribute) should instead have a value of Known absent (qualifier value).

For example,

- The concept 160273004 | No family history: Hypertension (situation)|[1500] negates 160357008 | Family history: Hypertension (situation)|[1501] by changing the value of Finding context (attribute) to Known absent (qualifier value) with Temporal Context (attribute) of All times past (qualifier value). The parent *IS A* Situation with explicit context (situation) with:

1499 http://snomed.info/id/430679000
1500 http://snomed.info/id/160273004
1501 http://snomed.info/id/160357008

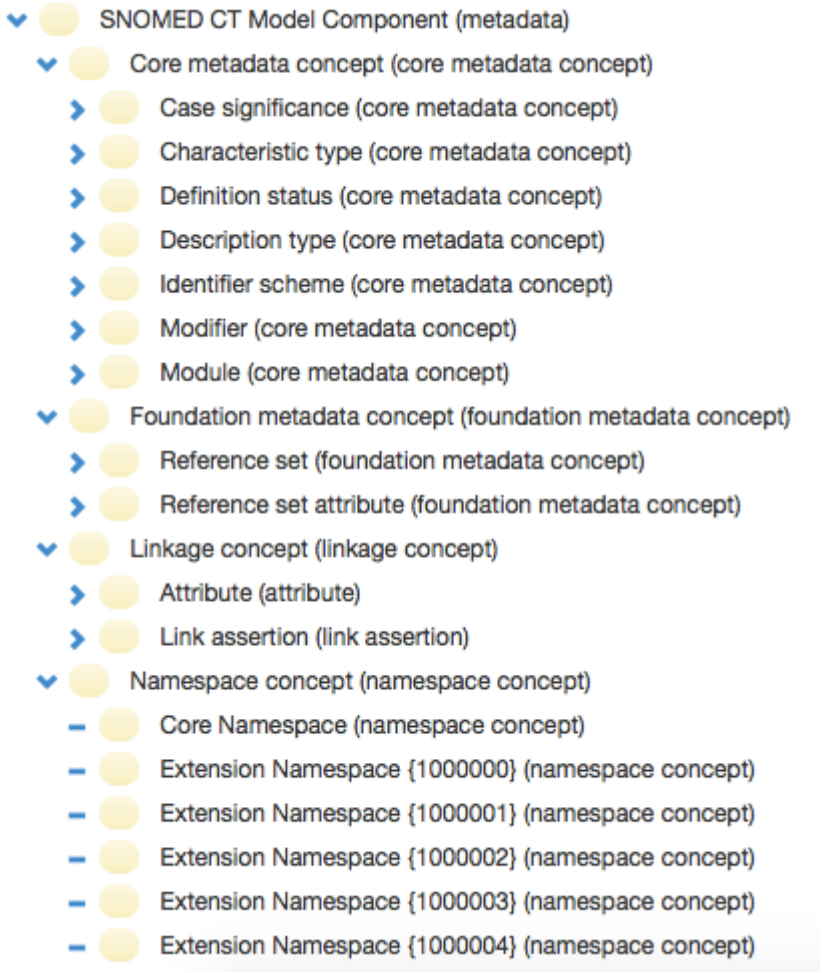
- Temporal context of All times past (qualifier value)
- Associated finding of Hypertensive disorder, systemic arterial (disorder)
- Finding context of Known absent (qualifier value)
- Subject Relationship Context of Person in family of subject (person)

3.8.15 SNOMED CT Model Component

Definition	Types
Concepts and attributes necessary to organize and structure SNOMED CT terminology and its derivatives	900000000000442005 | Core metadata concept (core metadata concept)|[1502] 900000000000454005 | Foundation metadata concept (foundation metadata concept)|[1503] 106237007 | Linkage concept (linkage concept)|[1504] 370136006 | Namespace concept (namespace concept)|[1505]

1502 http://snomed.info/id/900000000000442005
1503 http://snomed.info/id/900000000000454005
1504 http://snomed.info/id/106237007
1505 http://snomed.info/id/370136006

3.8.15.1 SNOMED Model component module (metadata)



3.8.15.2 Core metadata concept

Subtypes of 900000000000442005 | Core metadata concept (core metadata concept)|[1506] provide structural information required to support International Release data. This supporting information includes sets of enumerated values that apply to attributes of concepts, descriptions, and relationships.

3.8.15.3 Foundation metadata concept

Subtypes of the 900000000000454005 | Foundation metadata concept (foundation metadata concept)|[1507] provide supporting metadata and structural information for derivative release structures including Reference Sets.

1506 http://snomed.info/id/900000000000442005
1507 http://snomed.info/id/900000000000454005

3.8.15.4 Linkage concept

A 106237007 | Linkage concept (linkage concept)|[1508] links two or more concepts to express compositional meanings. All concept codes that can be used as a *Relationship Type* are included under Linkage concept (linkage concept). The Concept Model attributes are approved for use.

Linkage concept is a subtype of 900000000000441003 |SNOMED CT Model Component (metadata)|. The Linkage concept hierarchy has the subhierarchies:

- Attribute (attribute)
- Link assertion (link assertion)

Concepts in the Linkage concept subhierarchy are used to construct relationships between two SNOMED CT concepts; they indicate the relationship type between those concepts. Some attributes (relationship types) can be used to logically define a concept (defining attributes).

Unapproved attributes

408739003 |Unapproved attribute (attribute)| is a subtype within this hierarchy with over a thousand descendants. Unapproved attributes in the SNOMED CT Concept model may be used to create post-coordinated expressions with caution. Use of unapproved attributes is neither supported by the MRCM nor recommended beyond intraorganizational use. Approved attributes are those that fit the MRCM for data sharing and interoperability between systems. Unapproved attributes are used for creating expressions within a single system for semantic matching of vendor terms (i.e. those that are used for mapping of interface terms, clinical decision support that use components within the expression, etc.).

Users should beware that unapproved attributes can potentially

- conflict with approved attributes if used without discretion
- change into an approved attribute if warranted by SNOMED International

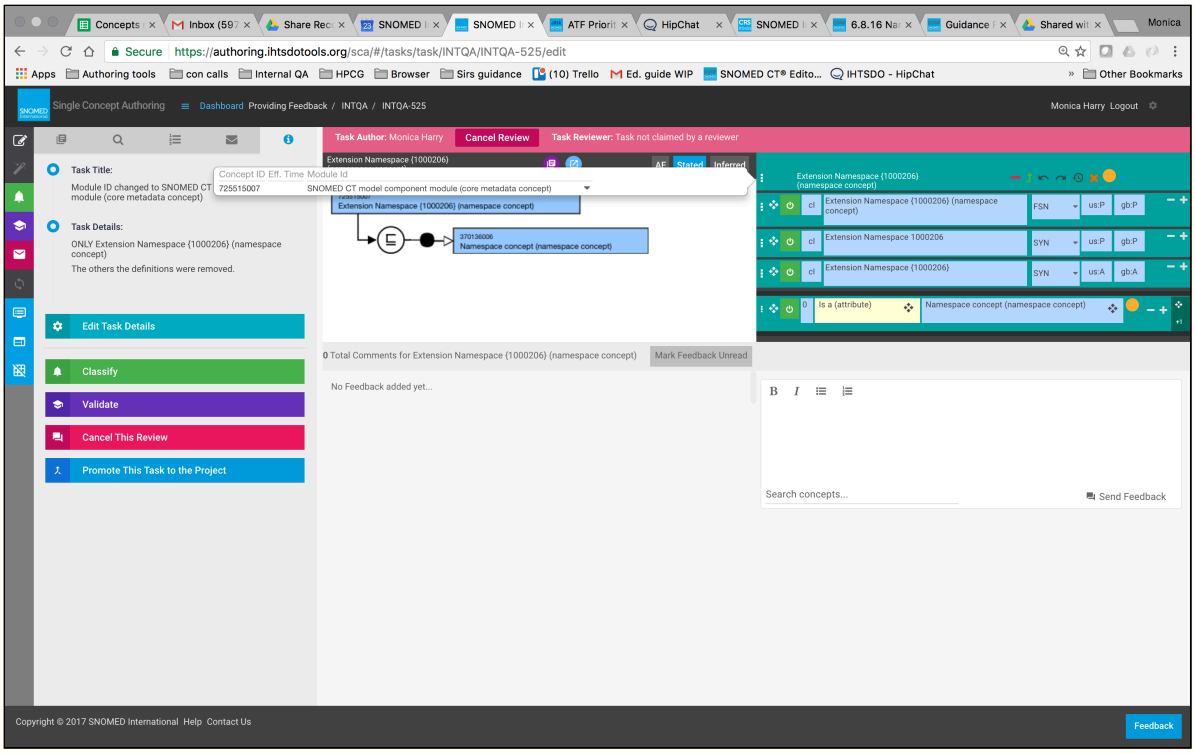
3.8.15.5 Namespace concept

370136006 | Namespace concept (namespace concept)|[1509] is a subtype of 900000000000441003 |SNOMED CT Model Component (metadata)|. Each of its subtypes has an integer term which is an assigned extension namespace identifier.

For more information

New namespace concepts are requested via email to *info@snomed.org*. A SNOMED International staff terminologist will add new extension namespace identifiers as requests are received. It is also necessary to change the Module ID per the following:

1508 http://snomed.info/id/106237007
1509 http://snomed.info/id/370136006



For further details, see *Namespace identifiers* on the SNOMED website at: https://www.snomed.org/snomed-ct/Use-SNOMED-CT. Find the Namespace Identifier Registry at https://cis.ihtsdotools.org/info/

3.8.16 Social Context

Definition	Examples
Social context (social concept) represents social aspects affecting patient health and treatment. Conditions and circumstances related to healthcare that are subtypes of this hierarchy include: • ethnic group • lifestyle • occupation • person • racial group • religion/philosophy • social status	• 413465009 | Afro-Caribbean (ethnic group)|[1510] • 116060000 | Eating habit (life style)|[1511] • 24413000 | Carpenter, general (occupation)|[1512] • 133932002 | Caregiver (person)|[1513] • 415794004 | Unknown racial group (racial group)|[1514] • 61154002 | Hinduism (religion/philosophy)|[1515] • 22575004 | Middle class economic status (social concept)|[1516]

3.8.16.1 Occupation

Interpretation of the meaning of various occupation codes is jurisdictionally specific. International occupation classifications generally do not go to the detailed level that is often required. Job titles are very idiosyncratic and in some cases do not represent the actual occupation, but a ranking or seniority within an occupation. Occupations should be added to national extensions.

3.8.17 Special Concept

Definition	Examples
Inactive concept Navigational concept	• 363664003 | Erroneous concept (inactive concept)|[1517] • 394899003 | Oral administration of treatment (navigational concept)|[1518]

3.8.17.1 Inactive concepts

Inactive concepts are no longer active in the terminology. When the first release format (RF1) was used, inactivated content was moved into this hierarchy. However, this approach is no longer used in the current release format (RF2).

1510 http://snomed.info/id/413465009
1511 http://snomed.info/id/116060000
1512 http://snomed.info/id/24413000
1513 http://snomed.info/id/133932002
1514 http://snomed.info/id/415794004
1515 http://snomed.info/id/61154002
1516 http://snomed.info/id/22575004
1517 http://snomed.info/id/363664003
1518 http://snomed.info/id/394899003

3.8.17.2 Navigational concepts

The concepts in navigational hierarchies are used for structured data entry and support the location of concepts in hierarchies. They can order data by priority or another convention (e.g. *cranial nerve order* or *topics related to diabetes*). Navigational concepts exist only to support navigation.

NO LONGER SUPPORTED IN SNOMED CT CORE

Navigational concepts:

- Are not suitable for recording or aggregating information
- Are direct subtypes of the concept 363743006 | Navigational concept (navigational concept)|[1519]
- Have no other supertype or subtype relationships
- Are linked to other concepts only by navigational links

For more information on navigational concepts, click here(see page 97).

3.8.18 Specimen

Definition	Examples
Entities that are obtained (usually from patients) for examination or analysis	• 384744003 | Lymph node from sentinel lymph node dissection and axillary dissection (specimen)|[1520] • 122880004 | Urine specimen obtained by clean catch procedure (specimen)|[1521]

Specimen concepts can be defined by attributes which specify the:

- Normal or abnormal body structure from which they are obtained
- Procedure used to collect the specimen
- Source from which it was collected
- Substance of which it is comprised

3.8.18.1 *Specimen* not *sample* in FSN

The Fully Specified Name for Specimen concepts should include the term *specimen,* not *sample*. Because of the differentiation between specimen and sample in some domains (e.g. biobanking), an additional description using the word *sample* should not be added to the specimen concept.

Legacy concepts exist in SNOMED CT that contain both *specimen* and *sample* in descriptions. Those are being retained for historical purposes.

1519 http://snomed.info/id/363743006
1520 http://snomed.info/id/384744003
1521 http://snomed.info/id/122880004

3.8.18.2 Combined specimens and pooled specimens

A *combined specimen* refers to more than one specimen taken from the same subject and combined in a single container to form a single specimen. A *pooled specimen* refers to specimens taken from multiple subjects and pooled (mixed) together into a single container. SNOMED CT concepts will include the appropriate term in the FSN and will not treat *combined specimen* and *pooled specimen* as synonymous.

3.8.18.3 Specimen Attributes Summary

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 123038009 | Specimen (specimen)|[1522]	
Domain Constraint[1523]	<< 123038009 |Specimen (specimen)|[1524]
Parent Domain	-
Proximal Primitive Constraint	<< 123038009 |Specimen (specimen)|[1525]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 123038009 | Specimen (specimen)|[1526]				
Attribute[1527]	Grouped[1528]	Cardinality[1529]	In Group Cardinality[1530]	Range Constraint[1531]

1522 http://snomed.info/id/123038009
1523 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1524 http://snomed.info/id/123038009
1525 http://snomed.info/id/123038009
1526 http://snomed.info/id/123038009
1527 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1528 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1529 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1530 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1531 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint

118171006 |Specimen procedure (attribute)|[1532]	1	0..*	0..1	<< 71388002 |Procedure (procedure)|[1533]
118170007 |Specimen source identity (attribute)|[1534]	1	0..*	0..1	<< 125676002 |Person (person)|[1535] OR << 133928008 |Community (social concept)|[1536] OR << 260787004 |Physical object (physical object)|[1537] OR << 276339004 |Environment (environment)|[1538] OR << 35359004 |Family (social concept)|[1539]
118168003 |Specimen source morphology (attribute)|[1540]	1	0..*	0..1	<< 49755003 |Morphologically abnormal structure (morphologic abnormality)|[1541]
118169006 |Specimen source topography (attribute)|[1542]	1	0..*	0..1	<< 442083009 |Anatomical or acquired body structure (body structure)|[1543]
370133003 |Specimen substance (attribute)|[1544]	1	0..*	0..1	<< 105590001 |Substance (substance)|[1545] OR << 260787004 |Physical object (physical object)|[1546] OR << 373873005 |Pharmaceutical / biologic product (product)|[1547]

3.8.18.4 Specimen Defining Attributes

The following defining attributes correspond to the *Specimen Attributes Summary* table.

Specimen source identity

Specimen source identity specifies the type of individual, group, or physical location from which a specimen is collected.

For example,

1532 http://snomed.info/id/118171006
1533 http://snomed.info/id/71388002
1534 http://snomed.info/id/118170007
1535 http://snomed.info/id/125676002
1536 http://snomed.info/id/133928008
1537 http://snomed.info/id/260787004
1538 http://snomed.info/id/276339004
1539 http://snomed.info/id/35359004
1540 http://snomed.info/id/118168003
1541 http://snomed.info/id/49755003
1542 http://snomed.info/id/118169006
1543 http://snomed.info/id/442083009
1544 http://snomed.info/id/370133003
1545 http://snomed.info/id/105590001
1546 http://snomed.info/id/260787004
1547 http://snomed.info/id/373873005

- 419695002 | Environmental swab (specimen)|[1548] has the Specimen source identity, Environment (environment)

Specimen source morphology

Specimen source morphology specifies the morphologic abnormality from which a specimen is obtained.

For example,

- 447407009 | Specimen from necrotic tissue (specimen)|[1549] has the Specimen source morphology, Necrosis (morphologic abnormality)

Specimen source topography

Specimen source topography specifies the body site from which a specimen is obtained.

For example,

- 16209771000119101 | Specimen from left lower lobe of lung obtained by bronchoalveolar lavage procedure (specimen)|[1550] has the Specimen source topography, Segment of lower lobe of left lung (body structure)

Specimen procedure

Specimen procedure identifies the procedure by which a specimen is obtained.

For example,

- 384744003 | Lymph node from sentinel lymph node dissection and axillary dissection (specimen)|[1551] has the Specimen procedure, Dissection procedure (procedure)

Specimen substance

Specimen substance specifies the type of substance, pharmaceutical/biologic product, or physical object of which a specimen is comprised.

For example,

- 110897001 | Bone marrow cytological material (specimen)|[1552] has the Specimen substance, Bone marrow fluid (substance)

Although Pharmaceutical / biologic product (product) and its descendants are considered valid values for the 370133003 |Specimen substance (attribute)| by the MRCM, they are not currently used as values for this attribute in the International Release. The only exception is 787859002 |Vaccine product (medicinal product)| and its descendants, which can be used as valid values for this attribute.

1548 http://snomed.info/id/419695002
1549 http://snomed.info/id/447407009
1550 http://snomed.info/id/16209771000119101
1551 http://snomed.info/id/384744003
1552 http://snomed.info/id/110897001

3.8.19 Staging and Scales

Definition	Examples
This hierarchy contains concepts which are named, authoritative, and internationally relevant staging or grading systems used to either make a judgment about the patient, e.g. cognition, or, evaluate a patient to determine the phase, or progression of a disease.	Assessment • 273472005 | Functional status index (assessment scale)|[1553] Staging • 254294008 | Tumor-node-metastasis (TNM) head and neck tumor staging (tumor staging)|[1554]

Some diseases are represented using a staging and/or grading system to signify the severity, extent, or rate of growth of a disease. For example, *chronic kidney disease* is represented with five stages determined by level of kidney function.

3.8.19.1 Assessment scale requests

Generally, requests to add the most recent version of an assessment scale are accepted. Updated versions of existing content are also accepted. Older versions may be added if justification is appropriate. Older versions may also remain as active concepts due to the need to retain history on the use of specific instruments.

When adding an assessment to the 273249006 |Assessment scales (assessment scale)| subhierarchy, also add corresponding concepts in the procedure and observable entity hierarchies:

For example,

- X assessment scale (assessment scale)
- Assessment using X assessment scale (procedure)
- X scale score (observable entity)

Case sensitivity will most often be CS, except for the procedure concepts with descriptions beginning, "assessment using..."; these will use cl, *Only initial character case insensitive*.

Do not change the US/GB spelling variants for standardized names.

For example,

- Do not add a GB spelling for *World Health Organisation*, as in 769390009 |World Health Organization Adult Attention-Deficit Hyperactivity Disorder Self-Report Scale (assessment scale)|, because *World Health Organization* is the proper name of the organization.

A revised or modified version of an assessment is not a subtype of the original.

3.8.19.2 Modeling

Concepts of the type |Assessment using X assessment scale (procedure)| are modeled with a proximal primitive parent of 445536008 | Assessment using assessment scale (procedure)|[1555] or one of its subtypes, as appropriate. A Method of Evaluation-action (qualifier value) is also added.

1553 http://snomed.info/id/273472005
1554 http://snomed.info/id/254294008
1555 http://snomed.info/id/445536008

For example,

- 445719003 | Assessment using visual analog pain scale (procedure)|[1556] has a parent of 445536008 | Assessment using assessment scale (procedure)|[1557]

Concepts of the type |X scale score (observable entity)| are modeled with a proximal primitive parent of 782487009 | Assessment score (observable entity)|[1558] or one of its subtypes, as appropriate.

For example,

- 165317007 |Mental disability discharge score (observable entity)| has a parent of 165314000 |Mental disability assessment score (observable entity)|

(See also *Why is Content Rejected* page*, Proprietary Names* for information about use of Questionnaire and Scale names)

3.8.20 Substance

Definition	Examples
The |Substance| hierarchy contains concepts that can be used for recording and modeling: chemical constituents of medicinal and non-medicinal products; allergies, adverse reactions, poisoning; physicians and nursing orders and laboratory reports and results. Sub-hierarchies of |Substance| include but are not limited to: Body substance (substance) and Chemical (substance)	387517004 | Paracetamol (substance)|[1559] 53682000 | Endorphin (substance)|[1560]

3.8.20.1 Substance Attribute Summary

When authoring in this domain, this is the approved attribute and allowable range. It is from the Human Readable Concept Model (HRCM).

HRCM 2023-12-01

Domain Information for 105590001 | Substance (substance)|[1561]	
Domain Constraint[1562]	<< 105590001 |Substance (substance)|[1563]

1556 http://snomed.info/id/445719003
1557 http://snomed.info/id/445536008
1558 http://snomed.info/id/782487009
1559 http://snomed.info/id/387517004
1560 http://snomed.info/id/53682000
1561 http://snomed.info/id/105590001
1562 https://confluence.ihtsdotools.org/display/DOCGLOSS/Domain+Constraint
1563 http://snomed.info/id/105590001

Parent Domain	-
Proximal Primitive Constraint	<< 105590001 |Substance (substance)|[1564]
Proximal Primitive Refinement	-

HRCM 2023-12-01

Author View of Attributes and Ranges for 105590001 | Substance (substance)|[1565]				
Attribute[1566]	Grouped[1567]	Cardinality[1568]	In Group Cardinality[1569]	Range Constraint[1570]
726542003 |Has disposition (attribute)|[1571]	0	0..*	0..0	<< 726711005 |Disposition (disposition)|[1572]
738774007 |Is modification of (attribute)|[1573]	0	0..*	0..0	<< 105590001 |Substance (substance)|[1574]

3.8.20.2 Substance Defining Attributes

The following defining attributes correspond to the *Substance Attribute Summary* table.

Is modification of

This attribute indicates that the concept is a structural modification of another concept.

Has disposition

This attribute enables the creation of an association between a substance concept and a disposition (A disposition is defined as a behavior that a substance will exhibit or participate in, given the appropriate context)

1564 http://snomed.info/id/105590001
1565 http://snomed.info/id/105590001
1566 https://confluence.ihtsdotools.org/display/DOCGLOSS/Concept+model+attribute
1567 https://confluence.ihtsdotools.org/display/DOCGLOSS/Grouped+attribute
1568 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+cardinality+constraint
1569 https://confluence.ihtsdotools.org/display/DOCGLOSS/Attribute+in+group+cardinality+constraint
1570 https://confluence.ihtsdotools.org/display/DOCGLOSS/Range+constraint
1571 http://snomed.info/id/726542003
1572 http://snomed.info/id/726711005
1573 http://snomed.info/id/738774007
1574 http://snomed.info/id/105590001

3.8.20.3 Supporting hierarchy - Disposition

Overview

A new hierarchy, 726711005 |Disposition (disposition)|, was created to support the remodeling of the Substance hierarchy. The concepts in this hierarchy are used as the attribute value for the |Has disposition (attribute)| for concepts in the Substance hierarchy, to sufficiently define grouper concepts representing dispositions, and to sufficiently define concepts in other SNOMED CT hierarchies. To provide adequate context to differentiate concepts in this hierarchy from similar concepts in other existing SNOMED CT hierarchies, a new (disposition) semantic tag was created.

