SNOMED CT Editorial Guide

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Leading healthcare terminology, worldwide

These guidelines should be applied to new content. While there are many terms 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 terms in *SNOMED CT*. It is for those who edit content in the International Release, but it may also be useful to those creating extensions. It is a working document, subject to change and revision.

SNOMED CT is distributed in sets of electronic files. Supporting software tools are not necessarily provided directly by SNOMED International.

July 2020 International Release

Web browsable version: http://snomed.org/eg

SNOMED CT Document Library: http://snomed.org/doc

Summary of changes since last release: https://docs.google.com/spreadsheets/d/1xHZNeNQwkCcUPaZGEl28GFGv_WMTHZoeHeAV5cSjOFU/

SNOMED CT Introduction

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.

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

(See also, Appendix: *SNOMED CT Requirements*)

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

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 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)

Scope

The statement of scope for the International Release is that it includes content necessary for international conformance and interoperability.

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.

SNOMED CT has an international and multilingual scope and can be localized to represent meanings and terms unique to particular organizations or localities. There are three dimensions to the scope of *SNOMED CT*:

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?

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.

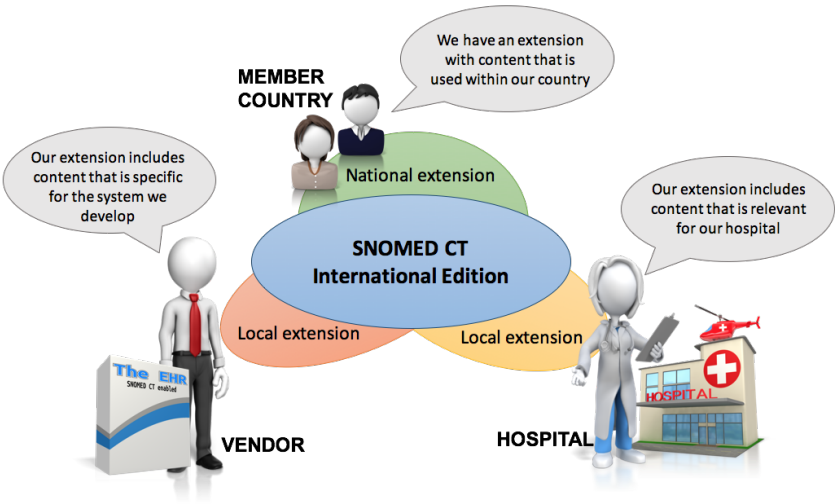


Figure 1: SNOMED CT International Edition and Extensions National Extension criteria include affirmative answers to the following:

- 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?
- If so, then the concept may be eligible for the National Extension.

SNOMED CT is not intended to cover all medical knowledge. Content that is strictly non-human is out of the scope of *SNOMED CT*.

Examples of non-human content,

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

Neither does *SNOMED CT* attempt to capture probabilistic or uncertain knowledge.

Structure of Domain Coverage

SNOMED CT includes 19 *domains* arranged in a polyhierarchical structure. Each hierarchy is a n 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 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) | (http://snomed.info/id/116676008) is defined as subtype of 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) The range of values of 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) is subtypes of 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)

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) | (http://snomed.info/id/450807008) • 52988006 | Lesion (morphologic abnormality) | (http://snomed.info/id/52988006)
2	Clinical Finding	• Clinical finding: normal/abnormal observations, judgments, or assessments of patients • Disorder: always and necessarily an abnormal clinical state	• 39579001 | Anaphylaxis (disorder) | (http://snomed.info/id/39579001) • 167222005 | Abnormal urinalysis (finding) | (http://snomed.info/id/167222005)
3	Environment and Geographical Location*	• Environment: types of environments • Geographical Location: named locations such as countries, states, or regions	• 405607001 | Ambulatory surgery center (environment) | (http://snomed.info/id/405607001) • 223581004 | China (geographic location) | (http://snomed.info/id/223581004)
4	Event	• Occurrences impacting health or health care; not procedures or interventions	

Domains			
			• 242039002 | Abuse of partner (event) | (http://snomed.info/id/242039002) • 2641000119104 | Exposure to chlamydia (event) | (http://snomed.info/id/2641000119104)
5	Observable Entity	• Information about a quality/property to be observed and how it will be observed	• 423493009 | Age at diagnosis (observable entity) | (http://snomed.info/id/423493009) • 416125006 | Concentration of hemoglobin in erythrocyte (observable entity) | (http://snomed.info/id/416125006)
6	Organism	• Organisms of significance to human and animal medicine; use in modeling cause of disease	• 3265006 | Genus Candida (organism) | (http://snomed.info/id/3265006) • 710877000 | Beta lactam resistant bacteria (organism) | (http://snomed.info/id/710877000)
7	Pharmaceutical /Biological Product	• Drug products (not Substances)	• 400687000 | Infliximab 100mg/vial powder for reconstitution injection (product) | (http://snomed.info/id/400687000) • 317222006 | Product containing only cimetidine 200 mg/1 each oral tablet (clinical drug) | (http://snomed.info/id/317222006)
8	Physical Force*	• Forces applied to the body that may cause injury	• 57955009 | Hot weather (physical force) | (http://snomed.info/id/57955009)

Domains			
			• 285719001 | Mechanical abrasion (physical force) | (http://snomed.info/id/285719001)
9	Physical Object*	• Physical devices relevant to health care, or to injuries/accidents	• 15237007 | Sitz bath chair, device (physical object) | (http://snomed.info/id/15237007) • 69861004 | Firearm, device (physical object) | (http://snomed.info/id/69861004)
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) | (http://snomed.info/id/54321008) • 386513007 | Anesthesia management (regime/therapy) | (http://snomed.info/id/386513007)
11	Qualifier Value*	• One of several possible values for an attribute used to define concepts	• 90734009 | Chronic (qualifier value) | (http://snomed.info/id/90734009) • 255412001 | Appearances (qualifier value) | (http://snomed.info/id/255412001)
12	Record Artifact*	• Clinical documents, or parts thereof	• 445673000 | Original report (record artifact) | (http://snomed.info/id/445673000) • 41000179103 | Immunization record (record artifact) | (http://snomed.info/id/41000179103)
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	• 169589005 | Antenatal care: history of infertility (situation) | (http://snomed.info/id/169589005)