Modeling (stated view)

Parent concept	726711005 |Disposition (<<) • Exceptions: none
Semantic tag	(disposition)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept) • Exceptions: none
Attributes	Not applicable

Terming Guidelines

General Terming Guidelines
The following words should be avoided unless specifically identified as an exception in the editorial guidelines. • agent • analog • and • and/or • content(s) • derivative • material • metabolite • modification • or • preparation • product • substance Exceptions: • Alkylating agent (disposition) • Chelating agent (disposition)
Descriptions should be singular, not plural.

Note: Additional examples of types of dispositions will be added as needed.

Disposition representing: • **receptor agonist or partial agonist** • **receptor antagonist or partial antagonist** • **enzyme inhibitor or enzyme system inhibitor** • **enzyme activator**	**FSN**	Patterns: • ***X*** receptor agonist (disposition) • ***X*** receptor antagonist (disposition) • ***X*** inhibitor (disposition) • ***X*** activator (disposition) Example of receptor agonist: • Dopamine receptor agonist (disposition) • Opioid receptor agonist (disposition) • Opioid receptor partial agonist (disposition) Example of receptor antagonist: • Beta-adrenergic receptor antagonist (disposition) • Histamine receptor antagonist (disposition) • Opioid receptor antagonist (disposition) • Opioid receptor partial antagonist (disposition) Example of inhibitor (enzyme): • Acetylcholinesterase inhibitor (disposition) • Phosphodiesterase 5 inhibitor (disposition) Example of inhibitor (enzyme system): • Hydrogen/potassium adenosine triphosphatase enzyme system inhibitor (disposition) • Selective serotonin reuptake inhibitor (disposition) Example of activator: • Plasminogen activator (disposition)

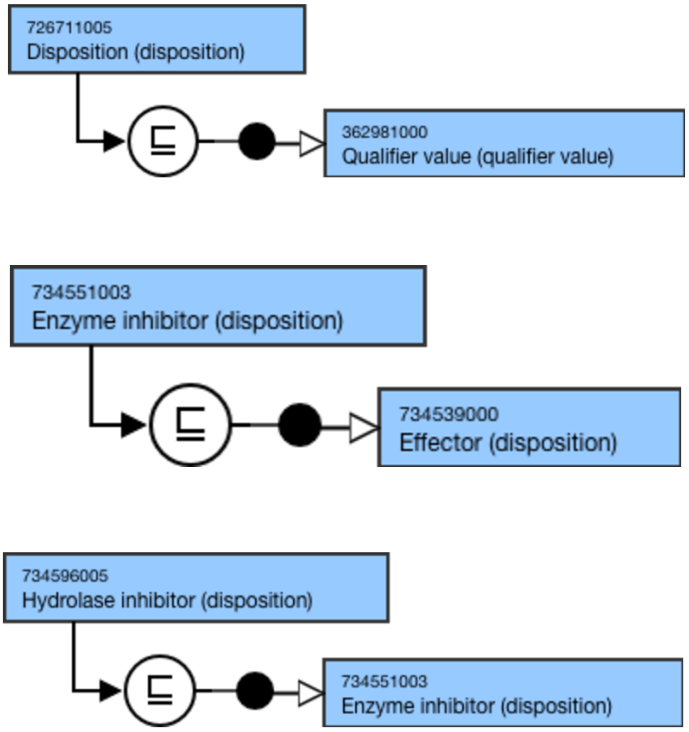
	Preferred Term	Patterns:
		• ***X*** receptor agonist
		• ***X*** receptor antagonist
		• ***X*** inhibitor
		• ***X*** activator
		Example of receptor agonist:
		• Dopamine receptor agonist
		• Opioid receptor agonist
		Example of receptor antagonist:
		• Beta-adrenergic receptor antagonist
		• Histamine receptor antagonist
		• Opioid receptor antagonist
		Example of enzyme inhibitor:
		• Acetylcholinesterase inhibitor
		• Phosphodiesterase 5 inhibitor
		• Centrally acting acetylcholinesterase inhibitor
		Example of enzyme system inhibitor:
		• Proton pump inhibitor
		• Selective serotonin reuptake inhibitor
		Example of enzyme inducer:
		• Plasminogen activator
		Exceptions:
		• Preferred terms may reflect the common clinical description for a disposition.
		  • Example:
		  • |Hydrogen/potassium adenosine triphosphatase enzyme system inhibitor (disposition)| has Preferred Term |Proton pump inhibitor|
		  • |3-Hydroxy-3-methylglutaryl-coenzyme A reductase inhibitor (disposition)| has Preferred Term |HMG-CoA reductase inhibitor|

	Synonyms	Synonyms are not allowed unless explicitly identified as an exception. • Exceptions: None

Disposition representing: • **response induced in an organism by a substance**	**FSN**	Pattern: • ***X*** (disposition) Example: • Growth factor (disposition) • Cytokine (disposition) • Carcinogen (disposition) • Potassium channel blocker (disposition) • Calcium channel blocker (disposition) • Fusion inhibitor (disposition)
	Preferred Term	Pattern: • ***X*** Example: • Growth factor • Cytokine • Carcinogen • Potassium channel blocker • Calcium channel blocker • Fusion inhibitor
	Synonyms	Synonyms are not allowed unless explicitly identified as an exception. • Exceptions: none identified
Disposition representing: • **a chemical effect or physical property**	**FSN**	Pattern: • ***X*** (disposition) Example: • Alkylating agent (disposition) • Chelating agent (disposition)
	Preferred Term	Pattern: • ***X*** Example: • Alkylating agent • Chelating agent
	Synonyms	Synonyms are not allowed unless explicitly identified as an exception. • Exceptions: none identified

Exemplar

The following illustrates the **stated** and **inferred** view:



3.8.20.4 General Assumptions and Scope for Substance Hierarchy

General Assumptions and Requirements

Decisions regarding requirements, applicable use-cases, scope, terming, and modeling guidelines are made based on requests submitted by user community and in consultation with Subject Matter Experts, associated Project Groups, and relevant credible references. General assumptions and requirements include the following:

	Assumption or Requirement
1	The |Substance| hierarchy contains concepts that can be used for recording and modeling: chemical constituents of medicinal and non-medicinal products; allergies, adverse reactions, poisoning; physicians and nursing orders and laboratory reports and results. Sub-hierarchies of |Substance| include but are not limited to: Body substance (substance) and Chemical (substance) **Examples of Substance concepts:** • Albumin (substance) • Amoxicillin (substance) • Amoxicillin trihydrate (substance) • Chromatin (substance) • Endorphin (substance) • Methane (substance) • Paracetamol (substance)

2	Concept model conforms to description logic principles, including use of the classifier to organize the concepts in the hierarchy where appropriate • Top level concepts in the hierarchy will primarily be grouper concepts for both the stated and inferred views
3	Concept model includes attributes necessary to define concepts where appropriate to ensure consistent and reproducible modeling of concepts
4	Concepts representing dispositions in the |Substance| hierarchy shall be sufficiently defined using proximal primitive modeling methodology unless explicitly noted as an exception in the editorial guidelines

Scope of Content

This section applies to the |Substance| hierarchy in the International Release:

	In Scope
1	Substances that support the modeling of concepts in other SNOMED CT hierarchies including but are not limited to: Medicinal product, Clinical finding, Procedure, Observable Entity, and Specimen.
2	Substances that support the modeling of the existing herbal products in SNOMED CT Note: 418165002 |Herbal medicine agent (substance)| is a role and will be replaced in future. Its descendants will be retained "as is" until use cases and/or detailed requirements are known. Requests for addition of new concepts or for modification of existing concepts will be evaluated on a case-by-case basis.

Note: Content requests related to the areas where terming and modelling guidelines are required (e.g. vaccine) will be accepted and placed in Inception/Elaboration status until a long term plan is agreed.

	Out of Scope
1	Concepts that refer to dose form (e.g. solution) or route of administration (e.g. topical) • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected
2	Concepts that refer to role or a specific context (e.g. dietary, medicinal, non-pharmaceutical, substance of abuse) • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected

	Out of Scope
3	Concepts that refer to a release state (e.g. immediate release, extended release) • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected
4	Concepts that refer to a brand or trade name • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected
5	Concepts that state "total" due to the inability to differentiate the definition between the "base" substance and "total" substance (e.g. "cholesterol" versus "total cholesterol") as well as the inability to create an appropriate relationship between the "base" and "total" concepts • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected
6	Substances of the pattern |X molecule of Y organism (substance)| which reference an organism that is not of interest to human medicine are considered out of scope of SNOMED CT. • Example: |Ribonucleic acid of Porcine reproductive and respiratory syndrome virus (substance)| • Existing instances will be inactivated as nonconformant to editorial policy. Requests for new instances will be rejected
7	Substances used in homeopathic products ◦ Existing instances will be retained for now; however requests for new instances will be rejected
8	Substances used in traditional medicine products • Existing instances will be retained for now; however requests for new instances will be rejected
9	Concepts that represent a combination of two or more separate substances • Existing instances have been inactivated. Changes to SNOMED CT concept model to permit the use of concepts within the products hierarchy (e.g. vaccine products) as well as use of General Concept Inclusion functionality to model disorder and findings concepts means that these combined substances concepts will no longer be required. Requests for new instances will be rejected.
10	Concepts representing genetic engineering process variations such as Somatropin (epr), Somatropin (rbe), or Somatropin (rmc) are out of scope as SNOMED CT does not generally differentiate substances based on production process. • Existing instances will be inactivated. Requests for new instances will be rejected.

3.8.20.5 Substance Naming and Modeling Conventions

- Substance Concept General Guidelines(see page 515)

- Guidelines for Substance Hierarchy Grouper Concepts(see page 517)
- Guidelines for Specific Substance Types(see page 536)

Substance Concept General Guidelines

Overview

This section of the document provides both general terming and modeling guidance for substance concepts.

Modeling (stated view)

Parent concept	<<105590001 |Substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..*
Attribute: Has disposition	• Range: <726711005 |Disposition (disposition)| • NOTE: While the allowed range is broader, substance concepts should only use descendants of the concept 726711005 |Disposition (disposition) as the attribute value. • Cardinality: 0..*

Naming Guidelines

General Naming Guidelines
Descriptions should be singular, not plural. • Exception: Fumes should be expressed in the plural (i.e. fumes as opposed to fume).
Descriptions should not include additional descriptors that reference a use case. For example, • Non-pharmaceutical

General Naming Guidelines
Some regulatory agencies may use prefixes or suffixes to distinguish between different manufacturers of a single substance but these will not be used in SNOMED CT; the INN name will be used. For example, • The FDA uses "ado-trastuzumab"; the INN for this substance is "trastuzumab". The INN should be reflected as the US and GB names in SNOMED CT International Release because the prefix represents a specific manufacturer's product. • The FDA uses "emicizumab-kxwh" and "vestronidase alfa-vjbk"; the INN for these substances are "emicizumab" and "vestronidase alfa". The INN should be reflected as the US and GB names in SNOMED CT International Release because the suffix represents a specific manufacturer's product.
Substance concepts should not include a strength.
Substance concepts should not include a dose form or use case
The FSN is aligned with the INN, the Preferred Terms are aligned with USAN and BAN (BAN almost always aligns with the INN). The Preferred Term in the US dialect variation must be given the acceptability of Acceptable (A) in the GB dialect and vice versa.
For isomers the INN names use the expanded prefix e.g. levo or dextro and so should be used for the FSN and Preferred Term
Changes to descriptions allocated to existing substance concepts may impact on the terming of medicinal product concepts and so should be undertaken with caution.
Based on recommendation by the International Protein Nomenclature Guidelines: • Usage of the term 'protein' in a protein name should be avoided if not necessary, especially when the name includes terms such as "factor", "enzyme", "inhibitor" or "regulator". • Enzyme names commonly end with 'ase' (aminoacylase, arginase, etc). The term ‘protein’ should not be appended to the enzyme names.
For case sensitivity assignment: • Greek alphabetical terms in substance concepts have been made case insensitive • For substance terms that have a single letter - either a single lower case letter or a single upper case letter - the case sensitivity should reflect this either CS if the single capital letter or single lower case letter is at the beginning of the term, or cI if the single capital letter or single lower case letter is contained within an otherwise case insensitive term • Proper names in substance terms should begin with a capital letter • Numeric numbers in substance terms should be ignored for case significance. Simply, they won’t be displayed differently if we switch between upper and lower case. The case sensitivity decision should be based on the rest of the letters and words in the term. When modeling terms the word following the numbers does not begin with a capital letter e.g. correct terming is 5-hydroxytryptamine (ci) and not 5-Hydroxytryptamine, and the substance abbreviated to '6-TG' is CS not cI.

Guidelines for Substance Hierarchy Grouper Concepts

Substance hierarchy grouper concepts

In the SNOMED CT substance hierarchy there are a large number of grouper concepts. Currently groupers within the substances can be considered to be structural groupers, disposition groupers, or role based.

The intent is to build the SNOMED CT substance hierarchy along structural or disposition groupers and use a HAS_DISPOSITION relationship to define grouper concepts in the substance hierarchy. Grouper concepts that do not reference structural or disposition properties of a substance should not be included within the substance hierarchy and existing role concepts are considered for relocation outside of the substance hierarchy.

Structure based Groupers
Groupers that organize substances by their chemical structure are used as the main hierarchy for substances. Where substances are heterogeneous and do not have a single identifiable chemical structure such as those of biological origin it may be more appropriate to organize them by source.

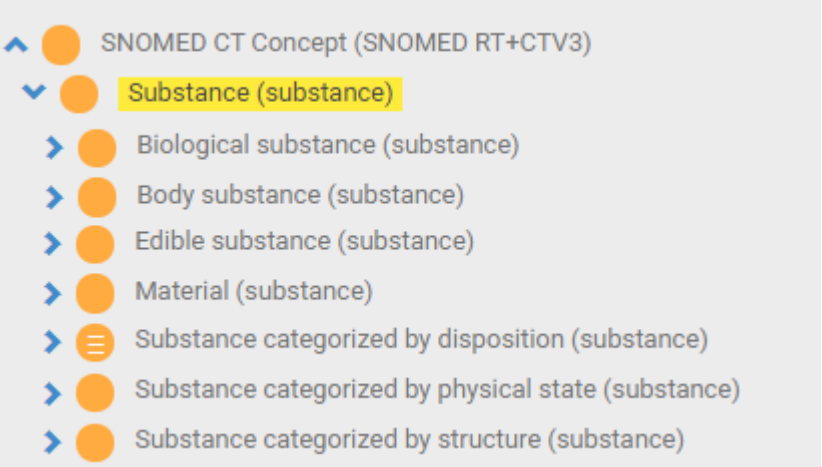
Dispositions Groupers
In the context of substances, a disposition is “a behavior that a substance will exhibit or participate in, given the appropriate context.” This context-based definition of disposition would allow us to assign HAS-DISPOSITION values that are necessarily true, even though the substance does not exhibit the disposition in all contexts.

Role based Groupers
Role based groupers are associated with a particular purpose or outcome. Roles are a function of the way the substance is formulated or presented and so may not be applicable to all products containing that substance. For this reason role based groupers should not be included in the substance hierarchy.

Restructure of the top level substances hierarchy

Previously, the substances hierarchy in SNOMED CT was organized using a number of different axes some of which did not comply with the terminological principle of being always true. This resulted in incorrect inferences both within the substance hierarchy and other hierarchies where substances were used to define concepts. To avoid this, the substances hierarchy has been organized by characteristics that are always true (e.g. chemical structure). For substances where the structure is unknown or the substance is heterogeneous, other characteristics that are always true should be used as parent concepts within the substances hierarchy.

The current substances top level hierarchy includes a number of grouper concepts that are role or use case based. The proposal is to create a substances top level hierarchy as below.



The grouper concepts that are retained as top level substance concepts will need review of their descendants, but ultimately it should provide a consistent hierarchy.

There are similarities in the scope of "ISO 11238 Health informatics – Identification of medicinal products – Data Elements and Structures for the Unique Identification and Exchange of Regulated Information on Substances" and the SNOMED CT substances revision, since both consider a substance to be defined by properties such as molecular structure and not by how it is formulated or used.

IDMP groups substances as being one of five types of single substances:

- (simple) chemical
- protein/peptide
- nucleic acid
- polymer
- structurally-diverse

or they are classified as a mixture. In IDMP the definition of a mixture is much broader that would be perceived by clinical users. IDMP defines starches as mixtures and also compounds such as isophane insulin and gentamicin sulfate as mixtures. This broad definition for mixtures would mean that many of the SNOMED CT substances would be classified as mixtures. These IDMP types are not represented in SNOMED CT since they are not mutually exclusive and are open to some interpretation. The IDMP documentation does provide guidance on the selection of the correct type for a substance but also acknowledges that a single substance may have two separate type definitions. In addition, the use of the word “mixture” in the substances hierarchy is to be discouraged, since as a general scope statement SNOMED CT does not include combination substances that are a mixture of more than one individual chemical even when the two exhibit a synergistic effect. E.g. tazobactam and piperacillin.

Changes to SNOMED CT concept model in the future to permit the use of concepts within the products hierarchy to model disorder and findings concepts means that these combined substances concepts will no longer be required and so will be inactivated at that time.

Differences between SNOMED CT substances and IDMP Substances

1. The scope of substances in SNOMED CT is broader than that of IDMP, since the definition of regulated products is not the only use case supported by the SNOMED CT substances hierarchy.
2. IDMP classes are used to identify which features could/should be identified as defining. This is different from the SNOMED CT requirement to identify top level concepts to support a hierarchy that provides a logical structure for substance concepts.
3. IDMP makes a distinction between Substance and the more closely defined Specified Substance. Substances are “any matter of defined composition that has discrete existence, whose origin may be biological, mineral or chemical".

a. Specified Substances are "defined by groups of elements that describe multi-substance materials or specifies further information on substances relevant to the description of Medicinal Products".
b. Specified substances include mixture substances, substances defined by pharmacopoeial specification or substances where a particular manufacturing process is specified.

In order for SNOMED CT to support the IDMP work, whose primary goal is to define unambiguously all substances present in regulated products, it is necessary for both the concepts that are IDMP Substances and those that are IDMP Specified Substances to be present in the SNOMED CT Substance hierarchy. Stereoisomers, hydrates and solvates will be included in the SNOMED CT substances hierarchy as concepts as well as concepts to represent their base chemical in the SNOMED CT substance hierarchy. Since both IDMP Substances and IDMP Specified Substances are candidate concepts to be used in the ingredient role attributes it does not add value in the definition of these concepts to separately identify IDMP Substances and IDMP Specified Substances in SNOMED CT and would likely cause confusion where substance concepts are used to define concepts outside the scope of IDMP and the medicinal product hierarchy.

Substance Groupers Based on Structure

Overview
Groupers based on structural properties of the substance that are deemed to be clinically useful will be included in the Substance hierarchy.

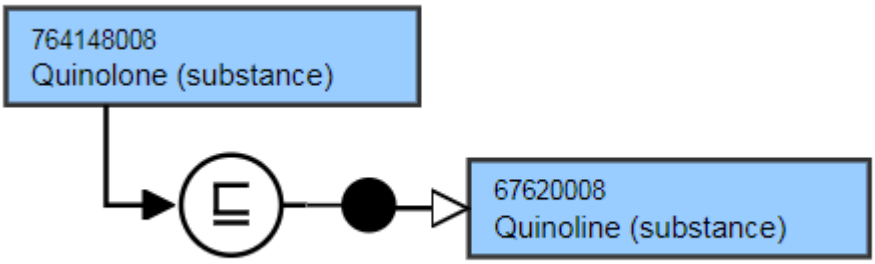
For example,

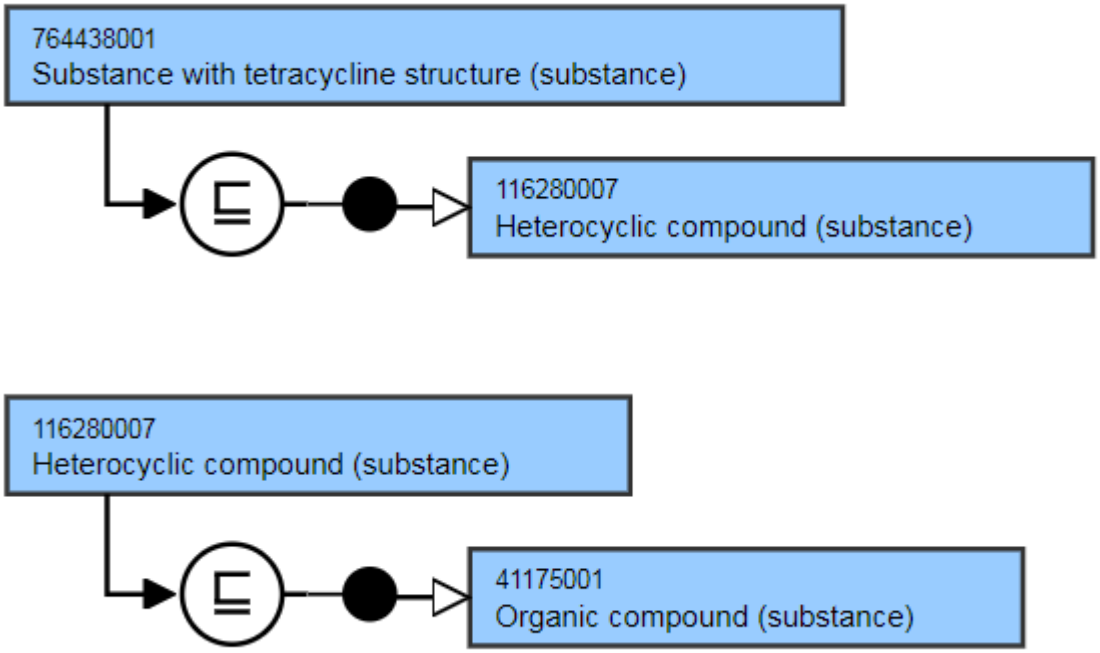
- Benzodiazepine (substance)
- Quinolone (substance)

Modeling (stated view)

Parent concept	Most distal appropriate descendant of 312413002 |Substance categorized by structure (substance)|
Semantic tag	(substance)
Definition status	900000000000074008|Necessary but not sufficient concept definition status (core metadata concept)
Attributes	None

Exemplar for Concept Model
The following illustrates the **stated** and **inferred** view.