Domains			
		• May be used to represent conditions /procedures that already occurred, haven't yet occurred, or refer to someone else (not patients)	• 407565004 | Angiotensin II receptor antagonist not tolerated (situation) | (http://snomed.info/id /407565004)
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) | (http://snomed.info/id /900000000000442005) • 900000000000454005 | Foundation metadata concept (foundation metadata concept) | (http://snomed.info/id /900000000000454005) • 106237007 | Linkage concept (linkage concept) | (http://snomed.info/id /106237007) • 370136006 | Namespace concept (namespace concept) | (http://snomed.info/id /370136006)
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) | (http://snomed.info/id /116060000) • 58626002 | Legal guardian (person) | (http://snomed.info/id /58626002) • 415794004 | Unknown racial group (racial group) | (http://snomed. info/id/415794004) • 35359004 | Family (social concept) | (http://snomed.info/id /35359004)
16	Special Concept*	• Inactive and navigational (support locating concepts in hierarchies) concept codes	• 363664003 | Erroneous concept (inactive concept) | (http://snomed.info/id /363664003)

Domains			
			• 394899003 | Oral administration of treatment (navigational concept) | (http://snomed.info/id/394899003)
17	Specimen*	• Entities that are obtained (usually from patients) for examination or analysis	• 373193000 | Lymph node from sentinel lymph node dissection (specimen) | (http://snomed.info/id/373193000) • 258441009 | Exudate sample (specimen) | (http://snomed.info/id/258441009)
18	Staging and Scales*	• Assessment and tumor staging scales	• 273472005 | Functional status index (assessment scale) | (http://snomed.info/id/273472005) • 254294008 | Tumor-node-metastasis (TNM) head and neck tumor staging (tumor staging) | (http://snomed.info/id/254294008)
19	Substance	• Active chemical constituents of allergens, agents, substances, chemicals, drugs, and materials (not Pharmaceutical/Biological Products)	• 116272000 | Dietary fiber (substance) | (http://snomed.info/id/116272000) • 64856004 | Digestive system fluid (substance) | (http://snomed.info/id/64856004)

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 multi-purpose. 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.

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.

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.

For example,

- 22298006 | Myocardial infarction (disorder) | (http://snomed.info/id/22298006)

Its terminological knowledge includes the following:

- IS A: 64572001 | Disease (disorder) | (http://snomed.info/id/64572001)
- Finding site: 74281007 | Myocardium structure (body structure) | (http://snomed.info/id/74281007)
- Associated morphology: 55641003 | Infarct (morphologic abnormality) | (http://snomed.info/id/55641003)

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) | (http://snomed.info/id/74400008)

Its terminological knowledge includes the following:

- IS A: 64572001 | Disease (disorder) | (http://snomed.info/id/64572001)
- Finding site: 66754008 | Appendix structure (body structure) | (http://snomed.info/id/66754008)
- Associated morphology: 23583003 | Inflammation (morphologic abnormality) | (http://snomed.info/id/23583003)

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
- Anorexia
- Nausea
- Elevated white blood count

Semantic Interoperability

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.

URU - Understandable, Reproducible, Useful

There are three basic operational criteria that help determine *SNOMED CT's* ability to create and sustain semantic interoperability. The content must be:

- **Understandable.** Healthcare providers must be able to communicate the meaning of concepts such that they are unambiguous and understood by recipients without reference to inaccessible, hidden or private meanings. Concepts should be universally understood.
- **Reproducible.** It is not enough for one individual to say they think they understand a meaning. It must be shown that multiple people understand and use the meaning in the same way.
- **Useful.** The meaning must have some demonstrable use or applicability to health or healthcare.

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

Root and Top-level Concepts

Concept

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

> **Term**
>
> A *term* is defined as a human-readable phrase that names or describes a concept. A term is one of the properties of a description. Other properties of a description link the term to an identified concept 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:

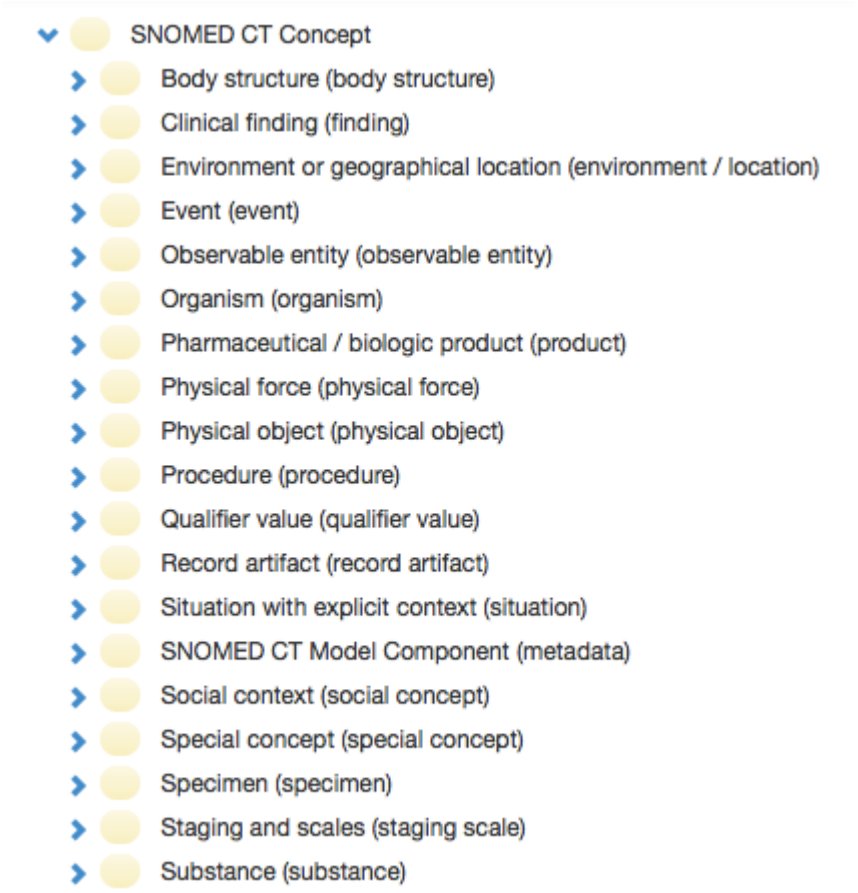
- Abbreviated name for the concept identifier. For clarity, this is should be referred to as an *identifier* (*ID*), or *code*, e.g. *concept identifier* (*ID*) or *concept code*.
- Idea or class of real-world entities (common usage meaning). For clarity, this is should be referred to as an *idea* or *meaning*, e.g. a *clinical idea*, *clinical meaning*, or *code meaning*.

Root Concept

The concept file includes a special concept referred to as the *root concept*. 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) | (http://snomed.info/id/116680003), i.e. all other concepts are regarded as subclasses of this concept. The root concept code is 138875005 | SNOMED CT Concept (SNOMED RT+CTV3) | (http://snomed.info/id/138875005), with the preferred term (PT), *SNOMED CT* Concept.

Features of the root concept

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.



Top-level Concept

Concepts that are directly related to the root concept by a single relationship of the Relationship type 116680003 | Is a (attribute) | (http://snomed.info/id/116680003) 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) | (http://snomed.info/id/116680003), i.e. all other concepts represent subclasses of the meaning of at least one top-level concept.

Top- level metadata concepts

A concept that is directly related to the root metadata concept, 900000000000441003 | SNOMED CT Model Component (metadata) | (http://snomed.info/id/900000000000441003) 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.

Subtype Relationships

Role of 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.

Representation of subtype relationships

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) | (http://snomed.info/id/116680003).

For example ,

- 53084003 | Bacterial pneumonia (disorder) | (http://snomed.info/id/53084003) is a subtype of 233604007 | Pneumonia (disorder) | (http://snomed.info/id/233604007) because it is a subtype of 312342009 | Infective pneumonia (disorder) | (http://snomed.info/id/312342009) which is also a subtype of 233604007 | Pneumonia (disorder) | (http://snomed.info/id/233604007)

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) | (http://snomed.info/id/410662002). 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) | (http://snomed.info/id/116676008)

Range		
Definition	Note	Example
A constrained set of values that the Concept Model permits to be applied to a specific attribute when that attribute is applied to a concept in a particular domain	The range of permitted values that can be applied to an attribute is typically defined to include concepts in one or more branches of the subtype hierarchy.	• The range fo r values of 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) is a subtype of 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003).

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.

Attribute naming

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)|.

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

Defining Characteristics

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.

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.

Relationships

The defining characteristics can be divided into 116680003 | Is a (attribute) | (http://snomed.info/id/116680003) 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) | (http://snomed.info/id/138875005) 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 | Gastrectomy (procedure) | include:

- 116680003 | Is a (attribute) | (http://snomed.info/id/116680003) = 65801008 | Excision (procedure) | (http://snomed.info/id/65801008)
- 260686004 | Method (attribute) | (http://snomed.info/id/260686004) = 129304002 | Excision - action (qualifier value) | (http://snomed.info/id/129304002)
- 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007) = 69695003 | Stomach structure (body structure) | (http://snomed.info/id/69695003)

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) | (http://snomed.info/id/53084003) according to its clinical course (373933003 | Acute onset (qualifier value) | (http://snomed.info/id/373933003) or 90734009 | Chronic (qualifier value) | (http://snomed.info/id/90734009)) or severity (255604002 | Mild (qualifier value) | (http://snomed.info/id/255604002), 6736007 | Moderate (severity modifier) (qualifier value) | (http://snomed.info/id/6736007), or 24484000 | Severe (severity modifier) (qualifier value) | (http://snomed.info/id/24484000))
- 125605004 | Fracture of bone (disorder) | (http://snomed.info/id/125605004) can be refined by qualifying it with 12611008 | Bone structure of tibia (body structure) | (http://snomed.info/id/12611008) to represent the concept 31978002 | Fracture of tibia (disorder) | (http://snomed.info/id/31978002)

Authoring

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.

Advantages of the approach

- Enhances ability to maintain content
- Supports identification of equivalences

Content that does not conform

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

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)

Authoring information

Does It Belong In SNOMED CT?

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* with electronic health applications.

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 the *SNOMED CT* authors.

Extensions

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. Please see the *Practical Guide to Extensions* for more information.

Criteria for inclusion in the International Release

For content to be included in the International Release, the following criteria must be met:

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.

Broad Use

It must be applicable within and across healthcare disciplines internationally.

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*.

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.

Useful. The meaning must have demonstrable use or applicability to health or healthcare.

SNOMED CT names classes of things

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.

References

Content must be submitted with:

- 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 CRS Customer Guidance, search for *Change or Add to SNOMED CT* in the document library at http://snomed.org/doc.

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

When Is Content Rejected?

The following information provides specifics on content rejection.

Fully specified name (FSN)

An FSN should conform to spelling, language, and style guidelines. It should also have parent codes that conform to editorial guidelines and show where in the hierarchy it belongs.

In general, an FSN should **not** have the following (there are exceptions, which are covered in this guide):

- Abbreviations or acronyms
- Hyphens
- Duplicate concepts
- Ambiguity
- The word OR
- Forward or backslash (/ \)
- Precoordinated numeric ranges
- General British (GB) spelling
- Plural form
- Procedures or clinical findings in past tense
- Reference to a particular instance

Classification system-derived phrases

Concept submissions that contain certain classification system-derived phrases in their FSNs are not accepted. Concepts with unclear, unspecified, or ambiguous meaning should not be used. It includes:

Not otherwise specified (NOS)

- For example, Mental disorder, *not otherwise specified*

Not elsewhere classified (NEC)

- For example, Chronic hepatitis, not elsewhere classified

Not mentioned

- For example, Attention deficit disorder *not mentioned* of hyperactivity

With or without

- For example, Tubal pregnancy *with or without* intrauterine pregnancy

Full statements or sentences

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

Disjunctives

Concepts with the disjunctives (*or, and/or*) are unacceptable with limited exceptions as follows below; Instead, there should be separate concepts.

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) | (http://snomed.info/id/774007)

- The concept is an intensional navigational aggregate.

For example,

- 707861009 | Structure of skin and/or skin-associated mucous membrane (body structure) | (http://snomed.info/id/707861009)

- The concept is based on an authoritative source, but not a classification system.

See *Conjunction and Disjunction* for the use of disjunctives, including their use with anatomical concepts.

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*, or 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, i.e. the range is an explanation or definition of the score, may be acceptable.

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*, and etc
- The Tumor, Node, Metastases (TNM) Classification of Malignant Tumor

Proprietary names

Proprietary names include brand name drugs and devices and some clinical forms or tools.

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. 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

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.

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 of clinical forms, tools, or assessment scales (e.g. *the XYZ Test*) do not require a license from the owner.

Questions. Questions within a form or tool generally qualify for copyright protection (except in the case of the simplest of forms).

Answers. Very simple answers on a form or tool (e.g. *yes* or *no*) do not require owner permission. However, more substantial answers may infringe on the owner's copyright. This usually does not apply to individual answers, but almost always to entire sets of answers.

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) | (http://snomed.info/id/443807003) 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

Non-human content

To be included in the International Release content must be useful in human medicine. Strictly non-human content may be included in extensions. Criteria for non-human content to be included in the International Release include the following:

Diseases, Findings, and Procedures. Occurs in both humans and animals.

Substances. Causes poisonings and adverse effects in humans.

Organisms. All organisms are included in the International Release.

Procedures: by complexity or count

Procedures categorized by complexity. Procedure concepts with modifiers representing complexity are not allowed in the International Release; this means the amount of effort required or based on realm-specific definitions (e.g. simple arthrodesis, simple repair, complex repair).

Exception

Procedures that use *simple* or *complex*, defined with reproducible meanings are allowed; they are based on what is done to or for the patient, rather than how much effort is expended.