Terming Guidelines

FSN	Use the following pattern for the FSN. Groupers should be expressed in the singular. (Compound not compounds) Example for substances that represent a structural grouper: • Organic nitrogen compound (substance) • Halide compound (substance) • Triazine derivative (substance) • Copper and/or copper compound (substance) • Phenothiazine and/or phenothiazine derivative (substance) • Nucleotide (substance) Where the same word is used to identify both a group of substances with a particular chemical structure and a particular chemical substance the following terming for the FSN will be used for the substance grouper concept. Substance with X structure (substance) Examples: • Substance with tetracycline structure (substance) • Substance with cresol structure (substance) • Substance with benzene structure (substance)

Preferred Term	Use the following pattern for the Preferred Term, For example, • Organic nitrogen compound • Halide compound • Triazine derivative • Copper and/or copper compound • Phenothiazine and/or phenothioazine derivative • Nucleotide Where the same word is used to identify both a group of substances with a particular chemical structure and a particular chemical substance the following pattern will be used for PT the substance grouper concept. Substance with X structure For example, • Substance with tetracycline structure • Substance with cresol structure • Substance with benzene structure
Synonyms	A synonym to match the FSN must be created. Additional synonyms are not allowed unless explicitly identified as an exception in the editorial guidelines.

Exemplar for Hierarchy

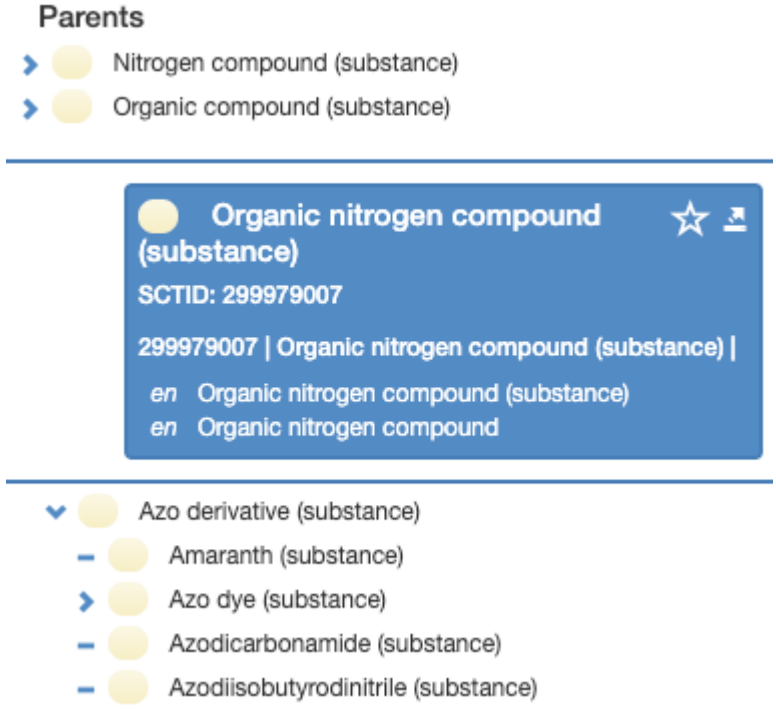


Figure 1: Browser view of 299979007 |Organic nitrogen compound (substance)|

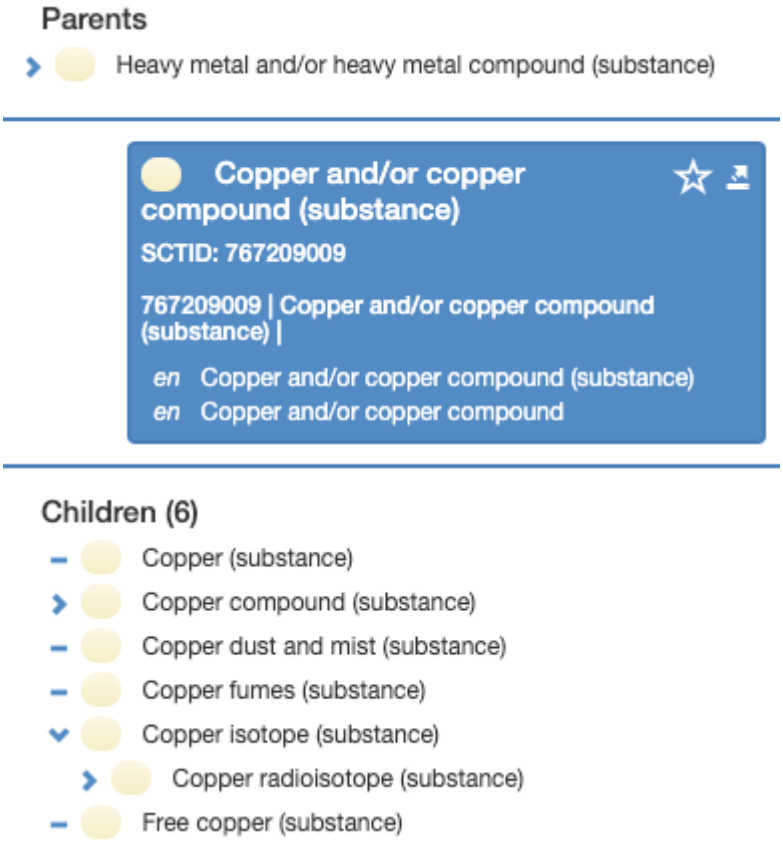


Figure 2: Browser view of 767209009 |Copper and/or copper compound (substance)|

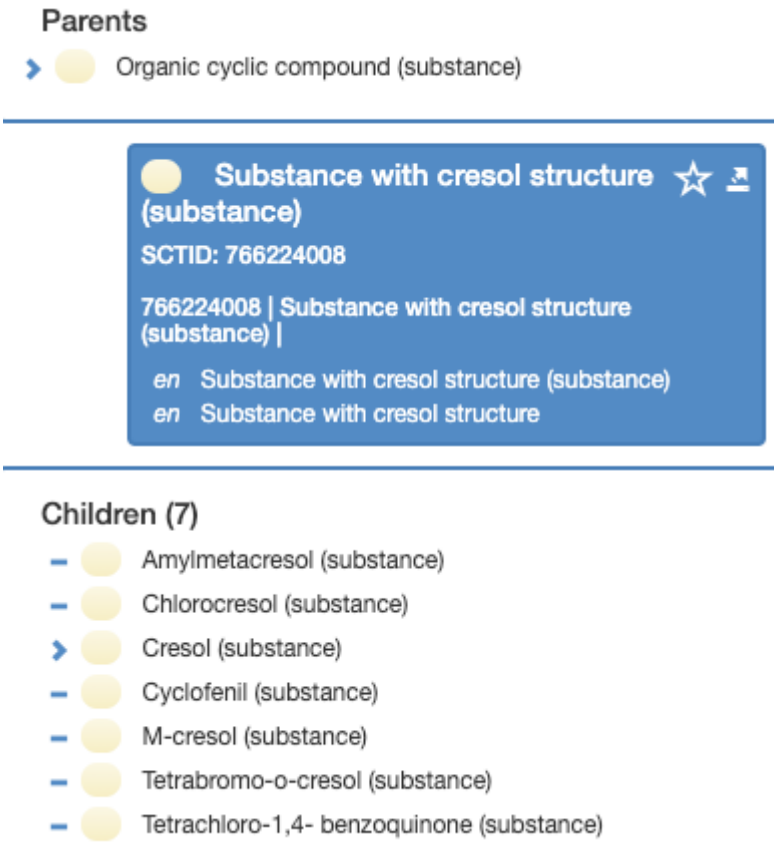


Figure 3: Browser view of 766224008 |Substance with cresol structure (substance)|

Substance Groupers Based on Disposition

Overview
Groupers based on disposition that are deemed to be clinically useful and that can be sufficiently defined will be included in the |Substance| hierarchy. Disposition is defined as a behavior that a substance will exhibit or participate in, given the appropriate context.

There is no requirement to introduce a new semantic tag in order to distinguish concepts representing a substance disposition from any other type of concept in the |Substance| hierarchy.

Note: This section applies to concepts representing a single disposition. It does not apply to concepts representing a disposition combined with a structural grouper or concepts representing more than one disposition.

Modeling (stated view)

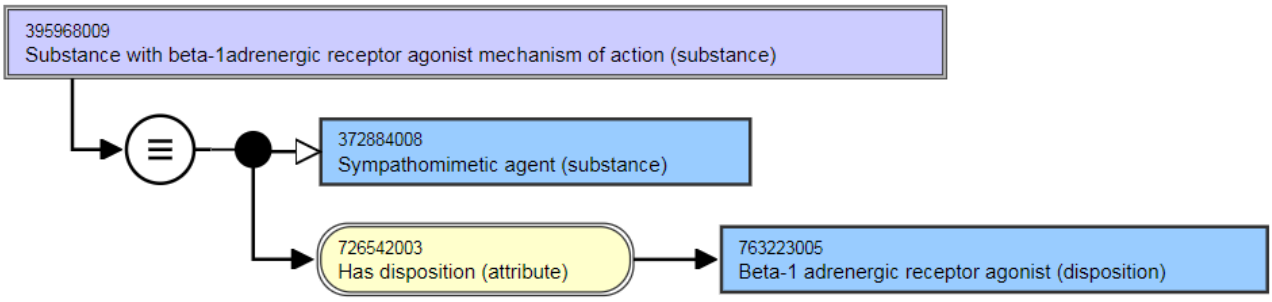
Parent concept	105590001 |Substance (substance)| • Exceptions: While the goal is to model these concepts using proximal primitive modeling, there will be a transition over several release cycles to get to that state. In the meantime, concepts may have stated parents other than 105590001 |Substance (substance) for the foreseeable future.

Definition status	900000000000073002 |Sufficiently defined concept definition status (core metadata concept)

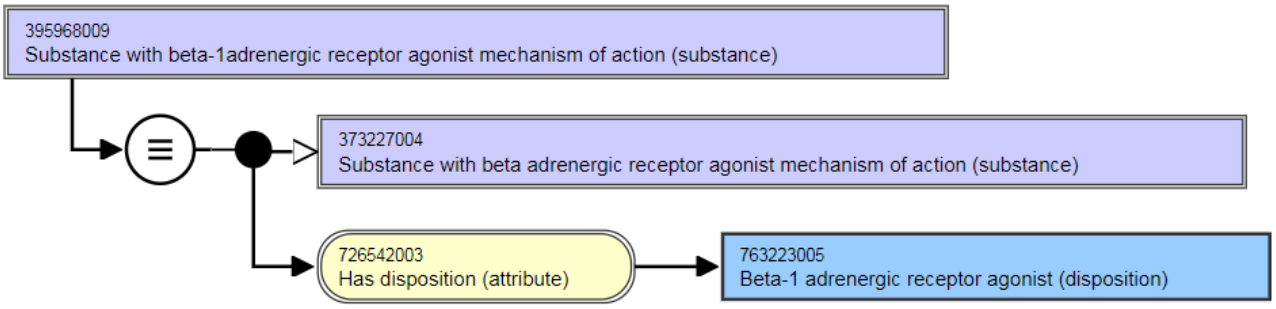
|Has disposition|	• Range: <726711005 |Disposition (disposition)
	  • NOTE: While the allowed range is broader, the Substance Groupers based on Disposition should only use descendants of the concept 726711005 |Disposition (disposition) as the attribute value.
	• Cardinality: 1..1
	  • NOTE: While the allowed range is broader, the Substance Groupers based on Disposition should have one and only one |Has disposition| attribute.

Note: Substance groupers representing etiopathic dispositions (e.g. 88376000 |Carcinogen (substance), 45986006 | Teratogen (substance)) will be created. Since most substances can exhibit these characteristics in some circumstances, the descendant concepts will not be populated. Exceptions will be noted in the editorial guidelines.

Exemplar for Grouper Concept Based on Disposition
The following illustrates the **stated** view for grouper concepts based on disposition.



The following illustrates the **inferred** view for grouper concepts based on disposition.



Terming Guidelines

FSN	Use the following pattern for the FSN. The FSN must reflect the terming used to describe the disposition consistent with the terming of the |Has disposition| attribute value. Example for dispositions that represent a mechanism of action: • Substance with opioid receptor agonist mechanism of action (substance) • Substance with histamine receptor antagonist mechanism of action (substance) • Substance with acetylcholinesterase inhibitor mechanism of action (substance)
Preferred Term	Use the following pattern for the Preferred Term. The Preferred Term must reflect the terming used to describe the disposition consistent with the terming of the |Has disposition| attribute value. Example for dispositions that represent a mechanism of action: • Opioid receptor agonist • Histamine receptor antagonist • Acetylcholinesterase inhibitor
Synonyms	Synonyms corresponding to the FSN are not required. Additional synonyms are allowed only if they are consistent with the synonyms for the corresponding disposition concept.

Substance Groupers Based on Both Structure and Disposition

Overview
Groupers based on both structure and disposition that are deemed to be clinically useful and that can be sufficiently defined will be included in the |Substance| hierarchy.

Note: This section applies to concepts representing a single structural parent and a single disposition. It does not apply concepts representing more than one structural parent or disposition.

Modeling (stated view)

Stated parent concept	The stated parent concept must be the concept that represents the structural grouper. If such a concept does not exist, it must be created and its stated substance descendants added before the grouper based on both structure and disposition can be created.
Definition status	900000000000073002 |Sufficiently defined concept definition status (core metadata concept)

Attribute: **Has disposition**	• Range: <726711005 |Disposition (disposition) • NOTE: While the allowed range is broader, the Substance Groupers based on both Structure and Disposition should only use descendants of the concept 726711005 |Disposition (disposition) as the attribute value. • Cardinality: 1..1

Exemplar for Grouper Concept Based on both Structure and Disposition
The following illustrates the **stated** and **inferred** view for grouper concepts based on both structure and disposition.

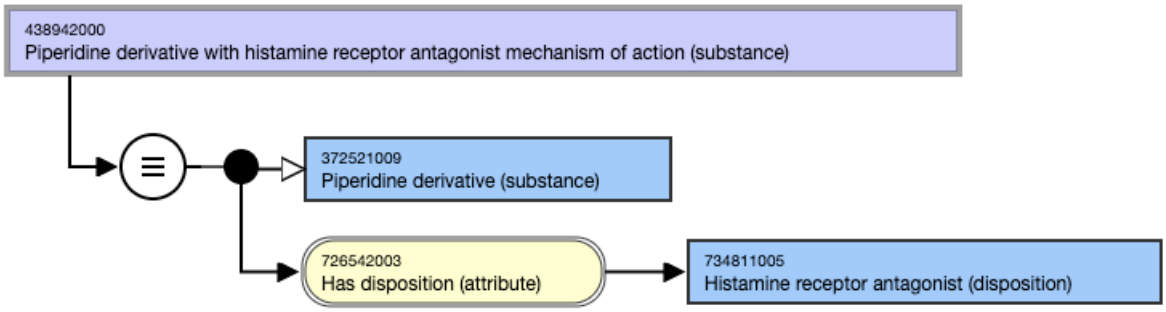


Figure 1: Stated view of 438942000 |Piperidine derivative with histamine receptor antagonist mechanism of action (substance)|

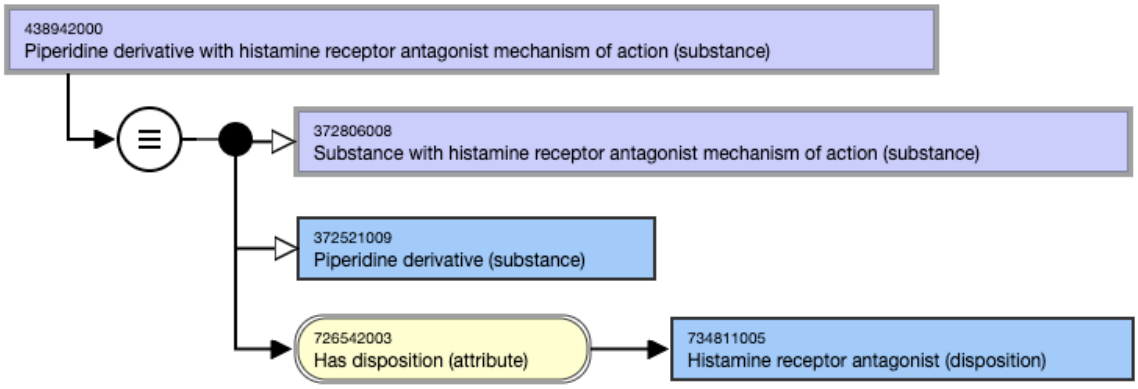


Figure 1: Inferred view of 438942000 |Piperidine derivative with histamine receptor antagonist mechanism of action (substance)|

Terming Guidelines

FSN	Use the following pattern for the FSN, with X representing the structure and Y representing the disposition. The FSN should align with the FSN for the substance grouper and disposition used as the stated parent and attribute value respectively. • X with Y mechanism of action (substance) For example, • Piperazine derivative with histamine H1 receptor antagonist mechanism of action (substance) • Substance with dihydropyridine derivative structure and calcium channel blocker mechanism of action (substance) • Substance with organophosphorus structure and acetylcholinesterase inhibitor mechanism of action (substance)
Preferred Term	Use the following pattern for the Preferred Term, with X representing the structure and Y representing the disposition. The FSN should align with the FSN for the substance grouper and disposition used as the stated parent and attribute value respectively. • X Y For example, • Piperazine derivative histamine H1 receptor antagonist • Dihydropyridine derivative calcium channel blocker • Organophosphorus acetylcholinesterase inhibitor
Synonyms	A synonym to match the FSN is not required. Additional synonyms are allowed only if they are consistent with the synonyms for the corresponding structure grouper and disposition.

Concepts Representing a Substance or its Modifications

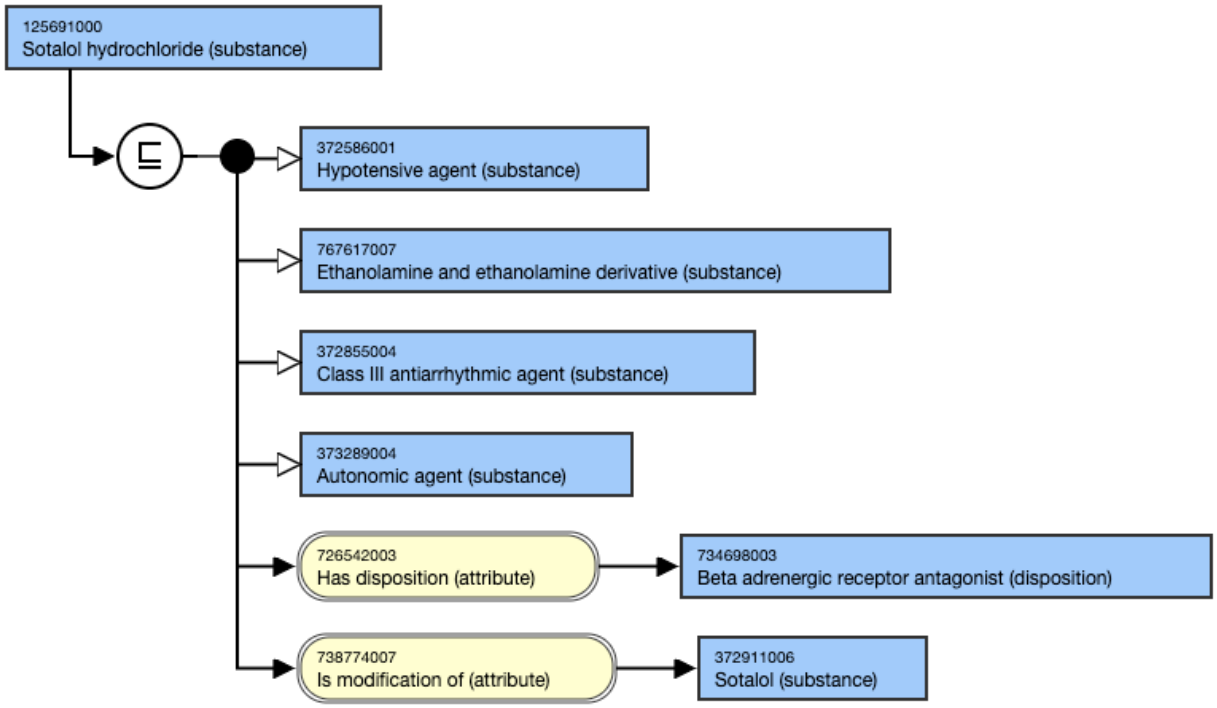
Overview
The substance redesign project has made a number of decisions regarding the representation of a substance and its modifications.

1. Modification concepts that exist to group modifications or derivatives of a specific substance not be created.
2. Metabolite groupers in the substances hierarchy are considered roles. No further concepts of this format will be created in the substances hierarchy. Existing concepts will only be retained where there is a specific requirement and will be modeled as a child of the concept Metabolite (substance). See relative section elsewhere in this document.
3. Structural groupers that reference modifications as a chemical group will be retained. Where the structural group name also refers to a specific chemical the grouper will be re-termed “Substance with X structure”. See relative section elsewhere in this document.
4. There is no requirement to introduce a new semantic tag in order to distinguish concepts representing a substance or its modifications from any other type of concept in the |Substance| hierarchy.