For example,

- 172043006 | Simple mastectomy (procedure) | (http://snomed.info/id/172043006); Reproducibly defined as the removal of all breast tissue without removal of axillary contents. Differentiated from modified radical, radical, skin-sparing, and subcutaneous variants of mastectomy.

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 or first, second, and etc. should be excluded.

Abbreviations

Abbreviations are shortened forms of words or phrases. Because they may not be understood by all users, they allow for misinterpretation. Consequently they are not permitted in FSNs. They may be used in preferred terms or synonyms if they are accompanied by the fully expanded term.

Acronyms

Acronyms are a specific type of abbreviation. They are formed from the initial letters of words and pronounced as words.

Exception

An acronym is allowed 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,

- 122456005 | Laser device (physical object) | (http://snomed.info/id/122456005)

Eponyms

Eponyms are names that are derived from proper names (usually the person who made the discovery or created the original description). They are found in many areas of health terminology, including anatomic structures, morphologic abnormalities, diseases, findings, and procedures.

For example,

- Rutherford Morrison's pouch, vein of Galen, Aschoff body, Kell blood group, Down syndrome, Moro reflex, and Whipple procedure.

It is neither desirable nor possible to completely avoid using eponyms in a health terminology; although, if possible, they should be avoided. This helps to improve clarity of meaning and to facilitate translation to other languages. FSNs should be full descriptions, whereas synonyms may be eponymous terms.

For example,

- *Infant startle reflex* would be the FSN and *Moro reflex* would be the synonym.

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

Exceptions

Exceptions require careful consideration since eponym meanings may change over time. Reasons for exceptions are:

- The full description is exceptionally long and unwieldy.

For example,

- - 233230003 | Hemi-Fontan operation (procedure) | (http://snomed.info/id/233230003) instead of *bidirectional Glenn shunt with end-to-side anastomosis of proximal superior vena cava to right pulmonary artery with isolation from right atrium.* (However, this should be added as a text definition).
- The eponym is the only precise, clinically relevant name available.
- A non-eponymous name would necessarily be vague or subject to misinterpretation.

For example,

- 118599009 | Hodgkin's disease (disorder) | (http://snomed.info/id/118599009) and 118617000 | Burkitt's lymphoma (disorder) | (http://snomed.info/id/118617000) are both clear.

Hyphens

Hyphens

Hyphens should not be used in FSNs, with rare exceptions.

For example,

- In the morphology hierarchy, where categories need to be distinguished from specific *subtypes;* 416500007 | Malignant glioma - category (morphologic abnormality) | (http://snomed.info/id/416500007) is allowed to differentiate it from a specific morphology of 74532006 | Glioma, malignant (morphologic abnormality) | (http://snomed.info/id/74532006) as defined by ICD-O.

Adjudication for Content Requests

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

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.

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.

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 Head of Terminology).

Descriptions

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.
- Every concept has one preferred term, unless there is variant spelling between U.S. and GB English. If so, there are two preferred terms.

For example,

22490002 | Bleeding from mouth (disorder) | (http://snomed.info/id/22490002)	
Description type	Description
FSN	Bleeding from mouth (disorder)
PT	Bleeding from mouth
SYN	Bleeding in mouth
SYN	Bleeding of mouth
SYN	Oral hemorrhage
SYN	Oral haemorrhage
SYN	Stomatorrhagia

22490002 | Bleeding from mouth (disorder) | (http://snomed.info/id/22490002)
241563001 | Computed tomography of upper limb (procedure) | (http://snomed.info/id/241563001)

Description type	Description
FSN	Computed tomography of upper limb (procedure)
PT	CT of upper limb
SYN	Computed tomography of upper limb

Fully Specified Name

Fully specified name (FSN) definition
A *term* unique among active descriptions in SNOMED CT that names the meaning of a concept code 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 Pattern JIRA Project*. New content should conform with the naming patterns, however legacy content may not.

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
- 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) | (http://snomed.info/id/266005), a procedure with this body structure is 726425007 | Lobectomy of lower lobe of right lung (procedure) | (http://snomed.info/id/726425007).
- For the body structure concept, 74386004 | Nasal bone structure (body structure) | (http://snomed.info/id/74386004), a disorder concept with this body structure is 413878002 | Closed, displaced fracture of nasal bone (disorder) | (http://snomed.info/id/413878002).

Unique

The FSN is unique among active concepts. Creating a synonym to match the FSN is no longer mandatory because the SNOMED International Authoring Platform automatically creates a matching description to the FSN. Authors then determine the clinical usefulness of the matching description. 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; 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.

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 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

Minor Changes - only the FSN changes but not the concept

Minor changes, those changes that do not change the meaning of the FSN, are allowed without inactivation of the concept. They may include:

- Capitalizing, i.e. from lower to upper case or 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*', from concept string
- Aligning with editorial policy, e.g. changing *appendectomy* to *excision of appendix*
- Where a change to the FSN does not result in a change to the preferred term

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
- 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)

Modeling tips

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.

Below is the order of actions in the *SNOMED CT Authoring Platform* when the FSN requires a minor change:

1. Add the new description, setting case significance
2. Change the new description type to *FSN*
3. DO NOT SAVE YET
4. Inactivate old FSN description
5. Now save

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
- The FSN is ambiguous
- Modeling is more specific than the FSN meaning
- The 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
- 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 (American) 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) | (http://snomed.info/id/191268006)
  - FSN: Chronic anemia (disorder)
  - US PT: Chronic anemia
  - GB PT: Chronic anaemia
- 414545008 | Ischemic heart disease (disorder) | (http://snomed.info/id/414545008)
  - 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 Tags

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

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)

Preferred Term

A *preferred term (PT)* is the description that is deemed to be the most clinically appropriate way of expressing a concept 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) | (http://snomed.info/id/32849002) has

- 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) | (http://snomed.info/id/84162001) has a preferred term of *cold*
- 82272006 | Common cold (disorder) | (http://snomed.info/id/82272006) also has a synonym of *cold*

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

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

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) | (http://snomed.info/id/22298006) 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

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

For example,

- *Fundus* in the context of obstetrics vs ophthalmology

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

Definitions

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 marked CS, this is default for case sensitivity in DEF status.

For example,

- The definition for the concept 11530004 | Brittle diabetes mellitus (finding) | (http://snomed.info/id/11530004) 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.

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, we may not be able to create a definition via the logical model, so would need a text definition to encourage a consistent use of the term.

Thus, if a term may be interpreted in multiple ways, but is intended to mean only one way in SNOMED CT, it needs a definition.

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

General Naming Conventions

In general, 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 *Does It Belong in SNOMED CT? (see page 20)*)

Approved pre-coordination naming patterns have been created and are available at: Pre-coordination Pattern JIRA Project .

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)|

Abbreviations

Abbreviations are shortened forms of words or phrases. Because they may not be understood by all users, they allow for misinterpretation. Consequently they are not permitted in fully specified names (FSN). They are not allowed in preferred terms (PT) or synonyms (SYN) unless they are accompanied by the fully expanded term.

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 CRM which is the abbreviated form for cross-reacting material.

Acronyms

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). Acronyms can be misinterpreted because they are not fully spelled out and have different meanings in different situations.

Fully specified names

Acronyms are not usually permitted in an FSN. 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) | (http://snomed.info/id/122456005) uses the term "laser", which originated as an acronym for "light amplification by stimulated emission of radiation"

Preferred terms and synonyms

Acronyms are allowed in a Preferred Term or Synonym when followed by the expanded term. If the a cronym stands alone (i.e. represents 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) | (http://snomed.info/id/30549001) has a synonym of |ROS - removal of suture|
- 387727008 | Intermittent positive pressure breathing treatment (regime/therapy) | (http://snomed.info/id/387727008) has synonym of |IPPB - intermittent positive pressure breathing therapy|

If the acronym forms only part of the description's meaning, it is followed by a space, then the expanded term in parentheses.

For example,

- |Nontraumatic AKI (acute kidney injury)| is a synonym for 140031000119103 | Acute nontraumatic kidney injury (disorder) | (http://snomed.info/id/140031000119103)

Exceptions

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) | (http://snomed.info/id/303653007)

Eponyms

Eponyms are names that are derived from proper names (usually the person who made the discovery or created the original description). 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).

It is neither desirable nor possible to completely avoid using eponyms in a health terminology; although, if possible, they should be avoided. This helps to improve clarity of meaning and to facilitate translation to other languages. 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
- Pancreaticoduodenectomy (procedure) has the synonym Whipple procedure

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

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).

Conventions when naming a body structure, substance or organism in a concept in another hierarchy

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) | (http://snomed.info/id/11218009)

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

- 337311000119101 | Blepharochalasis of left upper eyelid (disorder) | (http://snomed.info/id/337311000119101)

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.

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'.

Exception

When defining causative agent attribute for clinical findings and disorders by referring to an organism of sub-hierarchies 387961004 |Kingdom Animalia (organism)| or 31006001 |Kingdom Plantae (organism)|, the common name of the organism should be used in the clinical finding/disorder preferred term.

⚠ 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) | (http://snomed.info/id/266005), a disorder concept with this body structure is 724056005 | Malignant neoplasm of lower lobe of right lung (disorder) | (http://snomed.info/id/724056005).
- For the body structure concept, 266005 | Structure of lower lobe of right lung (body structure) | (http://snomed.info/id/266005), a procedure with this body structure is 726425007 | Lobectomy of lower lobe of right lung (procedure) | (http://snomed.info/id/726425007).

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".

Case Significance

Most SNOMED CT descriptions begin with an upper case letter in the SNOMED International Authoring Platform. Generally, the rest of the words in the description should be lower case except for abbreviations, proper nouns, i.e. names of people, organizations, taxonomic groups (e.g. species, genus, family), etc. The following values, as part of the *SNOMED CT* model component domain, provide details.

Case Sensitivity			
Case Sensitivity Indicator	Values	Meaning	Examples
cI	900000000000020002 | Only initial character case insensitive (core metadata concept) | (http://snomed.info/id/900000000000020002)	First letter 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) | (http://snomed.info/id/900000000000017005)	Cannot change any case in the description	• Down syndrome • English as a second language (finding) • pH measurement (procedure)

Case Sensitivity			
		Changing case may change the meaning of the term o r is not commonly used	• mm (qualifier value)
ci	900000000000448009 | Entire term case insensitive (core metadata concept) | (http://snomed.info/id /900000000000448009)	Entire description may be lower or upper case Changing case does not change the meaning of the term	• Fracture of tibia (disorder) • Abdominal aorta angiogram (procedure) • Bite of fish (event) • Floor mat (physical object)

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

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 E*ntire term case insensitive*.

For example,

- The concept 33635003 \| Serotonin (substance) \| (http://snomed.info/id/33635003) 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) \| (http://snomed.info/id/387407006) has the synonym, 6-TG. Apply the case sensitivity indicator of cl for *Only initial character case insensitive* .

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) \| (http://snomed.info/id/277976001) 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* i *nitial character case insensitive* .

Greek alphabet characters

Words derived from the Greek alphabet, for example, alpha, beta, delta, gamma, omega, and etc. are all case insensitive wherever they are in the description.

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* .

Person Naming Conventions

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) | (http://snomed.info/id/420058008)

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

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) | (http://snomed.info/id/425578005)
- Synonym: Carer able to cope

Plurals

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.

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

Exceptions

Organizational nodes or grouper concepts may be plural.

For example,

- 234320004 | Procedures for splenic lesions (procedure) | (http://snomed.info/id/234320004)
- 194732001 | Diseases of mitral and aortic valves (disorder) | (http://snomed.info/id/194732001), has IS A 195002007 | Multiple valve disease (disorder) | (http://snomed.info/id/195002007)

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.

Punctuation and Numbers

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

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

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,

- 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.

Special character (<, >, &, %, $, @, #)

The 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.

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.

WIPEDGUIDE-6 (https://jira.ihtsdotools.org/browse/WIPEDGUIDE-6?src=confmacro) COMPLETED

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) | (http://snomed.info/id/273420000) has a synonym of DAS - Disability assessment schedule

- 719977005 | Communication Activities of Daily Living (assessment scale) | (http://snomed.info/id/719977005) has a synonym of CADL - Communication Activities of Daily Living

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) | (http://snomed.info/id/416500007) distinguishes the category of malignant gliomas from those neoplasms that are called 74532006 | Glioma, malignant (morphologic abnormality) | (http://snomed.info/id/74532006). The neoplasm called malignant glioma is one of several subtypes of 416500007 | Malignant glioma - category (morphologic abnormality) | (http://snomed.info/id/416500007), and does not have the same meaning as the category itself.

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)

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)
- 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.

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) | (http://snomed.info/id/734582004).

Caret symbol (^)

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

For example,

- Technetium Tc^99m^ labeled carbon (substance)
- Blood group antigen Sd^a^ (substance)

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

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.

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) | (http://snomed.info/id/83901003) and one of its synonyms, Sjogrens syndrome

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.

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) | (http://snomed.info/id/11227005) is a noun phrase giving the proper description for the procedure

Unacceptable example,

- 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.

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.

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).

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 on the pre-coordination JIRA project page at Pre-coordination Pattern JIRA Project.

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) | (http://snomed.info/id/11227005)

> ⚠ **Situation hierarchy**
>
> Existing descriptions containing past tense verbs should be moved to the 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009) hierarchy.