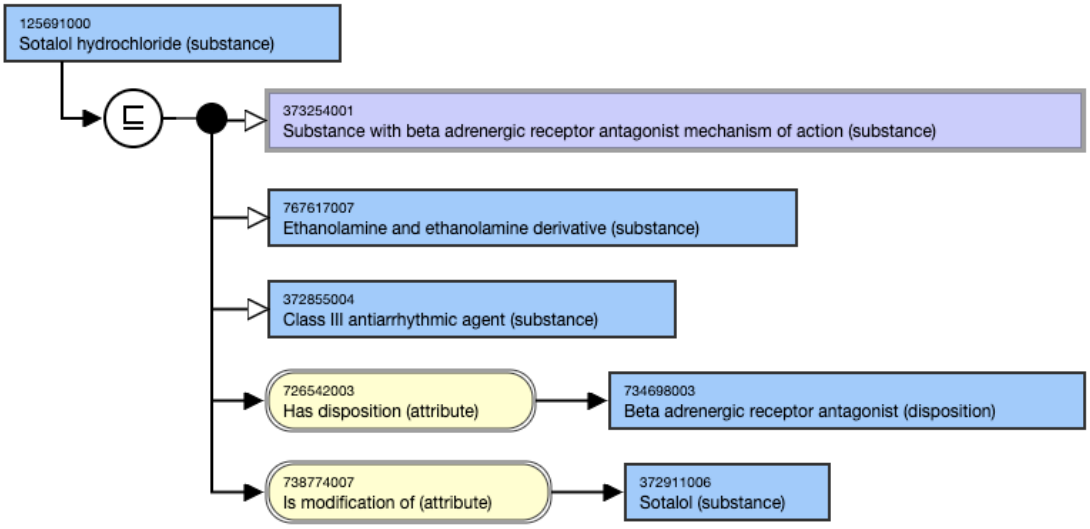
Modeling using the IS Modification attribute (stated view)

Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attributes	None

Exemplar
The following illustrates the **stated** view

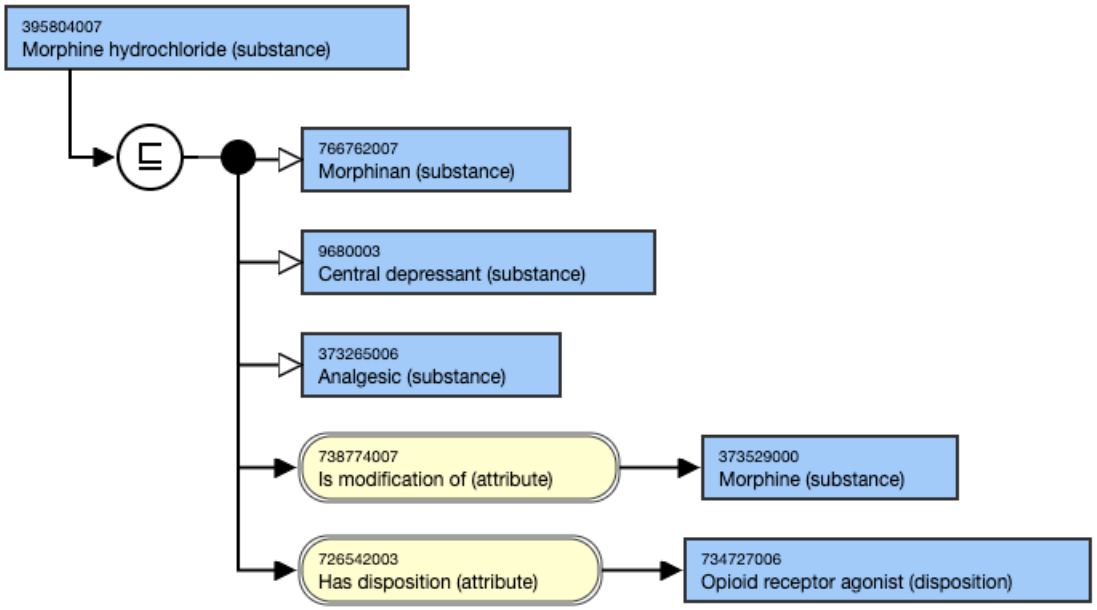


The following illustrates the **inferred** view for concepts that are a modification.

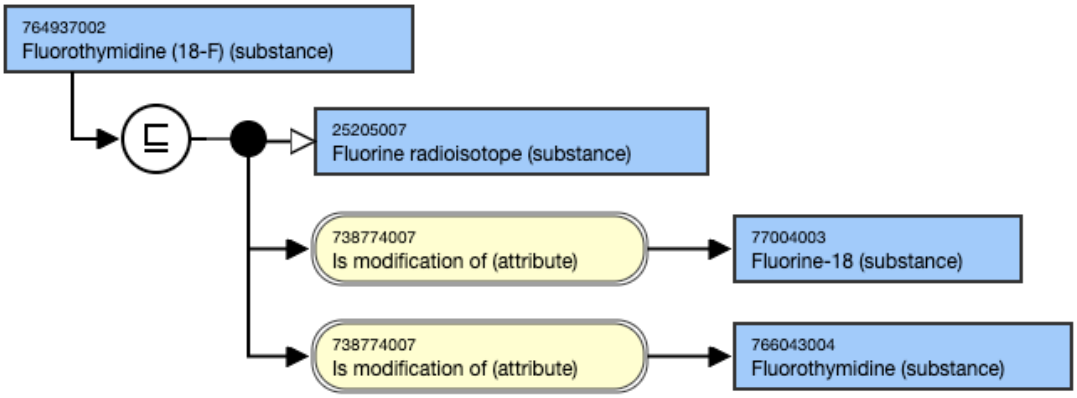


Guidelines for the use of the IS Modification attribute with Examples
Substances may have zero to many Is modification attribute(s)

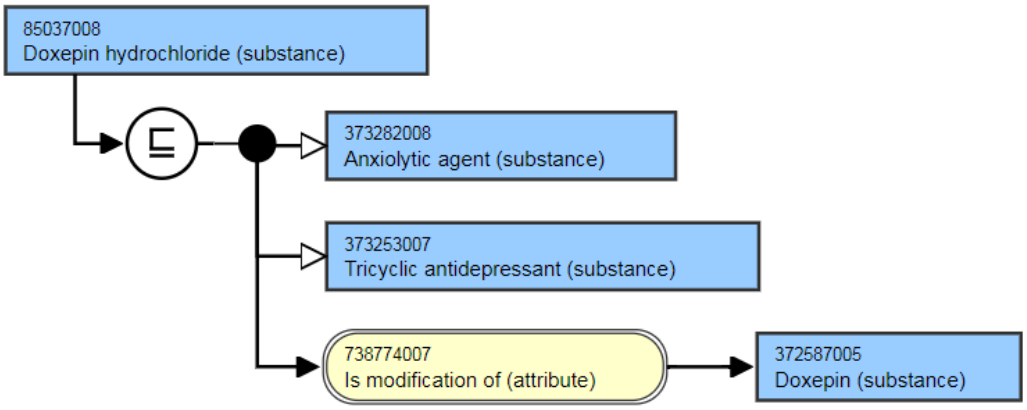
For example, Morphine hydrochloride (substance)



For example, Fluorothymidine (18-F) (substance)



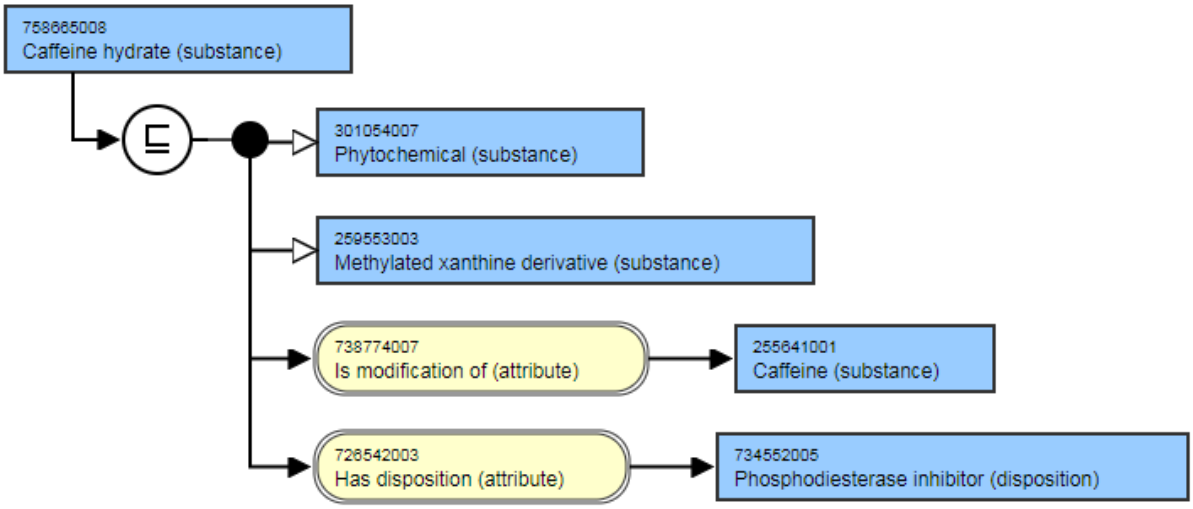
For example, Doxepin hydrochloride (substance)



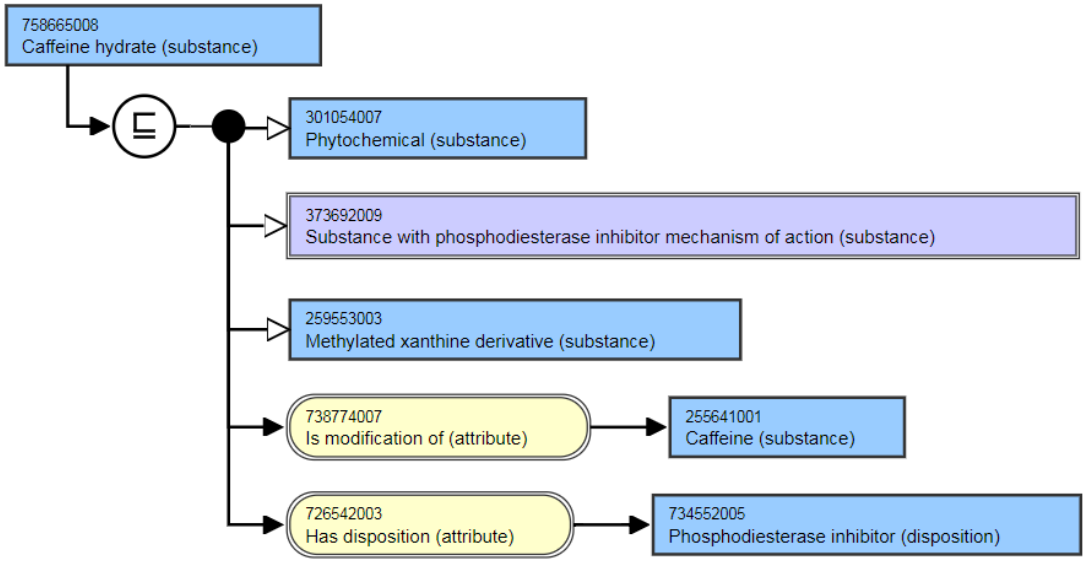
Hydrates have a IS MODIFICATION OF relationship to the unspecified salt.

For example, Caffeine hydrate (substance) IS MODIFICATION OF Caffeine (substance)

This is the **stated** view.

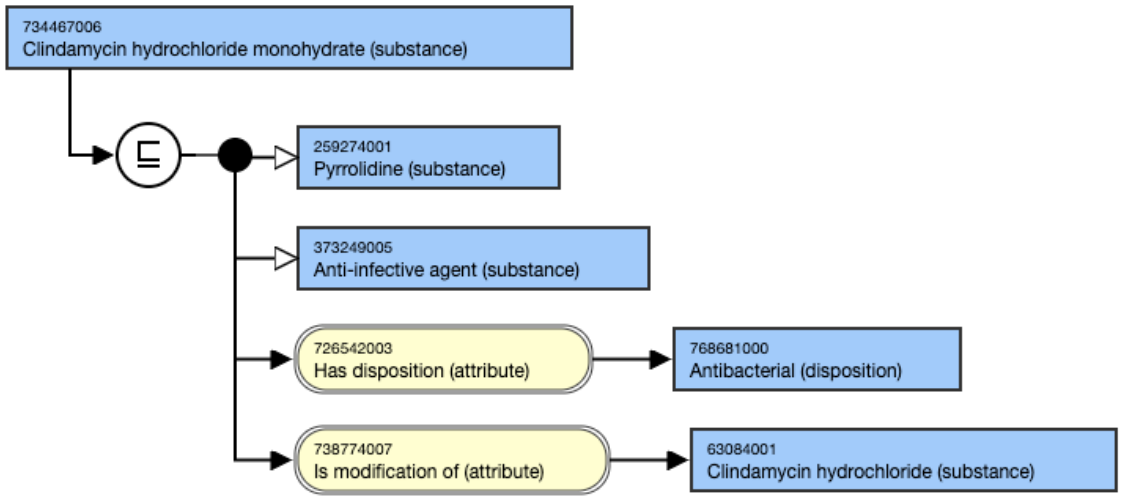


This is the **inferred** view

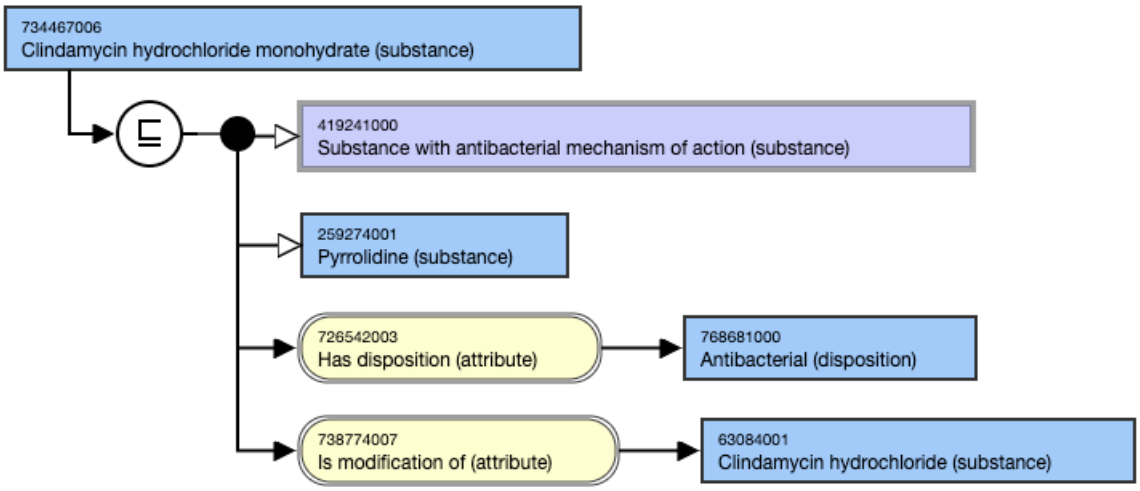


For example, Clindamycin hydrochloride monohydrate (substance) IS MODIFICATION OF Clindamycin hydrochloride (substance)

This is the **stated** view:

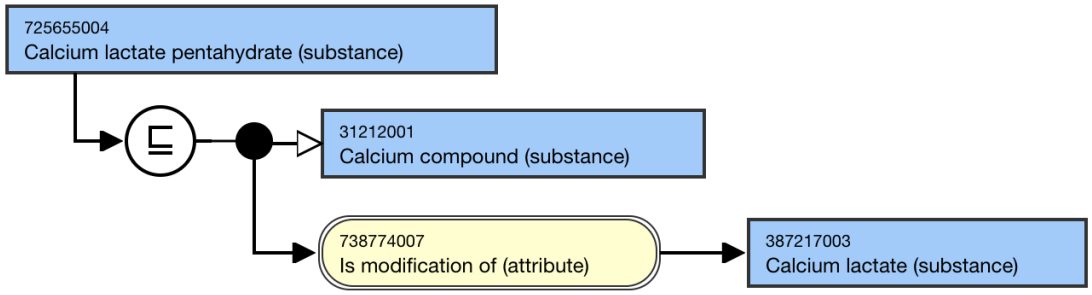


This is the **inferred** view:



For example, Calcium lactate pentahydrate (substance) IS MODIFICATION OF Calcium lactate (substance)

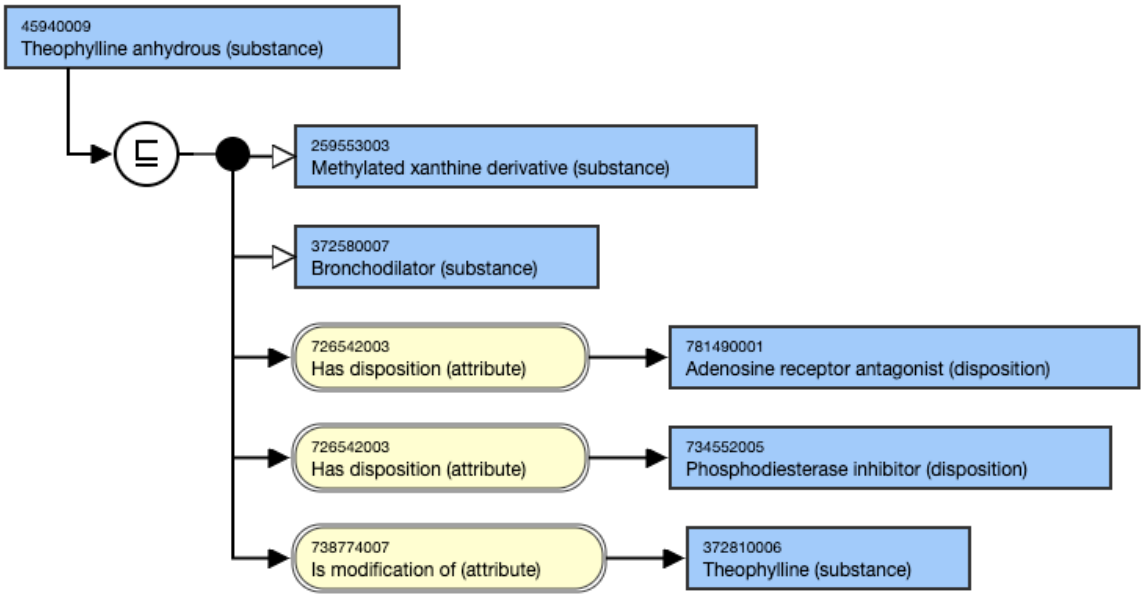
This is the **stated and inferred** view.



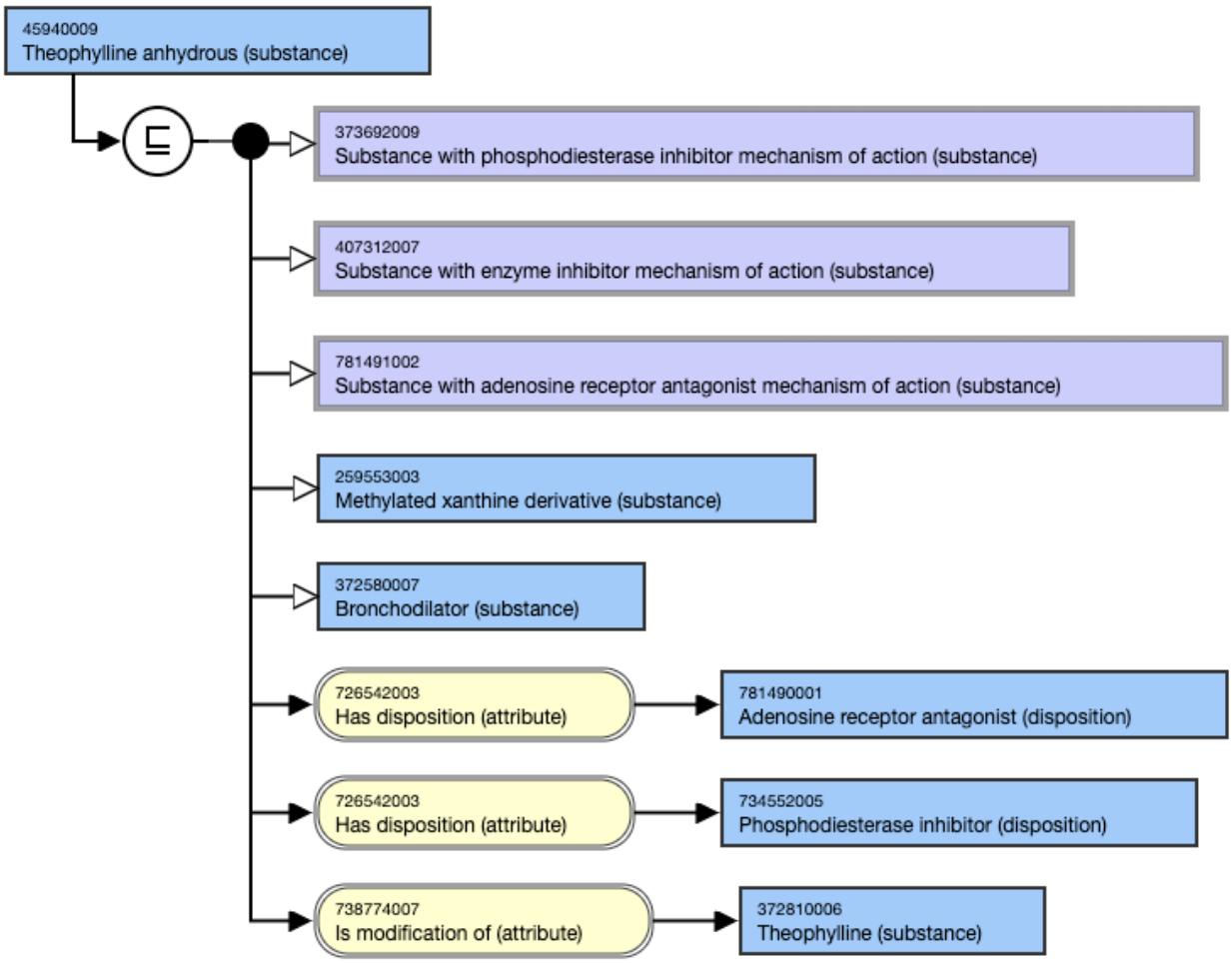
Anhydrous salts have a IS MODIFICATION relationship to the unspecified salt

For example, Theophylline anhydrous (substance) IS MODIFICATION OF Theophylline (substance)

This is the **stated** view

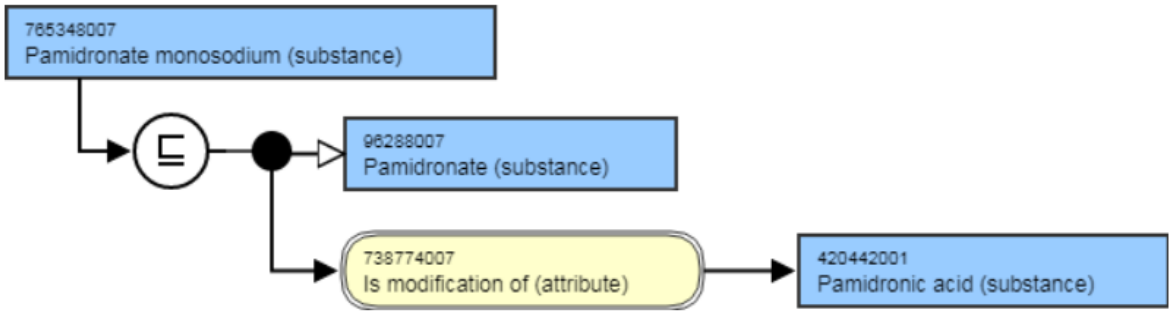


This is the **inferred** view



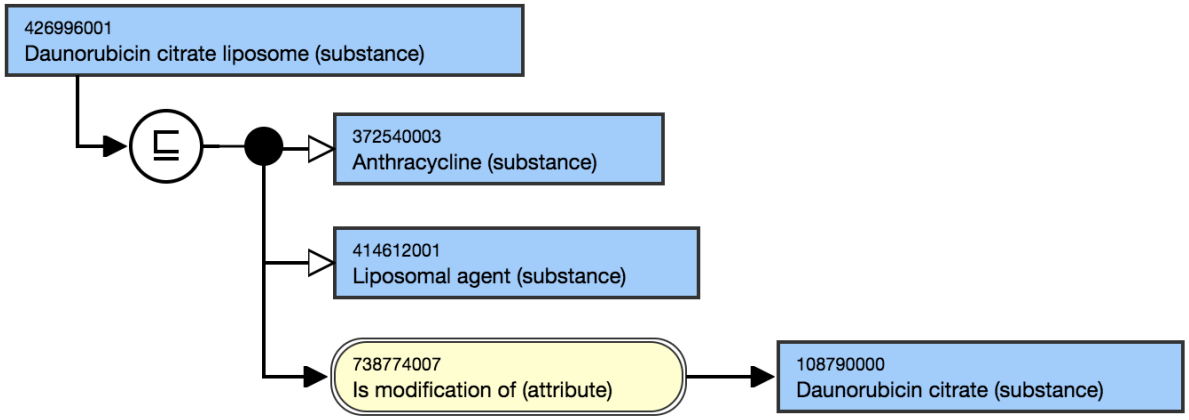
The salts are modeled with an IS Modification OF the acid substance.