General Modeling

> ⚠ **When to create a template**
>
> Less than 50 concepts affected; no template required; check existing templates could be generalised and /or look to add some elements as optional rather than mandatory.

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:

Templates

In addition to the guidance found in the Editorial Guide, please see information on the use of templates at SNOMED CT 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.

Changes to Components

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

Concept Inactivation

Concept inactivation values

Depending on the reason for inactivation, a specific Inactivation reason has to be selected.

Inactivation reason	Association type	Notes
Ambiguous	*Possibly equivalent to*	

Inactivation reason	Association type	Notes

		• The concept has been made inactive because it is inherently ambiguous. This may be because of an incomplete fully specified name or because it has several associated terms that are not regarded as synonymous or partially synonymous
		• The *possibly equivalent* target is an active concept that represents one of the possible meanings of the inactive concept
		• Multiple rows may be used to refer to each of the possible replacement targets for the ambiguous concept
		• Previously referred to as *May Be A*
		• Ambiguous concepts with a single target
		A single target may be justified in the following situations:
		  • If one of the meanings of the ambiguous concept is not clinically useful
		  • The FSN represents a classification concept, such as 'other', 'NOS'

C (http://snomed.info/id/900000000000524003) omponent moved elsewhere	*Moved to* association reference set (foundation metadata concept)	• Applies to a component that has been moved to, or is pending a move to another namespace • The target component identifies the target namespace, not the new component
Duplicate component	*Same as* association reference set (foundation metadata concept)	• The concept has been made inactive because it has the same meaning as another concept • The target component identifies the active component that this component duplicates
Erroneous component	*Replaced by* association reference set (foundation metadata concept)	• The concept has been made inactive because it contains an error • The target component identifies the active component that replaces this component
Limited component	No longer in use and no requirement to retain	• Inactivation reason of LIMITED/WAS_A is not allowed for any new content inactivations after the July 2018 release. • When changes are made to a historical relationship for a concept that was previously inactivated using WAS_A, effort will be made to assign a new historical relationship that facilitates traceability of the concept (e.g. DUPLICATE or AMBIGUOUS)
Outdated component		

Inactivation reason	Association type	Notes
	Replaced by Association reference set (foundation metadata concept)	• The concept has been made inactive because it is an outdated concept that is no longer used
Non-conformance to editorial policy	No association required	• Applies to a concept which does not adhere to the Editorial guidelines

Inactivation of duplicate concepts

Prior to inactivation

- Check to see if the two concepts are true duplicates, i.e. semantically equivalent.
- Decide if the semantic meaning of the two concepts is the same.
- Review ancestors and descendants (if any) of the concept. Are they inconsistent with what is implied by the FSN? If so, inactivate the concept.

Inactivation

- Keep the more specific FSN and keep the concept ID.
  - Note: Implementers do not see the modeling. Hence there should be more weight in the meaning of the FSN, rather than the underlying modeling.
- If appropriate, add the inactivated FSN as a synonym for retained concept.
- Add the synonyms from the inactivated concept, where they are semantically equivalent,

Consider

- Inactivating the concept with fewer subtypes. This will simplify the process and minimize the amount of rework required.
- If needed, the retained FSN should be reworded to align with current policy. If required, modeling should also be corrected.

Inactivated concept

- Add the inactivated descriptions as synonyms (if the meaning is the same) to the retained concept.
- The inactivated concept should be marked as *ambiguous*, if it has an unclear meaning.

⚠ Inform the requestor (if there is a request), as soon as possible, as to which concept is inactivated.

Inactivating classification-derived terms

SNOMED CT has many concepts derived from classifications that describe a clinical condition with an added exclusion, such as 90768003 |Contusion of brain without open intracranial wound (disorder)|. These "without x" terms are not clinically useful. When inactivating these concepts, use *Ambiguous* as the inactivation reason with the association type of *Possibly equivalent to* the parent concept, which is the clinical condition without any context.

For example,

When inactivating 156322003 |Pilonidal sinus without abscess (disorder)|, use the inactivation reason *Ambiguous* with P*ossibly equivalent to* association type pointing to |Pilonidal sinus|.

Non-conformance to editorial policy

The inactivation reason of "Non-conformance to editorial policy" can be used when there is no replacement, the concept is not clinically useful, or when the concept violates such policy, e.g. inclusion of numeric ranges, X with Y with Z, etc .

Description Inactivation

Description inactivation values

Depending upon the combination of the type of component and the reason for inactivation, a specific Inactivation reason has to 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)	The FSN Removal of device (procedure) has the synonym, Replacement of prosthetic device (procedure). The synonym has a more specific meaning than the FSN, so it should be inactivated
Outdated component (foundation metadata concept)	A component is no longer current, useful, appropriate or acceptable	The synonym *Funny looking kid* was inactivated from 112630007 | Abnormal facies (finding) | (http://snomed.info/id/112630007)
Erroneous component (foundation metadata concept)	A component contains a technical error	Case significance changes, *Alpha* where the lower case *a* should have been used Spelling errors, a description where *Asthma* is misspelled *Assthma*
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) | (http://snomed.info/id/167238004)

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) \| (http://snomed.info/id/723278000)
2. 900000000000483008 \| Outdated component (foundation metadata concept) \| (http://snomed.info/id/900000000000483008)
3. 900000000000485001 \| Erroneous component (foundation metadata concept) \| (http://snomed.info/id/900000000000485001)
4. 723277005 \| Nonconformance to editorial policy component (foundation metadata concept) \| (http://snomed.info/id/723277005)

Considerations for range Concepts

Concepts that are used as a target value 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.

Review after addition of new attribute value

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 a concept 713295009 | Surgical replacement - action (qualifier value) | (http://snomed.info/id/713295009) would require a review of current active concepts that represent surgical replacement procedures; that were previously modeled with the attribute relationship Method = *Replacement - action*.

A concept that represents a surgical replacement procedure that currently has the relationship Method = 282089006 | Replacement - action (qualifier value) | (http://snomed.info/id/282089006) , would require inactivation of the relationship and creation of a new relationship Method = 713295009 | Surgical replacement - action (qualifier value) | (http://snomed.info/id/713295009) .

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	Not allowed in *SNOMED CT*	**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

Anatomical structure hierarchy

Conjunction and disjunction are commonly used in the anatomical structure hierarchy.

For example, 419605007 | Structure of ankle and/or foot (body structure) | (http://snomed.info/id/419605007) represents adjacent regions of ankle and foot by a single concept. It is inclusive disjunction because any structures of ankle, foot, or both are true subconcepts. *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.

Following the anatomy SEP (Structure/Entire/Part) model (full discussion in appendices), structure means all or any part of an anatomic entity, which is inclusive disjunction. *Structure of ankle and foot* represents all or part of *entire ankle and foot*. Therefore, a ny structures of ankle, foot, or both are true subconcepts of *structure of ankle and foot*. *Structure of ankle and foot* has the same meaning as *structure of ankle and/or foot*. The use of *and/or* is actually redundant for structure concepts like 419605007 | Structure of ankle and/or foot (body structure) | (http://snomed.info/id/419605007).

Inclusive disjunction

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

And

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) | (http://snomed.info/id/75857000) 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.

And/or

The *and/or* represents disjunction in disorders and procedures, i.e. one or more of the parts is involved.

For example,

- 65966004 | Fracture of forearm (disorder) | (http://snomed.info/id/65966004)

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.

Modeling

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

General Concept Inclusions (GCIs)

Draft Guidance

See the background, use cases, and examples for general concept inclusion axioms as well as explanation of the definition status at https://docs.google.com/document/d/1-Tvswkw5USXydVWpBsT3iORdOFzx3qKAyownS4Enor4/edit?usp=sharing

Authoring Platform User Guide for GCIs

Reference the SNOMED International Authoring Platform User Guide for the technical information that describes adding an additional axiom and adding a general concept inclusion, https://confluence.ihtsdotools.org/display/SIAPUG/Authoring+-+Description+Logic+%28DL%29+Support+Features?src=contextnavpagetreemode

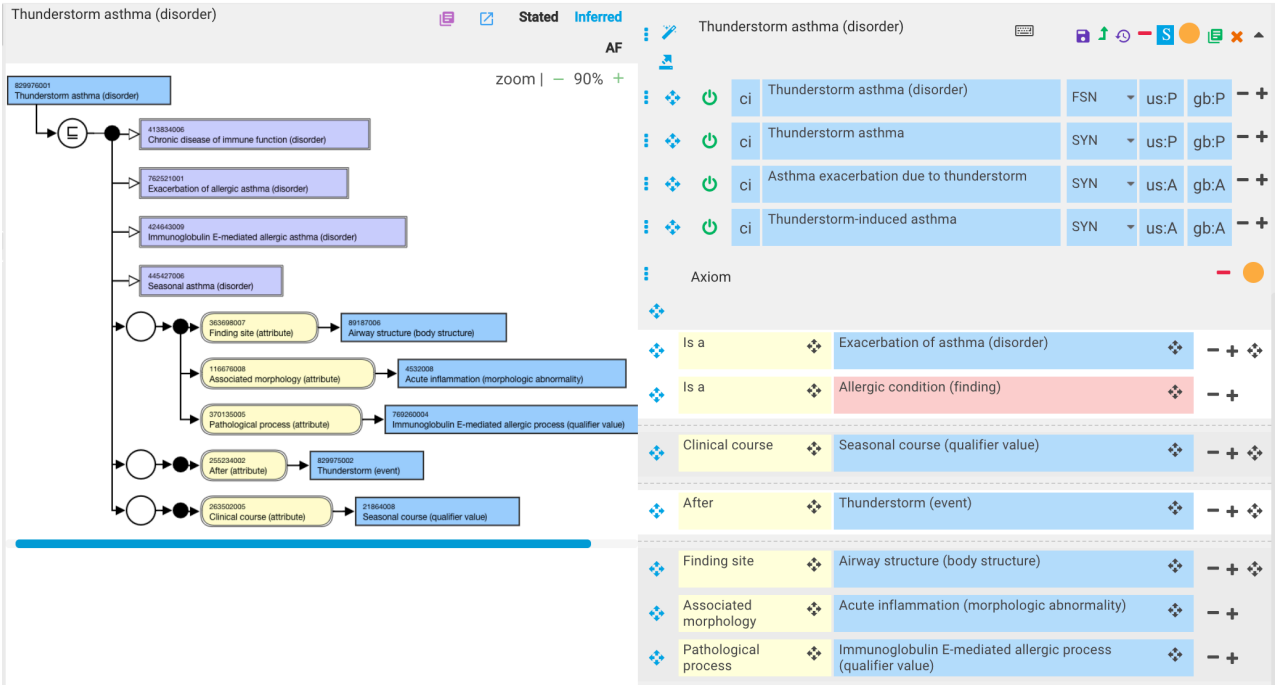
GCI-Modeled Primitive Ancestor

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.

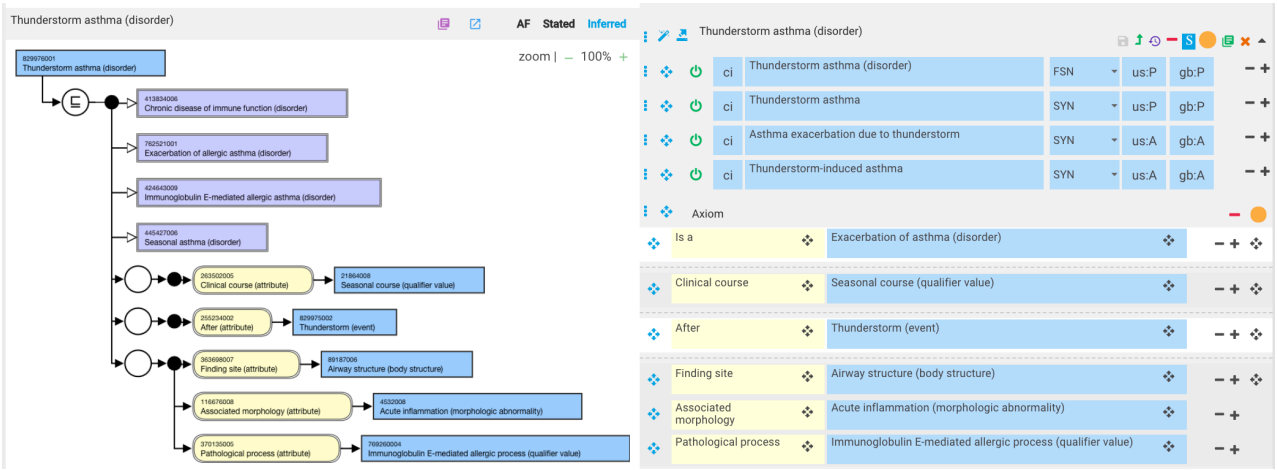
When modeling a concept that will be inherited by a GCI-modeled concept, there is no need to add the GCI-modeled concept as a parent even if that GCI concept is primitive. The benefit of GCIs is obtaining correct classification without having to state an intermediate primitive. The concept will be inherited under the GCI-modeled concept even though it is not asserted as a primitive parent.

For example,

- Thunderstorm asthma (disorder) below shows *incorrect* modeling stating two primitive parents. Allergic condition (finding) is modeled with GCI as notified by the salmon pink color. The diagram on the left shows the inferred view.