For example, Pamidronate monosodium (substance) IS MODIFICATION OF Pamidronic acid (substance). This is the **stated** and **inferred** view.



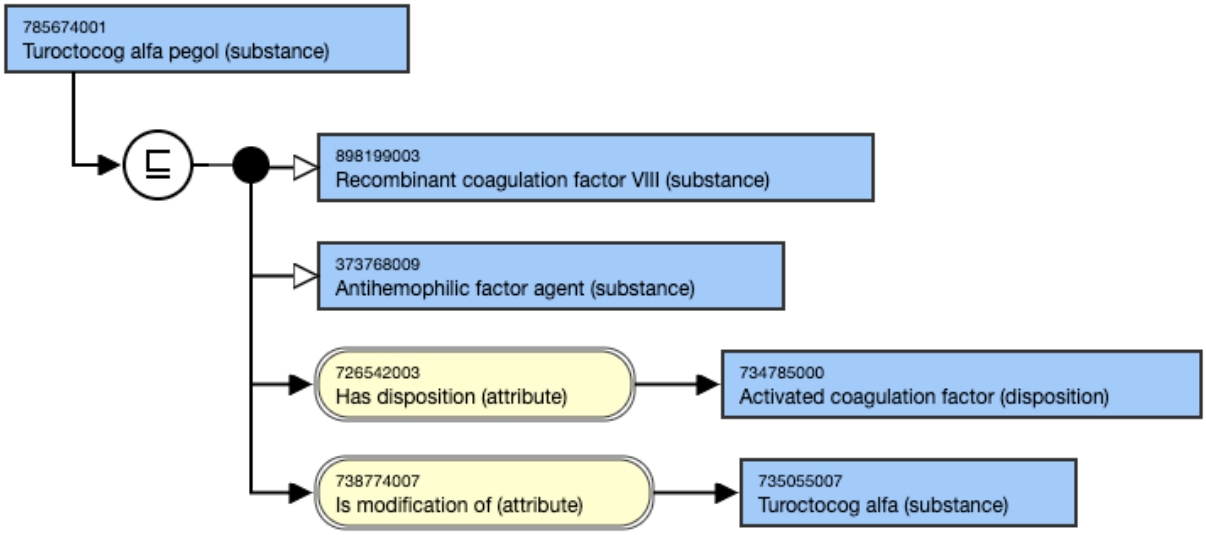
Liposomal preparations are modifications of the chemical substance.

For example, Daunorubicin citrate liposome (substance)|

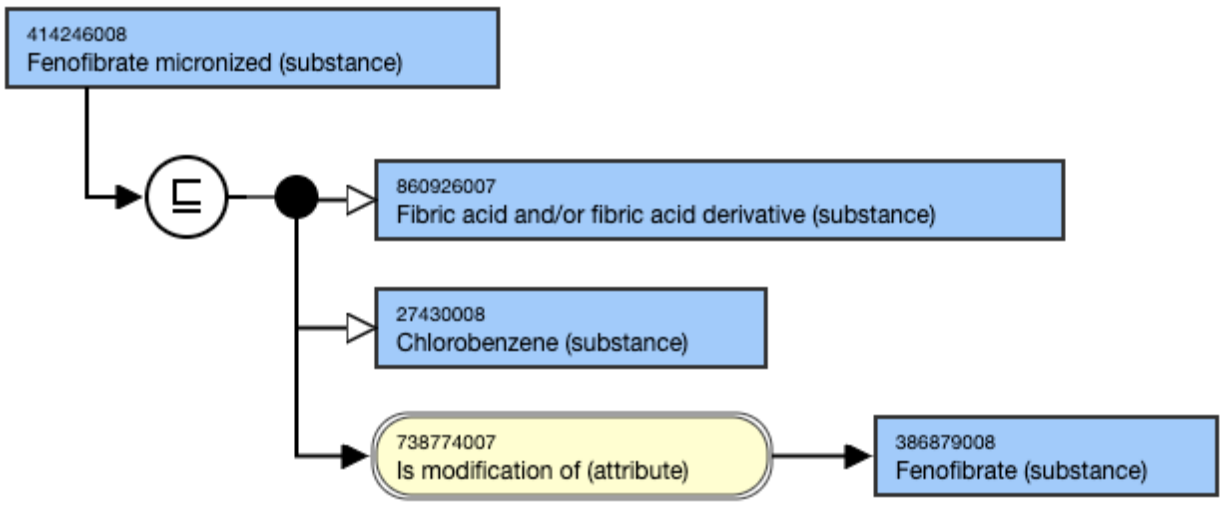


Pegylated substances should be modeled with |Is modification of (attribute)| generic substance–if such a substance has been made available; not all pegylated medicinal substances have a non-pegylated form as the non-pegylated form may have been too immunogenic or too toxic.

For example, 785674001 |Turoctocog alfa pegol (substance)|



Concepts specifying a particular physical form (e.g. micronized, macrocrystal, microsphere) should have a parent concept that relates to the structure of the substance and also an Is modification of (attribute) relationship to the unspecified substance concept.



Grouper concepts should not be targets of an "Is_modification" relationship.

In general, an |Is modification of (attribute)| is not applicable to prodrugs. For example, aspirin is not generally considered as a modification of the substance salicylic acid. This is because there is no requirement for the |Has active ingredient (attribute)| of medicinal products containing prodrug substances to use any relationship to the active substance to manage relationships within the medicinal product hierarchy.

When a prodrug is an esterified form of substance, there should be an "is_modification" relationship between the substance and its esterified form.
Exemplar:
- 715220007 |Tenofovir alafenamide (substance)|
- 89678001 |Cefuroxime axetil (substance)|

"Is_modification" relationship is not applicable between a glycan and its glycoconjugate. Exemplar: 259289005 | Trimethylene glycol (substance)| will not be a modification of 52086008 |Glycol (substance)|.

"Is_modification" relationship is not applicable to genetic engineering process variations (e.g. Somatropin(epr), Somatropin(rbe), or Somatropin(rmc) as SNOMED CT does not generally differentiate substances based on production process.

"Is_modification" relationship is not applicable between a chemical element and its salt. Exemplar: 387307005 | Calcium carbonate (substance) | is not a modification of |Calcium (substance)|.

Guidelines for Specific Substance Types

This section of the document provides guidance for specific types of substances.

Antibodies and antigens

Overview
This section includes concepts that represent Antigen of X organism, Antibody to X organism and Immunoglobulin G, M, A, E, D antibody to X organism.

- When referring to an organism name, while the Linnean taxon ranks (such as "genus") are not included, the subspecies variants (such as "biotype" and "serotype") are included in the naming. This is to avoid ambiguity when the same number or letter is used to refer to different organism variants. For example, without mentioning the specific variant (serogroup vs. serotype) and the nomenclature system (Danish vs. American), "Streptococcus pneumoniae 48" can refer to the following:
  - Streptococcus pneumoniae Danish serotype 48 (which is equivalent to Streptococcus pneumoniae American serotype 82)
  - Streptococcus pneumoniae American serotype 48 (which is equivalent to Streptococcus pneumoniae Danish serotype 7B)
  - Streptococcus pneumoniae serogroup 48

Modeling - Antigen of X organism

Parent concept	Most distal appropriate descendant of 116633006 |Microbial antigen (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	N/A

Naming Guidelines - Antigen of X organism
The antigen name is usually derived from the biological name of the organism as opposed to the “disease” or “infection” that the organism may cause and/or that the vaccine may provide immunization for.

FSN	Pattern: • Antigen of X organism (substance) For example, • Antigen of Filaria (substance) • Antigen of Alternaria alternata protein (substance)
Preferred Term	Pattern: • X organism antigen For example, • Filaria antigen • Alternaria alternata protein antigen Exception: • Preferred term for Antigen of live attenuated Mycobacterium bovis: Bacillus Calmette-Guerin antigen
Synonyms	Pattern: A synonym that matches FSN For example, • Antigen of Filaria • Antigen of Alternaria alternata protein
	Pattern: X organism Ag For example, • Filaria Ag • Alternaria alternata protein Ag
	Other • "X organism inactivated toxin" for concepts referring to "X organism toxoid (substance)" • Additional synonyms (e.g. when a legitimate synonyms exist for Organism name) are applicable and are evaluated on case-by-case basis.

Antigen variants:
There is a requirement for the inclusion of characteristic technologies that are essential for distinguishing between different antigen variants that are used in manufacturing vaccine products e.g live attenuated, inactivated, or subunit antigens. Antigen variants are evaluated for:

- References such as WHO, CDC, UpToDate, vaccine package inserts.
- Inclusion in the international release vs. national extensions
- Hierarchy they belong to: Substance or Product.
    - If they belong in the Substance hierarchy, the classification with respect to other antigens (legacy content that does not adhere to the following guideline will be updated in future releases)

Variants reviewed to date:

- “Antigen of X” is in scope for the international release and is modeled in the Substance hierarchy. It is a generic grouper concept and subsumes all instances of antigen variants related to Organism X.
    - X refers to a bacteria, virus, fungus, or parasite except when antigen refers to the organism “toxin/toxoid”, where it can only apply to a bacteria.
- “Antigen of live attenuated X” is in scope for the international release and is modeled in the Substance hierarchy as a direct child of Antigen of X.
    - It refers to attenuated whole cell bacteria or whole virus where the strains are made less virulent so infection is usually inapparent or very mild. It may be used in the creation of vaccine products for certain patient groups and hence is of clinical significance.
    - The following subtypes are also in scope for the international release and are modeled in the Substance hierarchy as direct children of Antigen of live attenuated X. Note that in the following examples "human" and "bovine" refer to source organisms which are differentiated from the organism producing antigen i.e. Rotavirus.
        - “Live attenuated human X” e.g. Antigen of live attenuated human Rotavirus serotype G1P[8]
        - “Live attenuated human-bovine reassortant X” e.g Antigen of live attenuated human-bovine reassortant Rotavirus serotype G1
- “Antigen of whole inactivated X” is in scope for the international release and is modeled in the Substance hierarchy as a direct child of Antigen of X.
    - It refers to the killed version of the organism that causes a disease.
    - As of the July 2020 release, the word "whole" is added to all new and existing concepts referring to "Antigen of inactivated X" to further clarify the differentiation between "Antigen of whole inactivated organism" (referring to a killed organism as a whole) and "Antigen of organism [subunit]" (referring to subparts of an organism).
- “Antigen of acellular X” is in scope for the international release and is modeled in the Substance hierarchy as the direct child of "Antigen of X".
    - "Antigen of acellular X", when it exists, can only apply to a bacteria.
- “Antigen of X [subunit]” is in scope for the international release and is modeled in the Substance hierarchy as the direct child of “Antigen of X”.
    - Subunit antigens differ from inactivated whole-cell antigens by referring only to the antigenic parts of the pathogen. These parts are necessary to elicit a protective immune response. The word “inactivated” does not need to be part of the name unless it is referring to a whole cell or a whole virus i.e for descriptions referring to a subunit, the word “inactivated” will be omitted as redundant.
    - [Subunit] refers to a sub-part of an organism i.e. a specific, isolated protein of the pathogen, a recombinant protein (made by recombinant DNA techniques), an inactivated toxin (toxoid), or a capsular polysaccharide/oligosaccharide coating of an encapsulated bacterium:
        - "Antigen of X [protein/recombinant protein]" is in scope for the international release and is modeled in the Substance hierarchy.
            - It represents a specific, isolated protein of the pathogen or a recombinant protein.
            - When both "Antigen of X [protein]" and "Antigen of X [recombinant protein]" exist for X organism, they are modelled as siblings.
        - “Antigen of X capsular polysaccharide/oligosaccharide" is in scope for the international release and is modeled in the Substance hierarchy.
            - It represents a polysaccharide/oligosaccharide antigen and acts as a grouper for the following:
                - "Antigen of X capsular polysaccharide/oligosaccharide unconjugated”, which represents a polysaccharide/oligosaccharide antigen without conjugation to any carrier protein or toxoid
                - “Antigen of X capsular polysaccharide/oligosaccharide conjugated”, represents a grouper concept and will be created in the international release and in the Substance hierarchy per request and (based on current ED guidelines) only if it has more than one child concept.
                    - Exception can apply if there is a use case that support retaining/creating these conjugate groupers:

- Recording the history of a conjugated vaccine when the type of conjugated protein is not known
- Aggregating data for forecasting
- The existing grouper concepts with just one child will not be deprecated at this time. However, requests for addition of these concepts will be rejected.
- "Antigen of X capsular polysaccharide/oligosaccharide conjugated to Y", which represents an oligosaccharide or polysaccharide antigen attached to a protein Y, where "Y" refers to a carrier protein to increase efficacy and immunogenicity e.g. Corynebacterium diphtheriae cross-reacting material 197 protein.
  - It is the direct child of single parent "Antigen of X capsular polysaccharide/oligosaccharide conjugated". There are no clinical use-case that requires association to the conjugated part of antigen as an additional parent. This classification is in line with all other similar concepts (modifications such as pegylated substances).
- "Antigen of X toxoid" is in scope for the international release and is modeled in the Substance hierarchy.
  - Like other subunit antigens, "Antigen of X toxoid" is classified under "Antigen of X". While the toxin is not an intrinsic part of the organism, it is a product of the organism that would not exist in the absence of that organism. In other words, there is always a direct association between the substance and the source organism. There are other antigenic proteins that are generated by the organism (e.g. surface protein) and they are classified as children of "Antigen X organism". The only difference, in comparison to toxoids, is that they are not being excreted by the organism.
  - Toxoid antigens are based on the toxin produced by certain bacteria (e.g. tetanus or diphtheria), which has been chemically processed so that it is still immunogenic. Once the toxin has been inactivated, it is called a toxoid.
  - A toxoid can be an antigen in its own right, or it can be conjugated to another antigen.
- When referring to Organism parts/subunits:
  - Referring to more than one subunit (e.g. combined protein such as Bordetella pertussis FIM 2 and FIM 3 antigen) would not be acceptable for the Substance hierarchy i.e. the combined protein needs to be modelled at the product level with more than one active ingredient.
  - Abbreviated organism subunit names such as "Corynebacterium diphtheriae **CRM197** protein", are not allowed in a fully specified name (and similar synonym). The FSN and similar synonym should only include the spelled-out terms i.e. "Corynebacterium diphtheriae cross-reacting material 197 protein".
  - Abbreviated organism part names are allowed in a preferred term (and other synonyms). The abbreviations do not need to be accompanied by the fully expanded term, which is an exception to the general naming guidelines on abbreviations and acronyms in the SNOMED CT Editorial Guide. e.g the following PT includes CRM which is the abbreviated form for cross-reacting material.
    - Streptococcus pneumoniae Danish serotype 1 capsular polysaccharide antigen conjugated to Corynebacterium diphtheriae CRM197 protein
- Inclusion of Vaccine manufacturing techniques and/or residuals in antigen names is generally out of scope for the international release. However, exceptions can be made for applicable use-cases.
  - "Antigen of X grown in nervous tissue" or "Antigen of X grown in cellular line" is acceptable for inactivated Rabies antigens grown in brain tissue or cell lines and is included in the international release, considering the difference in the adverse reactions that they cause. If and when created:
    - "Antigen of X grown in cellular line" will be a grouper and other subgroups will be added as needed, e.g. "grown in Human diploid cell".
    - "Antigen of X grown in nervous tissue" should indicate the specific type of nervous tissue e.g. brain.

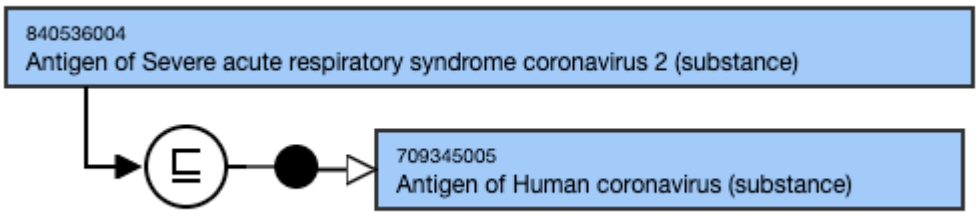
- "Split virion" and "surface subunit" is acceptable when the proposed granular antigen is used in a real Clinical Drug, e.g. Influenza antigens.
    - For influenza strains, the candidate vaccine virus (CVV) is not included in the antigen name in the international release. The justification is that each pharmaceutical company may use a different CVV to manufacture their product, or they may omit that level of detail in their product information. However, each of the recommended "parent strain + CVV" are antigenically like the parent virus.
- "Antigen of X adsorbed" is in scope for the international release and is modeled in the Substance hierarchy. It is not required to specify details regarding what is adsorbed with as there is no known use-case at this point.
- With the exception of conjugated proteins/toxoids that are in scope for the international release, inclusion of other adjuvants as well as delivery mechanisms (e.g. Aluminum Salts, Oil-in-Water Emulsions, Virosomes) is currently on hold and will be considered if and when associated requests and uses cases are presented.
- "Purified" will not be included in antigen names as the clinical value of stating "Purified antigen" is not clear. In addition, in some cases, it is implied that an antigen is purified based on the preparation technique. This inconsistency in naming (stated vs. implied) can lead to misclassification. If needed, it can be accomplished by using groupers or other modeling considerations in future. But for now, adding a maintenance burden with very limited benefit does not seem valuable.
- Inclusion of non-antigenic vaccine ingredients such as preservatives and stabilizers is out of scope for the international release.
- For “Antigen of whole inactivated X”, the inactivation technique (e.g. heat inactivated, formalin inactivated) is out of scope for antigens in the International Release.

The classification of the antigen variants in the Substance hierarchy:

- Antigen of X
    - Antigen of live attenuated X
    - Antigen of inactivated whole X
    - Antigen of acellular X
    - Antigen of X [protein/recombinant protein]
    - Antigen of X toxoid
    - Antigen of X polysaccharide/oligosaccharide
    - Antigen of X polysaccharide/oligosaccharide unconjugated
    - Antigen of X polysaccharide/oligosaccharide conjugated
        - Antigen of X polysaccharide/oligosaccharide antigen conjugated to Y

Exemplar

The following illustrates the **stated** and **inferred** view:



Modeling - Antibody to X organism

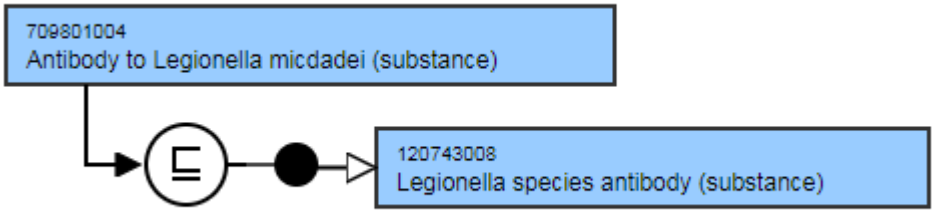
Parent concept	Most distal appropriate descendant of |116642004 |Antimicrobial antibody (substance)|

Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	

Naming Guidelines - Antibody to X organism

FSN	Pattern: • Antibody to X organism (substance) For example, • Antibody to Bebaru virus (substance)
Preferred Term	Pattern: • X organism antibody For example, • Bebaru virus antibody
Synonyms	Pattern: A synonym that matches FSN For example, • Antibody to Bebaru virus
	Pattern: X organism Ab For example, • Bebaru virus Ab
	• Additional synonyms (e.g. when a legitimate synonyms exist for Organism name) are applicable.

Exemplar
The following illustrates the **stated** and **inferred** view:



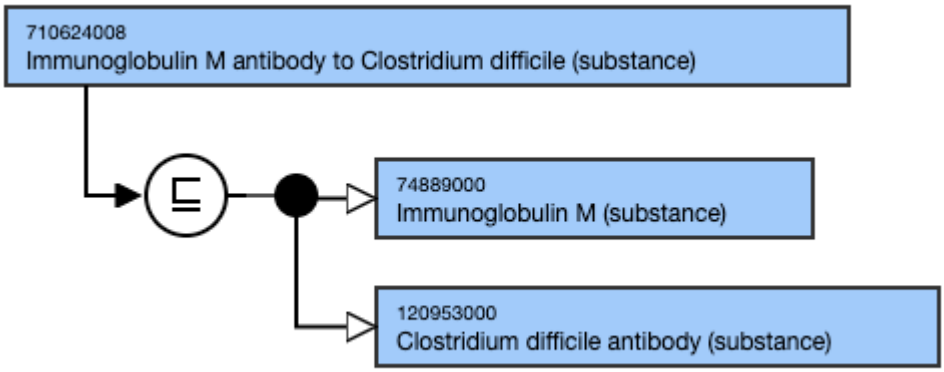
Modeling - Immunoglobulin G, M, A, E, D antibody to X organism

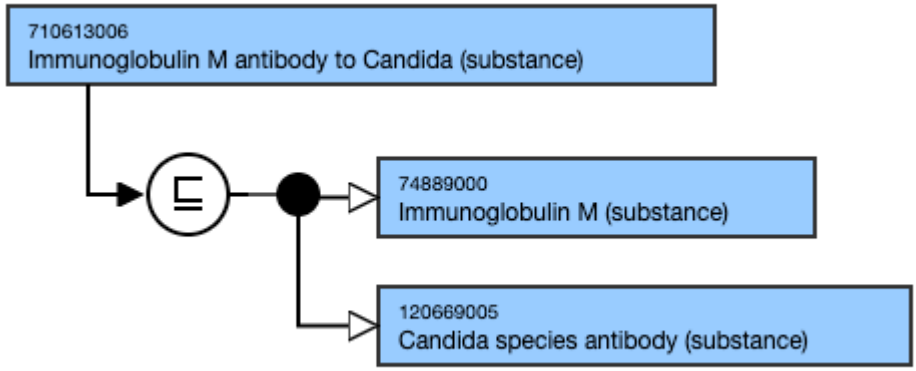
Parent concept	Most distal appropriate descendant of 70095009 |Immunoglobulin isotype (substance)| and | Antibody to X organism (substance)| if in SNOMED CT
Semantic tag	(substance)
Definition status	900000000000074008|Necessary but not sufficient concept definition status (core metadata concept)
Attribute	

Naming Guidelines - Immunoglobulin G, M, A, E, D antibody to X organism

FSN	Pattern: Immunoglobulin G, M, A, E, D antibody to X organism (substance) For example, • Immunoglobulin M antibody to Clostridium difficile (substance)
Preferred Term	Pattern: X organism IgG, M, A, E, D For example, • Clostridium difficile IgM
Synonyms	Pattern: A synonym that matches FSN For example, • Immunoglobulin M antibody to Clostridium difficile
	Pattern: Anti-X organism IgM For example, • Anti-Clostridium difficile IgM
	• Additional synonyms (e.g. when a legitimate synonyms exist for Organism name) are applicable.

Exemplar
The following illustrates the **stated** and **inferred** view:





Antivenom

Modeling

Parent concept	Most distal appropriate descendant of 115668003 |Biological substance (substance)
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attribute	|Has disposition| = 763291003 |Antivenom (disposition)|

Naming Guidelines

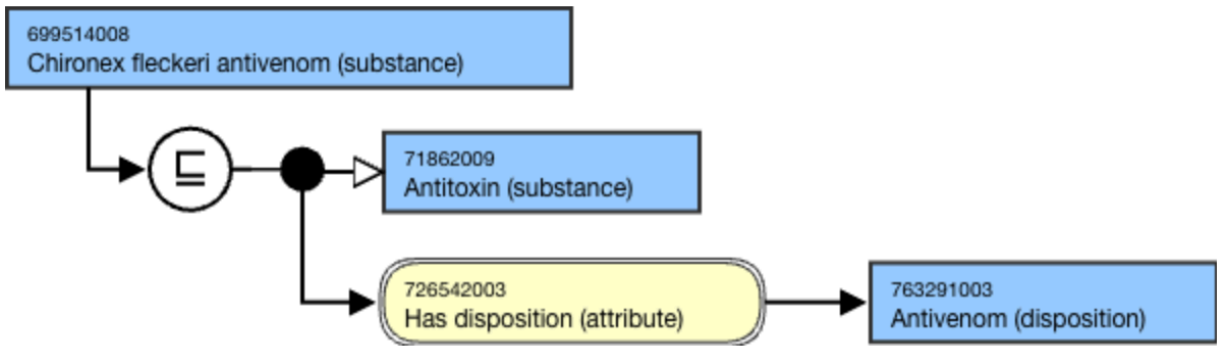
- Use *antivenom*, not *antivenin*, for FSNs and Preferred Terms. Synonyms containing *antivenin* are not created routinely but may be created upon request.

- FSNs should be based on the scientific name if there is a one-to-one correspondence. Naming conventions for polyvalent antivenoms (effective against multiple organisms) will not comply with this naming convention and will be evaluated on a case-by-case basis. Preferred Terms are based on the common name.
- Synonyms based on the scientific name should be created in most cases.

Useful reference: Current version of *WHO Guidelines for the Production, Control and Regulation of Snake Antivenom Immunoglobulins*

FSN	Pattern: • X antivenom (substance), where X = scientific name of organism For example, • Chironex fleckeri antivenom (substance)
Preferred Term	Pattern: • Y antivenom, where Y = Common name of organism For example, • Australian box jellyfish antivenom Exception • When there is no common name for the organism, the PT will match the FSN
Synonyms	Pattern: • A synonym that matches FSN (If not used Preferred term; see notes above) For example, • Chironex fleckeri antivenom • Additional synonyms (e.g. when other legitimate synonyms exist for Organism name) are applicable and are evaluated on a case-by-case basis For example, • Deadly sea wasp antivenom

Exemplar
The following illustrates the **stated** view of 699514008 |Chironex fleckeri antivenom (substance)|:



Autoantibody

Overview
This section includes modeling and terming guidelines for autoantibodies.

Modeling - Autoantibody

Parent concept	Most distal appropriate descendant of 30621004 |Autoantibody (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)
Attribute	n/a

Naming Guidelines - Autoantibody

FSN	Pattern: "Antibody to" + Antibody target Note: An antibody target can be an antigen or another antibody For example, • Antibody to nuclear antigen (substance) • Antibody to thyroglobulin immunoglobulin G (substance)
Preferred Term	Pattern: Antibody target + "antibody" For example, • Nuclear antibody or Thyroglobulin immunoglobulin G antibody
Synonyms	Pattern: A synonym that matches FSN For example, • Antibody to nuclear antigen • Antibody to thyroglobulin immunoglobulin G
	Pattern: Antibody target + "Ab" For example, • Nuclear Ab • Thyroglobulin IgG Ab

	Additional synonyms: • Add a description containing antibody target + "autoantibody" • Nuclear autoantibody • Thyroglobulin IgG autoantibody • In general anti X antibody or anti X autoantibody is redundant and should be avoided. However, description(s) that are commonly used are considered for addition on a case by case basis: • ANA - anti-nuclear antibody

Conjugate acids, bases and salts

Overview
Acids substance concepts should be modeled with a structural parent concept.

Salts should be modeled with a conjugate base as parent (if one exists, otherwise they are modeled with a structural parent). Salts may have an Is modification of (attribute) relationship to the conjugate acid where a specific use case is identified. See examples of such use cases in the "Concepts Representing a Substance or its Modifications" section of this Editorial Guide.

Conjugate base concepts (e.g. valproate, pamidronate, etidronate) should only be created where a specific use case is identified for example when required to support the definition of other concepts in the terminology.

Conjugate bases should be created as separate concepts - not added as synonyms to the corresponding acid concept.

New instances of substance concepts containing the word "salt" will not be added. The existing concepts will be reviewed and if possible will be replaced by equivalent compounds.

Modeling

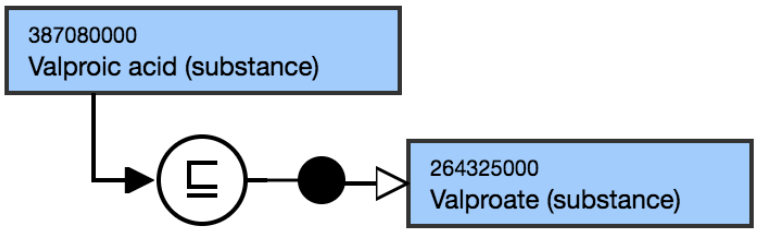
Parent concept	Most distal appropriate descendant of 312413002 |Substance categorized structurally (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: **IsMmodification of**	• Range <105590001 |Substance (substance)| • Cardinality: 0..1 • Used to identify the conjugate acid
Attribute: **Has disposition**	• Range: <726711005 |Disposition (disposition)| • NOTE: While the allowed range is broader, substance concepts should only use descendants of the concept 726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..1

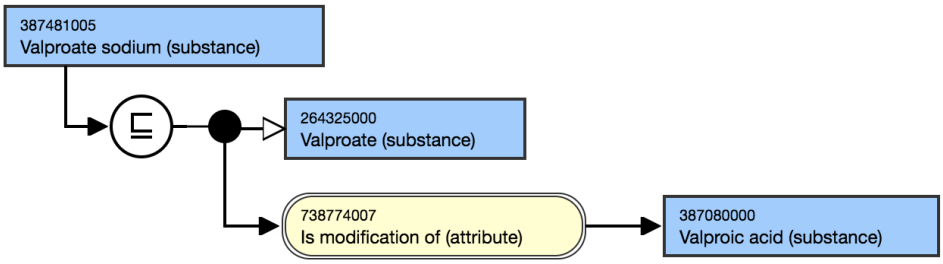
Naming Guidelines

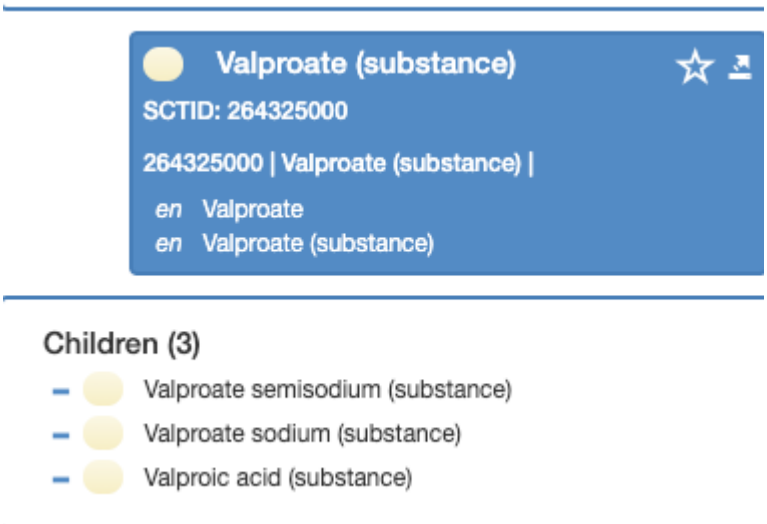
Where INN names exist these should be used for the FSN and PT

FSN	Pattern: • X sulfate (substance) • X pamidronate (substance) For example, • Copper sulfate (substance) • Disodium pamidronate (substance) • Etidronate (substance) Exception: • Valproate sodium (substance)
Preferred Term	Pattern: • X sulfate • X pamidronate For example, • Copper sulfate • Pamidronate monosodium • Etidronate Exception: • Valproate sodium
Synonyms	Pattern: Pamidronate X For example, • Pamidronate monosodium • Valproate sodium

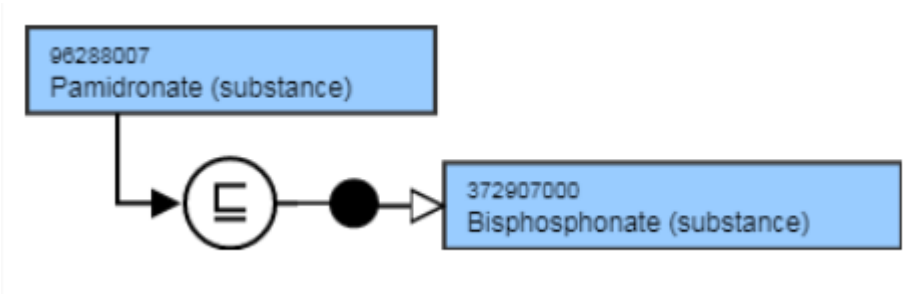
Exemplar
The following illustrates the **stated** and **inferred** views.

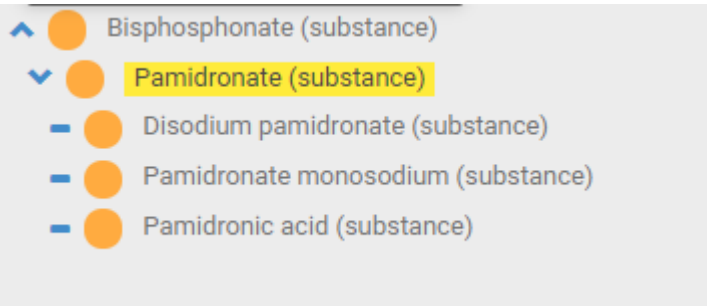






The following illustrates the **stated** and **inferred** views.





Deoxyribonucleic acid and ribonucleic acid

Modeling - Ribonucleic acid of X organism

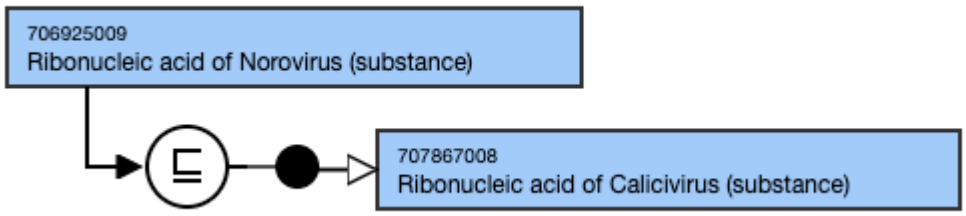
Parent concept	Most distal appropriate descendant of 118248003 |Microbial ribonucleic acid (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: <726711005 |Disposition (disposition)| • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..*

Naming Guidelines - Ribonucleic acid of X organism

FSN	Pattern: • Ribonucleic acid of X organism (substance) For example, • Ribonucleic acid of Norovirus genogroup I (substance)
Preferred Term	Preferred Term (US/GB), with Initial letter case sensitive: Pattern: • X organism RNA For example, • Norovirus genogroup I

Synonyms	Pattern: A synonym that matches FSN For example, • Ribonucleic acid of Norovirus genogroup I
	• Additional synonyms (when a legitimate synonyms exist for Organism name) are applicable.

Exemplar
The following illustrates the **stated** and **inferred** view:



Modeling - Ribosomal ribonucleic acid of X organism

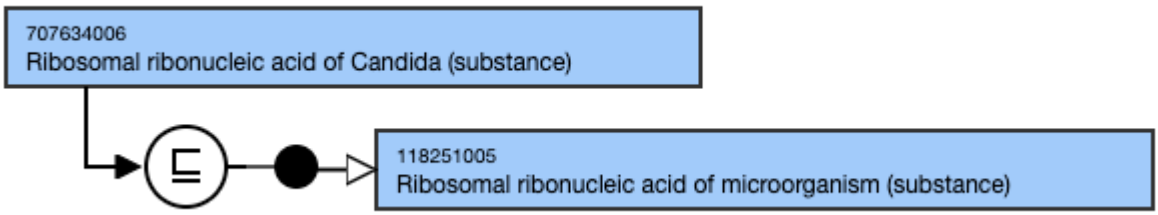
Parent concept	Most distal appropriate descendant of 118251005 | Microbial ribosomal ribonucleic acid (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is Modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: < 726711005 |Disposition (disposition)| • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..*

Naming Guidelines - Ribosomal ribonucleic acid of X organism

FSN	Pattern: • Ribosomal ribonucleic acid of X organism (substance) For example, • Ribosomal ribonucleic acid of Candida (substance)

Preferred Term	Preferred Term, with Initial letter case sensitive. Pattern: • X organism rRNA For example, • Candida rRNA
Synonyms	Pattern: • A synonym that matches FSN For example, • Ribosomal ribonucleic acid of Candida
	• Additional synonyms (when a legitimate synonyms exist for Organism name) are applicable.

Exemplar
The following illustrates the **stated** and **inferred** view:



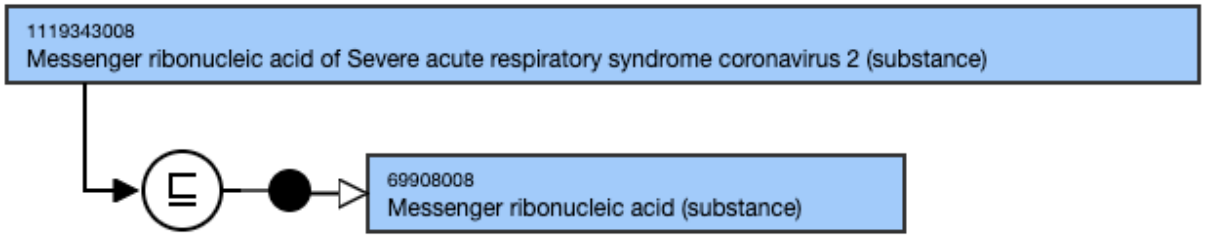
Modeling - Messenger ribonucleic acid of X organism

Parent concept	Most distal appropriate descendant of 69908008 |Messenger ribonucleic acid (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: <726711005|Disposition (disposition) • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..*

Naming Guidelines - Messenger ribonucleic acid of X organism

FSN	Pattern: Messenger ribonucleic acid of X organism (substance) For example, • Messenger ribonucleic acid of Severe acute respiratory syndrome coronavirus 2 (substance)
Preferred Term	Preferred Term, with Initial letter case sensitive. Pattern: X organism mRNA For example, • SARS-CoV-2 mRNA
Synonyms	Pattern: A synonym that matches FSN For example, • Messenger ribonucleic acid of Severe acute respiratory syndrome coronavirus 2
	Additional synonyms (when a legitimate synonyms exist for Organism name) are applicable.

Exemplar



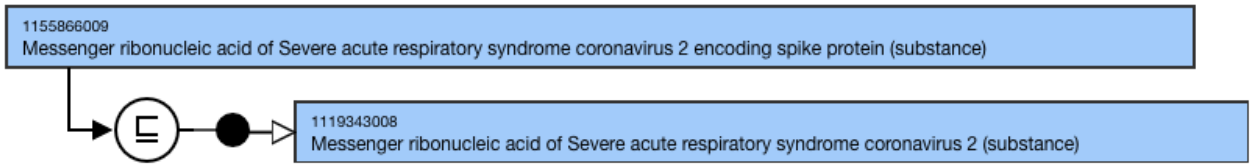
Modeling - Messenger ribonucleic acid of X organism encoding for specific protein

Parent concept	Most distal appropriate descendant of 69908008 |Messenger ribonucleic acid (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance

Attribute: Has disposition	• Range: <726711005 |Disposition (disposition) • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..*

Naming Guidelines - Messenger ribonucleic acid of X organism encoding for specific protein

FSN	Pattern: Messenger ribonucleic acid of X organism encoding for protein Y (substance) For example, • Messenger ribonucleic acid of Severe acute respiratory syndrome coronavirus 2 encoding spike protein (substance)
Preferred Term	Preferred Term, with Initial letter case sensitive. Pattern: X organism mRNA encoding for protein Y For example, • SARS-CoV-2 mRNA encoding spike protein
Synonyms	Pattern: A synonym that matches FSN For example, • Messenger ribonucleic acid of Severe acute respiratory syndrome coronavirus 2 encoding spike protein (substance)
	Additional synonyms (when a legitimate synonyms exist for Organism name) are applicable.



Modeling - Deoxyribonucleic acid of X organism

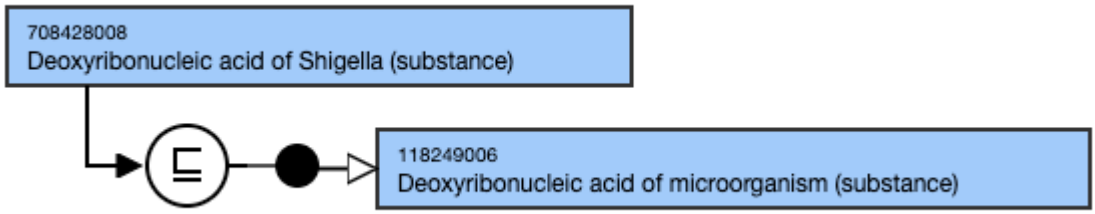
Parent concept	Most distal appropriate descendant of 118249006 |Microbial deoxyribonucleic acid (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance

Attribute: Has dispositio n	• Range: <726711005 |Disposition (disposition) • NOTE: While the allowed range is broader, substance concepts should only use <726711005 | Disposition (disposition)| as the attribute value. • Cardinality: 0..*

Naming Guidelines - Deoxyribonucleic acid of X organism

FSN	Pattern: • Deoxyribonucleic acid of X organism (substance) For example, • Deoxyribonucleic acid of Aspergillus terreus (substance)
Preferred Term	Preferred Term (US/GB), with Initial letter case sensitive: Pattern: X organism DNA For example, • Aspergillus terreus DNA
Synonyms	Pattern: A synonym that matches FSN For example, • Ribonucleic acid of Norovirus genogroup I
	Additional synonyms (when a legitimate synonyms exist for Organism name) are applicable.

Exemplar
The following illustrates the **stated** and **inferred** view:



Edible substance and descendants

Overview
Ultimately the intent is to retire this Edible substance subhierarchy since it represents a role. Substance concepts should, where possible, be modeled with either a structural parent or one that denotes source or origin.

Modeling (stated view)

Parent concept	Most distal appropriate descendant of 762766007 |Edible substance (substance)| Additional parent concepts may be modeled to denote origin or structural characteristics.

Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|

Naming Guidelines
FSN, PT or Synonym should not contain "- dietary" context in descriptions

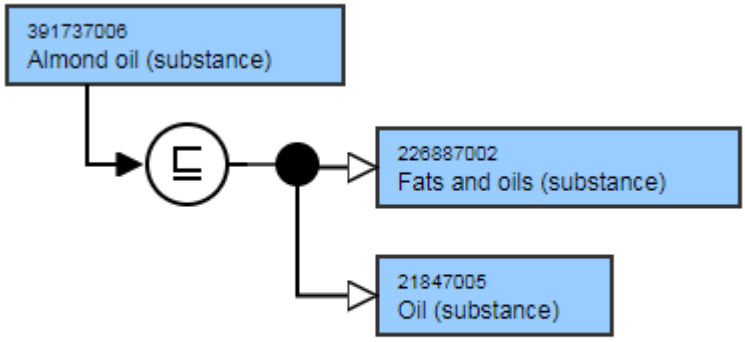
FSN, PT or Synonym should not contain brand or trade names.

Culinary name should be used for the FSN and PT when referring to meat products and food E.g. Beef dripping (substance), Pork sausage (substance)

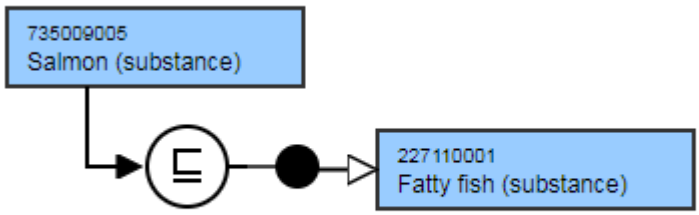
If there are additional adjectives such as baked, boiled, fried, lean, minced, low-fat, roast, or stewed, these adjectives should proceed the name of source organism, e.g. Fried beef steak (substance), Tinned fish (substance).

FSN	Pattern: • X (substance) For example, • Betel nut (substance) • Wheat dextrin (substance) • Tinned fish (substance)
Preferred Term	Pattern: • X For example, • Betel nut • Wheat dextrin • Tinned fish
Synonyms	Pattern: scientific name if appropriate For example, • Areca catechu

Exemplar
The following illustrates the **stated** and **inferred** view



Exemplar
The following illustrates the **stated** and **inferred** view



Flap substances

Overview
This section includes concepts that represent flap substances used in flap surgery. The concepts in this subhierarchy are used to define:

- Flap composition, for example, bone, skin, muscle, myocutanous, osteocutaneous
- Flap blood supply, for example:
  - Free flap: A completely detached flap transferred with its own blood supply intact is known as a free flap. A free flap is re-attached at the recipient site, which is a highly skilled technique, often involving microsurgical anastomosis of the blood vessels
  - Pedicle flap: A pedicle flap is transferred still attached to its original blood supply (the pedicle)

Flap substances exist for free flaps and pedicle flaps (<<261238005 |Free flap (substance)| and << 261235008 |Pedicle flap (substance)|) and reflect the fact that whether a flap is free or pedicle is also a function of its blood supply (i.e. completely unattached from its original blood supply, or still attached via a vascular pedicle).

Modeling Guidelines

Parent concept	Most distal appropriate descendant of 256683004 |Flap (substance)|
Semantic tag	(substance)

Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|

- Flap substances comprising composite multiple flap tissues are siblings (and not subtypes) of the various single tissue flap substances from which they are composed
- Flap substances should not include the procedure method such as whether a flap is local or distant, or if a flap is rotated or advanced

Naming Guidelines

- The concepts in this subhierarchy must not be conflated with either the donor procedure site or the site that the procedure acts upon

Exceptions

Flaps that include the named specific muscle site are to remain as a refinement in the flap substances, for example, 840353005 |Transverse rectus abdominis myocutaneous flap (substance)|

- For substances representing skin flaps, the FSN and PT contains 'skin flap' with an acceptable synonym of 'cutaneous flap'
- For Osteocutaneous flaps terming for FSN and PT is 'osteocutaneous flap' with an acceptable synonym of 'osseocutaneous flap'

Fractionated and unfractionated substances

Overview
Substance concepts that contain terms such as "fractionated" or "unfractionated" are not created in the Substance hierarchy. "Unfractinated" should not be included when referring to the "entire substance" or "whole substance"; it is implied. "Fractionated" usually refers to a separation technique or process.

Hydrates and anhydrous substances

Modeling (stated view)

Parent concept	Most distal appropriate descendant of 105590001 |Substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	738774007 |Is modification of (attribute)| relationship to the unspecified substance 726542003 |Has disposition (attribute)| as appropriate

Hydrates

Hydates are modeled with an Is modification of (attribute) relationship to the unspecified substance.

For example,

- Ferrous oxalate dihydrate (substance)
- Caffeine hydrate (substance)
- Zinc sulfate heptahydrate (substance)

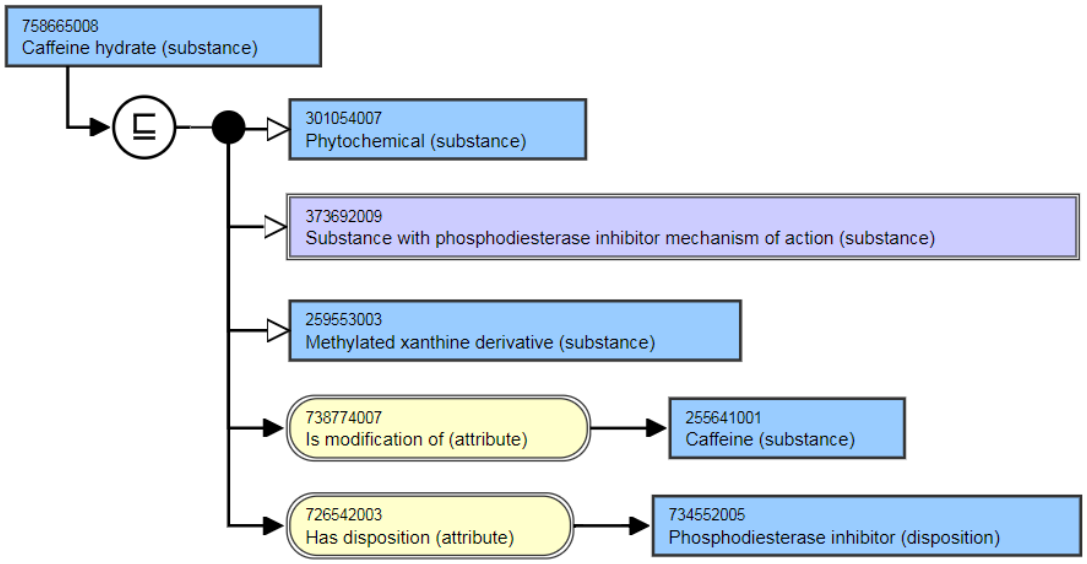
Naming Guidelines

FSN	Pattern: • X hydrate (substance) • X dihydrate (substance) • X monohydrate (substance) • Example: • Copper sulfate pentahydrate (substance)
Preferred Term	Pattern: • X hydrate • X dihydrate • X monohydrate Example: • Copper sulfate pentahydrate

Exemplar

The following illustrates the **inferred** view.

Caffeine hydrate (substance) IS MODIFICATION OF Caffeine (substance)



Anhydrous compounds

Anhydrous compounds have a IS MODIFICATION OF relationship to the unspecified substance, i.e. where the level hydration is not specified.

For example,

- Sodium carbonate anhydrous (substance)

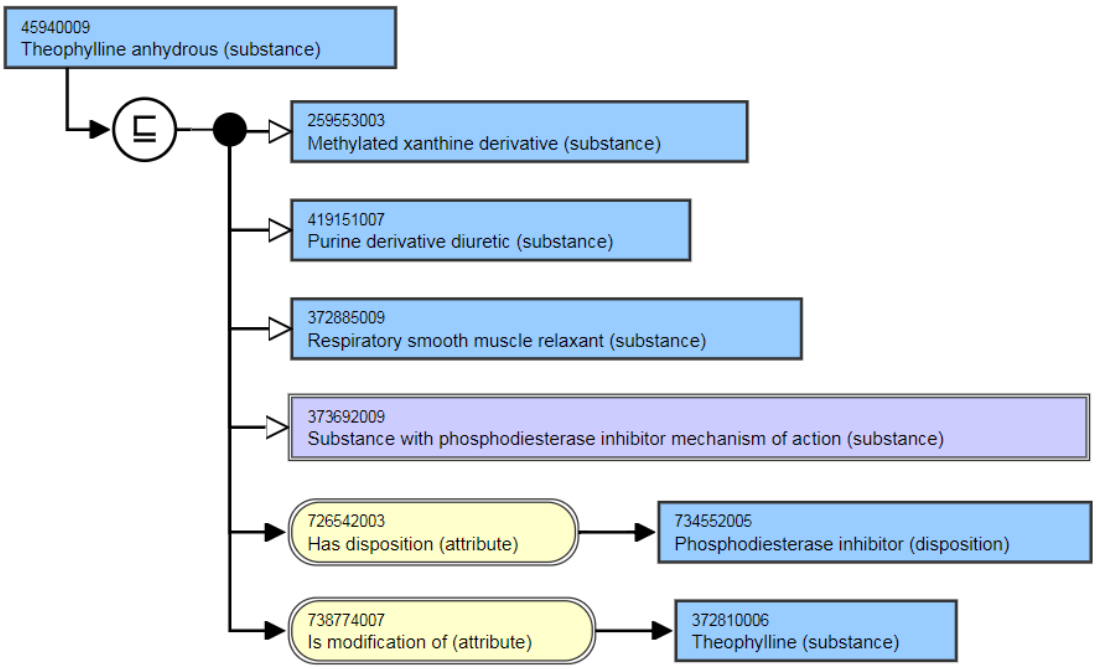
- Theophylline anhydrous (substance)

Naming Guidelines

FSN	Pattern: • X anhydrous (substance) Example: • Theophylline anhydrous (substance)
Preferred Term	Pattern: • X anhydrous Example: • Theophylline anhydrous
Synonyms	Pattern: Anhydrous X

Exemplar
The following illustrates the **inferred** view.

Theophylline anhydrous (substance) IS MODIFICATION OF Theophylline (substance)



Ions and electrolyte substances

Overview

Previously, SNOMED CT represented ions and electrolytes as separate concepts. Although the two terms are subtly different, there is considerable overlap in their definitions, and they seem to be used interchangeably in medicine. The Substances Redesign Project Group has considered this issue and determined the following:

- Ions should be modeled as child concepts of the substance.
- A second parent (in addition to X (substance)), that indicates the concept is an ionized substance should be modeled.
    - Use a descendant of 86355000 |Electrolyte (substance)| as the additional parent. (86355000 | Electrolyte (substance)| and its children are used in LOINC term expression associations.)
- Non-Ionized/Non-Ionised substances should not be created.

Modeling (stated view)

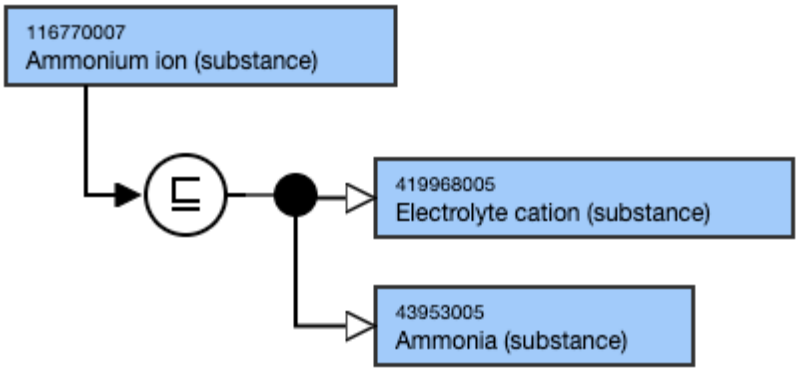
Parent concepts	Most distal appropriate descendant of 86355000 | Electrolyte (substance)| Most distal appropriate descendant of 312413002 |Substance categorized structurally (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	none

Naming Guidelines

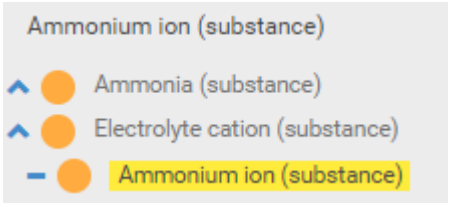
FSN	Pattern: • **X ion (substance)** For example, • Ferric ion (substance)
Preferred Term	Pattern: • **X ion** For example, • Ferric ion

Synonyms	Pattern:**"Ionized X" and "X electrolyte".** **Add "Ionised X" as GB synonym.** For example, • Ionised fluorine • Ionized fluorine • Fluoride electrolyte Where an element can exist with more than one level of oxidation, for example iron can exist in either the ferric (Fe^{3+}) or ferrous (Fe^{2+}) ionization states, the synonyms "Ionised X" and "Ionized X" should not be added since they are ambiguous.

Exemplar
The following illustrates the **Stated** and **Inferred** view



The following illustrates the hierarchy view



Isomers

Overview
Within the substances hierarchy in SNOMED CT there are a number of substances where that is either a mix of isomers of a single chemical, a racemic mix or a single isomer.

- Omeprazole and Esomeprazole
- Cetirizine and Levocetirizine
- Loratadine and Desloratadine

Each of these substances will all need to be represented in SNOMED CT as separate concepts to support the representation of active ingredients in SNOMED CT and should be represented as sibling concepts without any SNOMED CT relationship created between the two substances.

Exemplar

The following illustrates the hierarchy view for Omeprazole and Esomeprazole:

Metabolites

Overview
Concepts representing *Metabolites of X* will be considered for inclusion based upon project requirements.

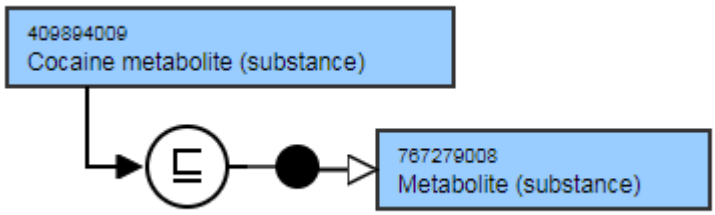
Modeling

Parent concept	767279008 |Metabolite (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	None

Naming Guidelines

FSN	Pattern: X metabolite (substance) For example, • Cocaine metabolite (substance)
Preferred Term	Pattern: X metabolite For example, • Cocaine metabolite

Exemplar
The following illustrates the **stated** and **inferred** view:



Radioactive substances

Representation of radioactive isotopes
Modeling (stated view)

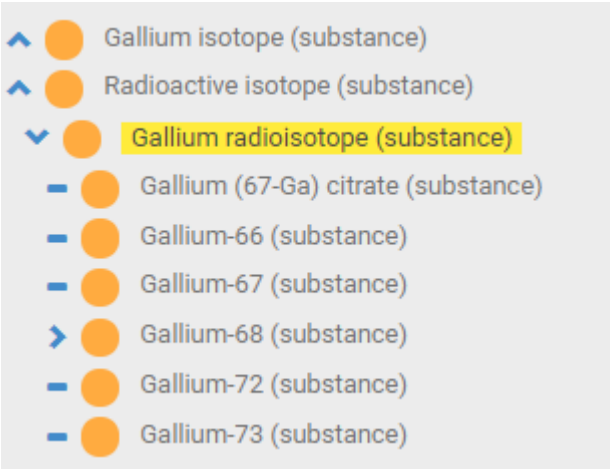
Parent concept	Most distal appropriate descendant of 89457008 |Radioactive isotope (substance)| Most distal appropriate descendant of 33638001 |Isotope (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|

Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: <726711005 |Disposition (disposition) | • NOTE: While the allowed range is broader, substance concepts should only use descendants of the concept 726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..1

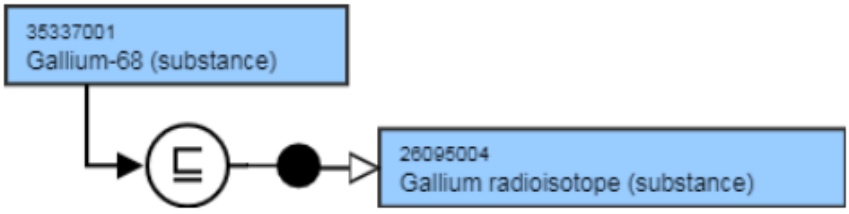
Naming Guidelines
Superscripts should not be used in either Fully Specified Name, Preferred Term, or Synonyms.

FSN	Pattern: • [name of isotope]-[atomic number] (substance) For example, • Gallium-67 (substance)
Preferred Term	Pattern: [name of isotope]-[atomic number] For example, • Gallium-67
Synonyms	Pattern: • [atomic number]-[chemical symbol] For example, • 67-Ga No synonyms should exist using the superscript notation.

Exemplar
The following illustrates the hierarchy view:



The following illustrates the **stated** and **inferred** view:



Representation of radioisotope with salt
Modeling (stated view)

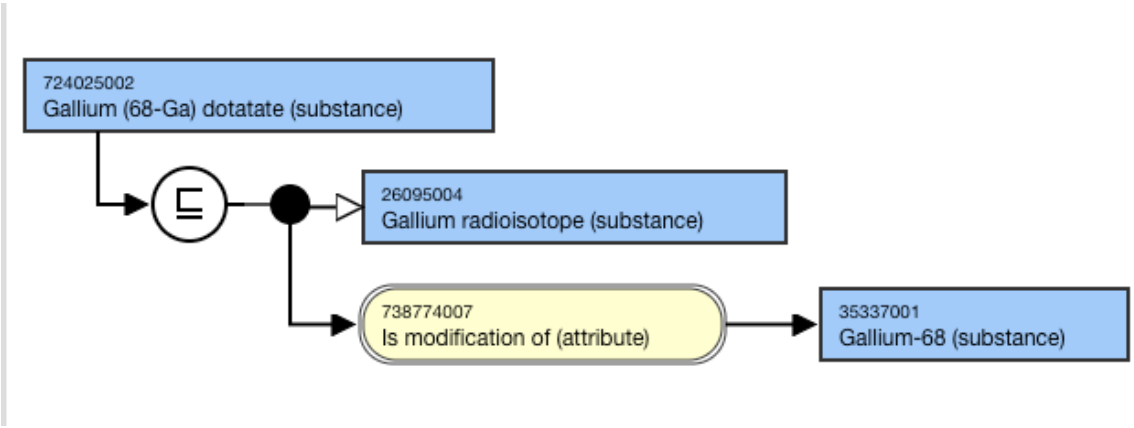
Parent concept	Most distal appropriate descendant of 89457008 |Radioactive isotope (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: <726711005 |Disposition (disposition) | • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..1

Naming Guidelines
Superscripts should not be used in either Fully Specified Name, Preferred Term, or Synonyms.

Parentheses should be used to delineate the atomic number and chemical symbol from the rest of the terming, this aligns with INN.

FSN	Pattern: [name of isotope] ([atomic number]-[chemical symbol]) [salt] (substance) For example, • Gallium (67-Ga) citrate (substance)
Preferred Term	Pattern: [name of isotope] ([atomic number]-[chemical symbol]) [salt] For example, • Gallium (67-Ga) citrate

Exemplar - radioisotope with salt
The following illustrates the **stated** and **inferred** view:



Representation of combined radioisotope substances
Modeling (stated view)

Parent concept	Most distal appropriate descendant of 89457008 |Radioactive isotope (substance)| and a second parent identifying the labeled component
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute: Is modification of	• Range <105590001 |Substance (substance)| • Cardinality: 0..* • One relationship to be created to represent each modified component of the substance
Attribute: Has disposition	• Range: <726711005 |Disposition (disposition) | • NOTE: While the allowed range is broader, substance concepts should only use <726711005 |Disposition (disposition)| as the attribute value. • Cardinality: 0..1

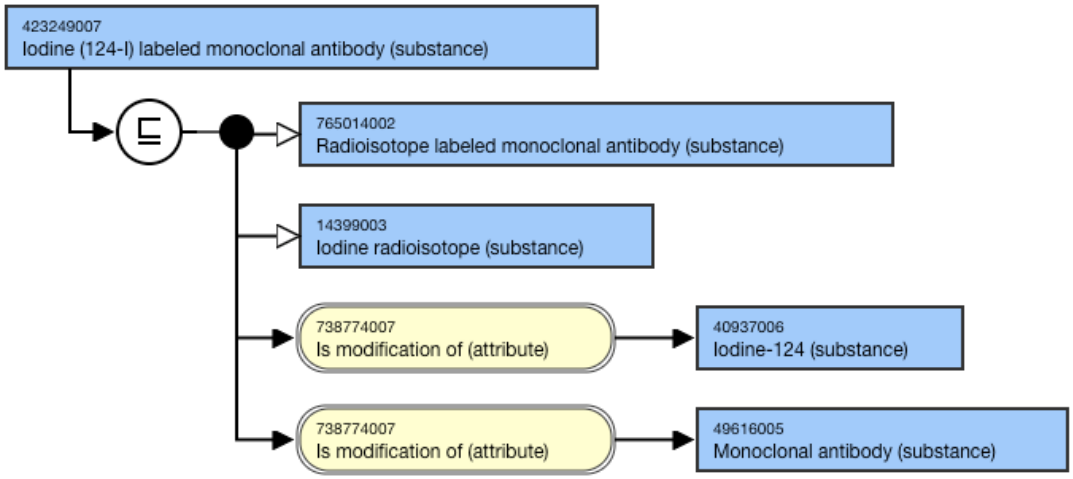
Naming Guidelines

Superscripts should not be used in either Fully Specified Name, Preferred Term, or Synonyms.

The Fully Specified Name should explicitly state that a component was “labeled” by a radioisotope in the FSN. Do not use “with”, “and”, or “tagged”.

Omit the word “labeled” from the PT, keep a synonym to match the FSN.

Exemplar - combined radioisotope substances
The following illustrates both the **stated** and **inferred** view:



Saturated or unsaturated substances

Modeling (stated view)

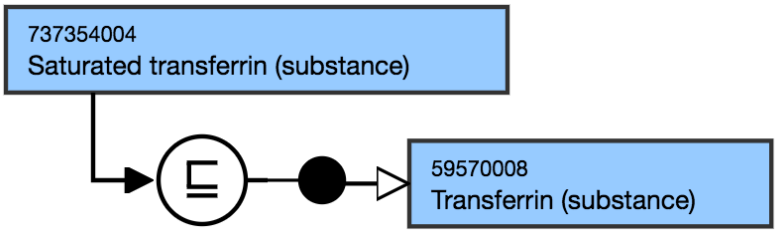
Parent concept	Most distal appropriate descendant of 115668003 |Biological substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	• none

Naming Guidelines

FSN	Pattern: • Saturated X (substance) • Unsaturated X (substance) For example, • Unsaturated adipate (substance)

Preferred Term	Pattern: • Saturated X • Unsaturated X For example, • Unsaturated adipate
Synonyms	Pattern: • X Saturated or X Unsaturated For example, • Adipate unsaturated

Exemplar
The following illustrates the **stated** and **inferred** view:



Substances specifying a source or origin

Overview
- A recombinant (A new entity e.g., gene, protein, cell, or individual that results from genetic recombination) or synthetic/semi-synthetic substance (of, relating to, or produced by chemical or biochemical synthesis; especially: produced artificially) is similar in structure (but not identical to the naturally occurring substance). It should be created as a sibling of the naturally occurring substance.
- A substance that is part of (e.g. dander) or is derived from (e.g. Insulin) an organism (human or non-human) is identical and should be created as a child of the naturally occurring substance.

Modeling

Parent concept	Most distal appropriate descendant of 105590001 |Substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	738774007 |Is modification of (attribute)| as applicable 726542003 |Has disposition (attribute)| as appropriate

Naming Guidelines

“Recombinant”, “Synthetic”, or “Semi-synthetic” should precede the name of the substance

The source organism name should precede the name of the substance

- An exception to this rule is the naming of DNA, RNA, rRNA, antibody, Immunoglobulin, and antigen of organisms, which should follow the guideline specified for antibodies and antigens
- For some non-human sources, there are different ways of referring to the source organism:
    - The common name of the organism e.g. pig, cow, horse, mouse, sheep
        - The common name of an organism is used when referring to a part of the organism or to non-meat products
            - E.g. Pig epithelium, Cow milk
    - An adjective referring to the organism, e.g. porcine, bovine, equine, murine, ovine
        - The adjective is usually used when referring to a substance extracted from the organism
            - E.g. Bovine growth hormone (substance), Porcine calcitonin (substance)
    - The adjective is commonly used in referring to the organism hosting a virus, but there are exceptions. In general, proper name of organism such as virus name should be preserved as it is (including the case sensitivity):
        - Ribonucleic acid of Bovine leukemia virus (substance)
        - Immunoglobulin G antibody to Eastern equine encephalitis virus (substance)
        - Antigen of Nairobi sheep disease virus (substance)

Additional adjectives (such as labeled, Iodinated) should proceed the name of source organism

For example,

- Lente human insulin (substance)
- Iodinated (125-I) human serum albumin (substance)

If a concept includes “recombinant” or “synthetic” as well as a source organism, “recombinant” or “synthetic” should precede the source organism name

For example,

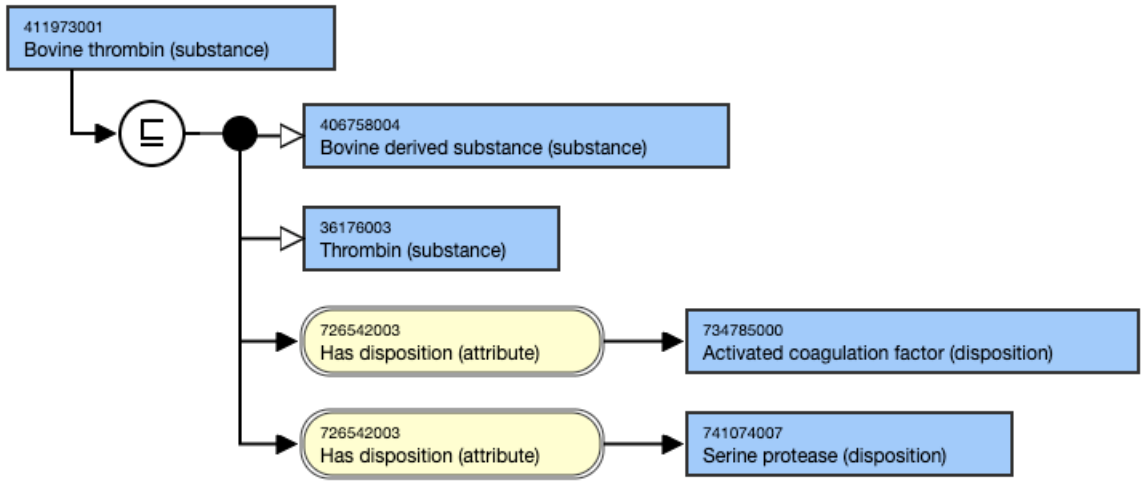
- Recombinant bovine growth hormone (substance)

FSN	Pattern: • [Source organism] X (substance) • Recombinant X (substance) • Synthetic X (substance) For example, • Human antithrombin III (substance) • Recombinant thrombin (substance) • Synthetic steroid (substance)

Preferred Term	Pattern: • [Source organism] X • Recombinant X • Synthetic X For example, • Human antithrombin III • Recombinant thrombin • Synthetic steroid
Exception	The naming of DNA, RNA, rRNA, antibody, Immunoglobulin, and antigen of organisms should follow the specific guideline for this type of substances.

Exemplar

Exemplar
Stated view of 411973001 |Bovine thrombin (substance)|



Substances specifying bound

Overview
Creation of substance concepts that contain “bound” is limited to the measurement of biological substances (Observable entities, evaluation procedures, LOINC collaboration project) or to report their level (clinical findings).

Concepts are modeled with an Is modification of (attribute) relationship to the corresponding unspecified substance. Where the substance is "bound" the molecule to which the substance is bound to may be specified in the term.

Bound substances modeling (stated view)

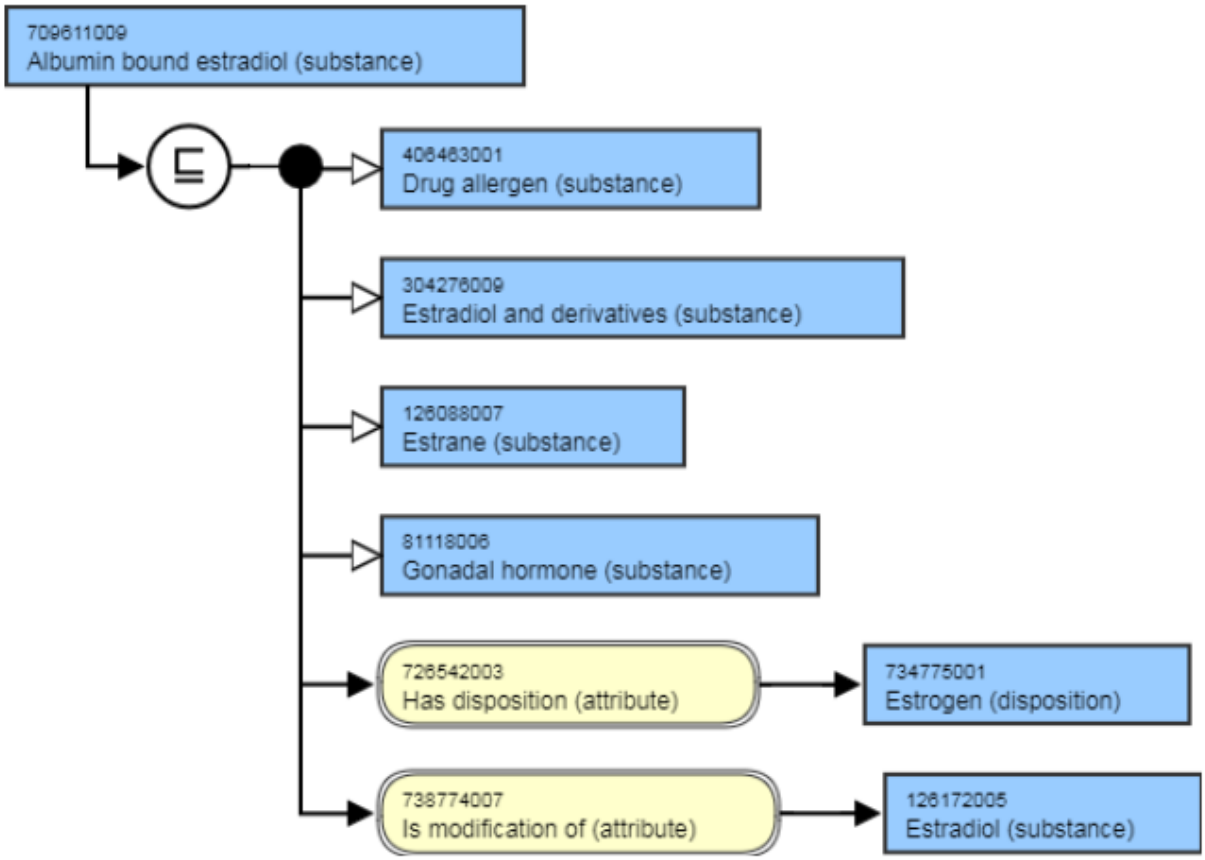
Parent concept	Most distal appropriate descendant of 115668003 |Biological substance (substance)|

Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	738774007 |Is modification of (attribute)| 726542003 |Has disposition (attribute)|

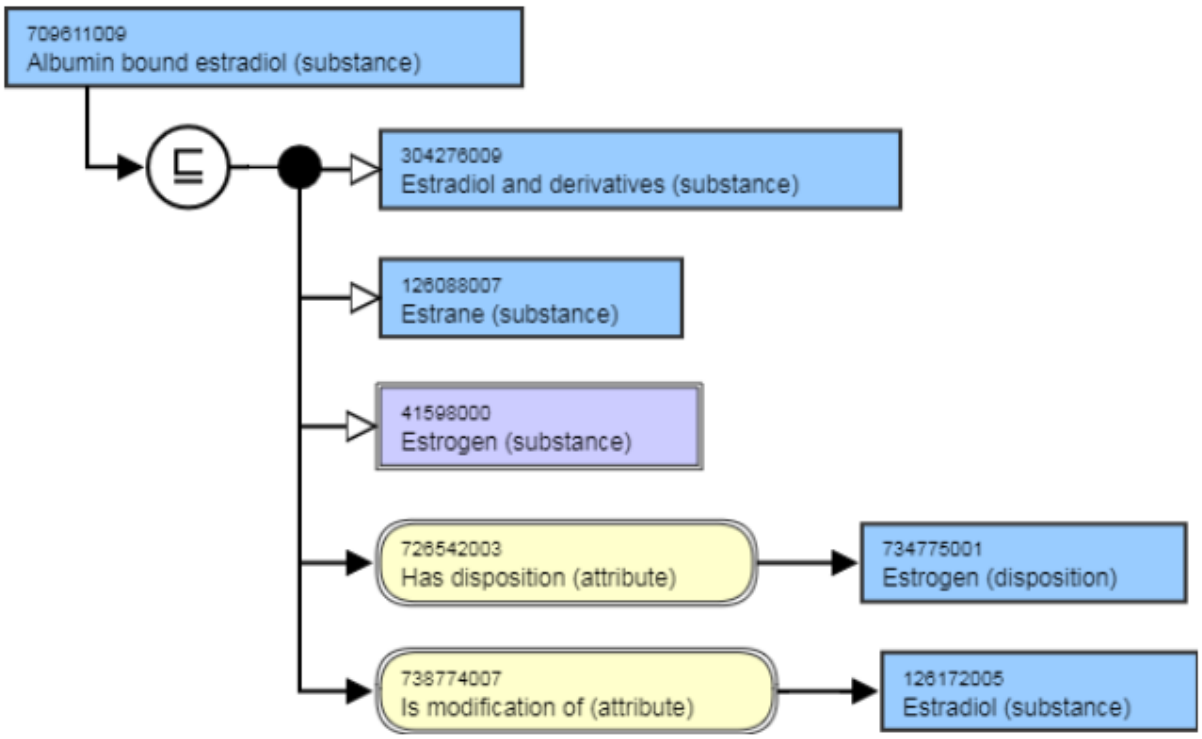
Terming Guidelines

FSN	Pattern: Bound X (substance) For example, • Bound insulin (substance) • Protein bound iodine (substance) • Albumin bound thyroxine (substance)
Preferred Term	Pattern: Bound X (substance) For example, • Bound insulin • Protein bound iodine (substance) • Albumin bound thyroxine (substance)

Exemplar
The following illustrates the **stated** view:



The following illustrates the **inferred** view:



Substances specifying free or unbound or unconjugated

Overview
Creation of substance concepts that contain terms such as “free” (or "unbound" or "unconjugated") is limited to the measurement of biological substances (Observable entities, evaluation procedures, LOINC collaboration project) or to report their level (clinical findings). These concepts are created as siblings of the base concepts with a "substance X and X derivatives" or "X and X compound" as common supertype.

Modeling (stated view)

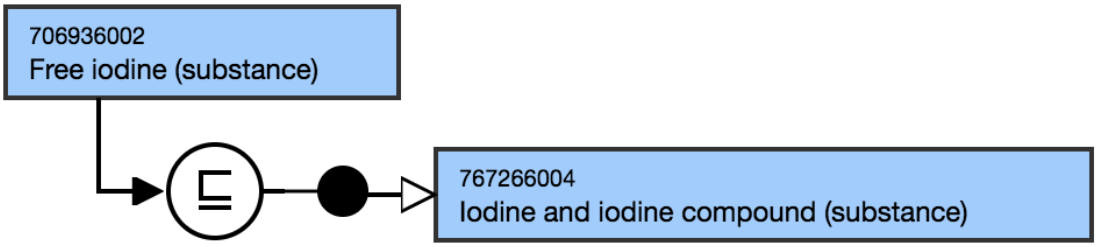
Parent concept	Most distal appropriate descendant of 105590001 |Substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	726542003 |Has disposition (attribute)|

Naming Guidelines

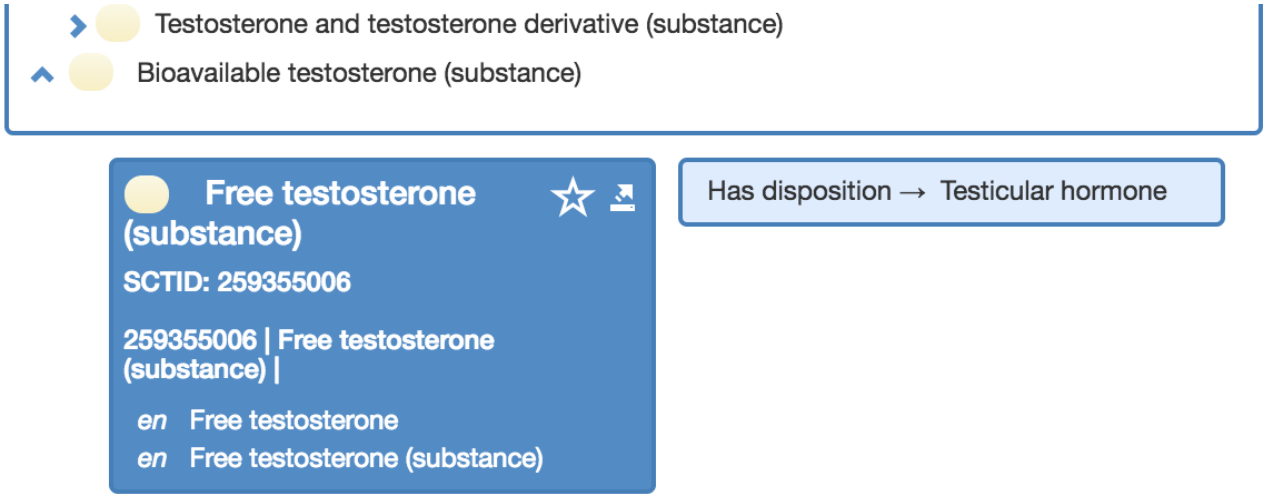
FSN	Pattern: Free X (substance) For example, • Free iodine (substance)

Preferred Term	Pattern: Free X For example, • Free iodine
Synonyms	Optional pattern: Unbound x For example, • Unbound iodine

Exemplar
The following illustrates both the **stated** and **inferred** view:



The following illustrates the hierarchy view:



Substances specifying intact, fragment or subunit

Overview
- Fragments to be created as siblings of the intact/whole/entire substance
- “Intact” should not be included when referring to the "entire substance" or "whole substance"; it is implied

- Alpha and beta sub-units should be the children of the entire substance, where "nicked" substances and fragments should be the siblings
- INN should be used for the Preferred Term where they exist

Modeling

Parent concept	Most distal appropriate descendant of 115668003 |Biological substance (substance)|
Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	|Has disposition| as appropriate

Naming Guidelines

FSN	Pattern: • X fragment (substance) • X subunit (substance) For example, • Corticotrophin big fragment (substance) • Thyrotropin beta subunit (substance)
Preferred Term	Pattern: • X fragment For example, • Corticotrophin big fragment • Thyrotropin beta subunit

Substances specifying physical state or physical form

Overview
Concepts specifying a particular physical state (e.g. liquid, solid, fumes, vapor, crystal, foam) of a substance should be represented as the sibling for the unspecified substance and also have a parent concept that relates to the structure of the substance.

Concepts specifying a particular physical form (e.g. micronized, macrocrystal, microsphere) should have a parent concept that relates to the structure of the substance and also an Is modification of (attribute) relationship to the unspecified substance concept.

Modeling - Micronized substance

Parent concept	Most distal appropriate descendant of 105590001 |Substance (substance)| An additional parent concept to be allocated to denote physical form as appropriate

Semantic tag	(substance)
Definition status	900000000000074008 |Necessary but not sufficient concept definition status (core metadata concept)|
Attribute	738774007 |Is modification of (attribute)| relationship to the unspecified substance 726542003 |Has disposition (attribute)| as appropriate

Naming Guidelines
Fumes should be expressed in the plural (i.e. fumes as opposed to fume)

Fumes and vapor are different and so should not be used as synonyms on the same concept https://www.commerce.wa.gov.au/worksafe/gases-vapours-smoke-and-fumes

FSN	Pattern: • X fumes (substance) • X micronized (substance) For example, • Bauxite fumes (substance) • Fenofibrate micronized (substance)
Preferred Term	Pattern: • X fumes • X micronized For example, • Bauxite fumes • Fenofibrate micronized
Synonyms	Pattern: X form to represent EN-GB language variants where appropriate For example, • Fenofibrate micronised

Exemplar

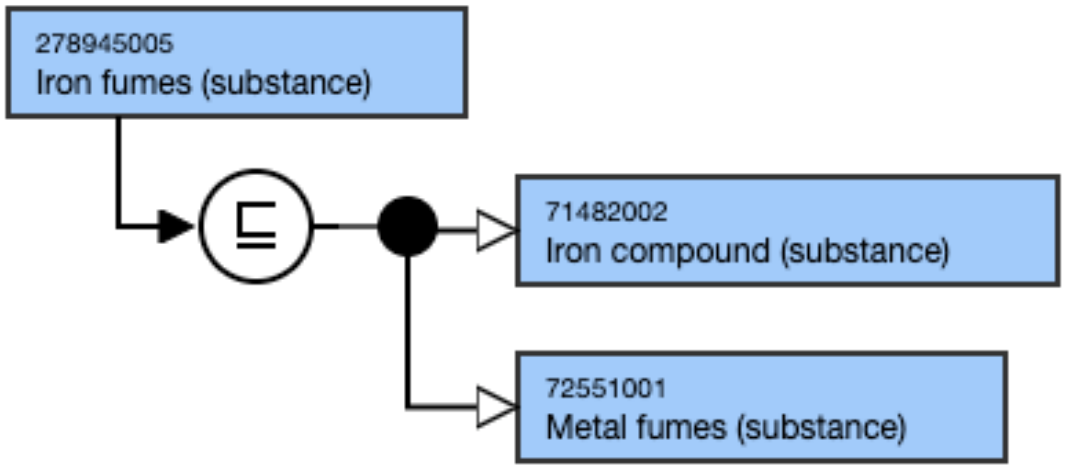


Figure: View of both stated and inferred form of 278945005 |Iron fumes (substance)|

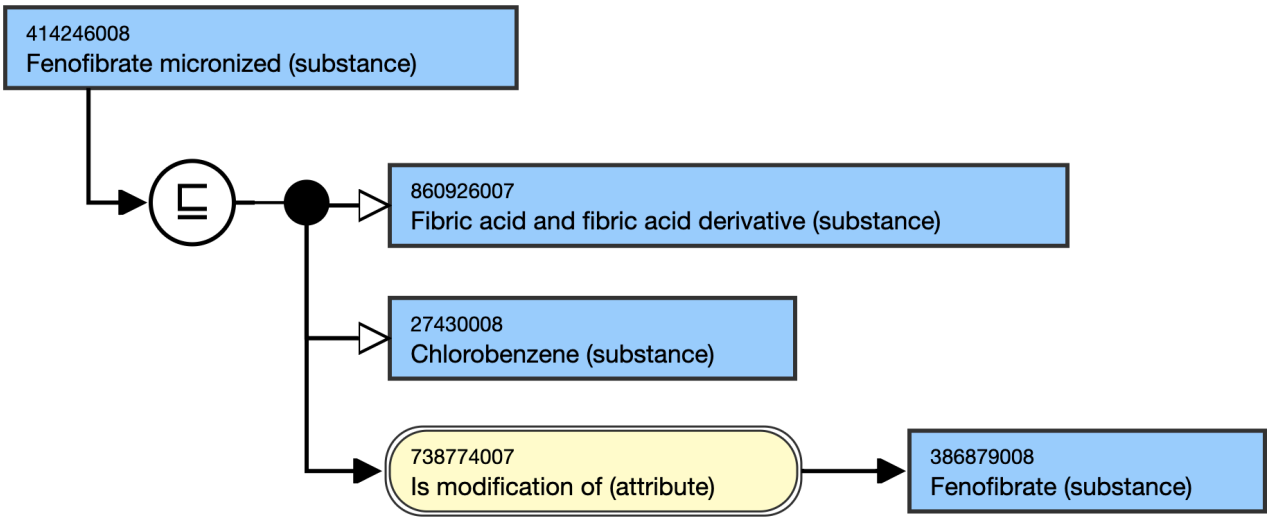


Figure: Stated view of 414246008 |Fenofibrate micronized (substance)|

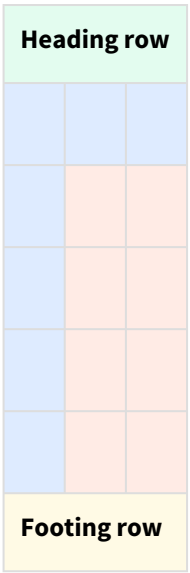
4 Editorial Guide Style and Terms

To provide consistency and clarity, there has been an effort to use certain styles and specific terms within the Editorial Guide. Although this has been the intent, it is the content of the Guide that has been the focus. Consequently, authors may find instances where alternative styles or terms are used.

Style	
Type	Notes
Italics	• To emphasize a word in a sentence or phrase • To indicate the name of something
Upper case first letter	• To emphasize a word in a sentence or phrase not necessarily at the beginning
Periods.	Not used in: **Don't do this** • Lists when items contained therein are not sentences • At the end of sentences within tables
Examples	• Presented as: For example, • *text of example* • When possible, examples from the SNOMED CT browser are provided. When examples from the browser are not available, i.e do not yet exist, they are obtained from other sources

Style	

Macros:
• Note = yellow
  • For example
  • For more information
• Tip = green
  • For example
  • Concept modeling
  • URLs
• Warning = red
  • Exceptions
• Info = blue
	General
	For more information
	Contains general information or additional resource (may be a link)
	Modeling
	Contains modeling information
	Exception or Inactivation or Under Revision
	Contains information about content exceptions, inactivation, or under revision
	Hello
	Informational box
	Specific

Tables • Heading row - light green fill; **bold** font • Sub-heading row - light blue fill • Column heading - light blue fill • Other cells - may have pink fill for emphasis • Footing row - light yellow fill	 **Note:** Tables generated from the *Human Readable Concept Model* have unique formatting
Text formats • "Quotation marks" • **Bold font** • ALL CAPS	• Minimally used

Style	
Page headings	• Section headings - Heading 2 • Subsection headings - Heading 3

Terms	
Used in Guide	Synonym / Other
Attribute	Concept Model Attribute; Relationship type
Authoring platform	~~SCA tool~~
Child	Subtype, Subtype child
Classifier	Description logic (DL) classifier; Logic reasoner
Descendant	Child **and** Subtype child/children
Domain	Concept model domain
Electronic health application	Software application; Clinical information systems
Electronic health record or EHR	Electronic medical record; Electronic record; Electronic patient record
Extension	SNOMED CT extension, Member/Affiliate-Added Terminology
Grouping concept/Grouper	NA
Inactivate/Inactivation	~~Retire~~*
International Release	Core
Material entity	Material agent
Modeler/Modeling	Author/Authoring, Editor/Editing
Parent	Supertype, Supertype parent
Precoordinated	Precoordinated expression

Terms	
Postcoordinated	Postcoordinated expression
Qualifier	Qualifying characteristic
Range	Concept model range, Allowable value
Relationship group	Role group
Root concept	Top-level concept
Semantic tag	Semantic type, Hierarchy tag, Hierarchy designator
Situation with Explicit Context	Context-dependent Category
Sufficiently defined	~~Fully defined*~~
*Strikethrough = No longer used	

5 PDFs for Download

Downloads of the SNOMED CT Editorial Guide can be found on this page.

File	Modified
SNOMED CT Editorial Guide-2021-10-01.pdf[1575]	2023-Feb-28 by Rory Davidson[1576]
SNOMED CT Editorial Guide-2023-01-31.pdf[1577]	2023-Feb-28 by Rory Davidson[1578]
SNOMED CT Editorial Guide-2022-01-31.pdf[1579]	2023-Feb-28 by Rory Davidson[1580]

1575 https://confluence.ihtsdotools.org/download/attachments/174691765/SNOMED%20CT%20Editorial%20Guide-2021-10-01.pdf?api=v2
1576 https://confluence.ihtsdotools.org/display/~rdavidson
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