Because GCI-modeled primitive parents are unnecessary to state in the model, the diagram below shows the *correct* modeling of the concept, which is the absence of Allergic condition (finding) as a parent, and yet the inferred view diagram on the left is still the same as compared to the incorrectly modeled diagram above.



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.

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) | (http://snomed.info/id/128524007).

Anatomy concepts

Anatomy concepts have separate rules.

Navigational concepts

Grouper concepts should not be confused with *navigational concepts* . N avigational 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.

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 is being consulted regarding current use of navigational concepts.

As 363743006 | Navigational concept (navigational concept) | (http://snomed.info/id/363743006) is within the 370115009 | Special concept (special concept) | (http://snomed.info/id/370115009) subhierarchy, please see that section of the Editorial Guide at Special Concept* (see page 247).

Intermediate Primitive Groupers

Intermediate primitive groupers are sometimes necessary when the concept model is not robust enough to support the full definition of a subset of terms.

For example,

- Not robust enough to handle the needs of genomics (i.e. genetic diseases for which we cannot state, *the majority of cases of this disease present with X)*
- Where there are variances in the clinical manifestations

However, intermediate primitive groupers add a substantial management burden, thus they are discouraged. They may be added on a case-by-case basis and with approval from the Head of Terminology or the Principal Terminologist.

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) | (http://snomed.info/id/363743006) hierarchy, the navigational concept should be inactivated.

Sufficiently Defined vs Primitive Concept

Sufficiently defined

A concept is sufficiently defined 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.

Primitive

A concept which is not sufficiently defined is *primitive*. A primitive concept 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).

Proximal Primitive Modeling

See glossary for definition here: proximal primitive (PP)

- 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.

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) | (http://snomed.info/id/702499000). The PP supertype for this concept is 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002). It has been modeled with one stated supertype and two attribute value pairs in a relationship group.

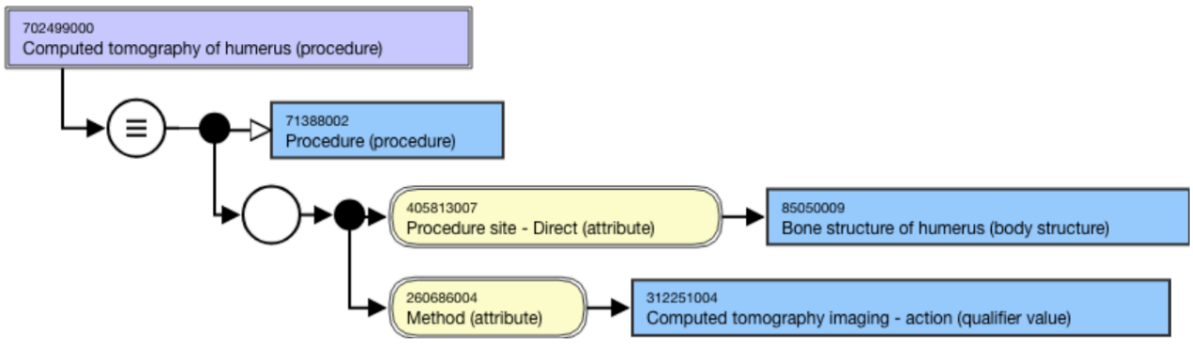


Figure 1: Stated view

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)

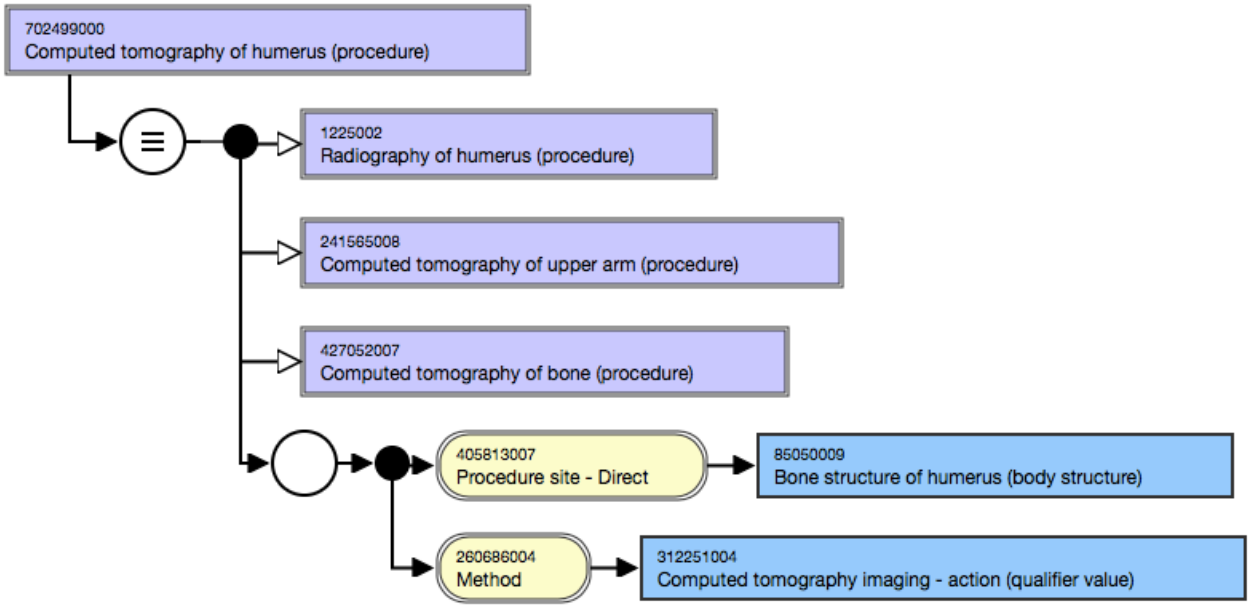


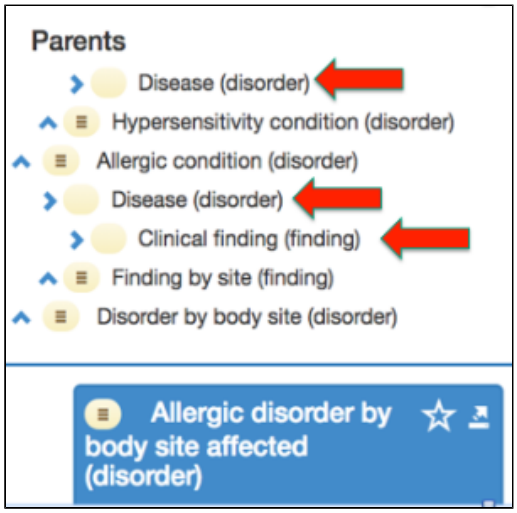
Figure 2: Inferred view

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) | (http://snomed.info/id/421095001). However, 64572001 | Disease (disorder) | (http://snomed.info/id/64572001) is subsumed by 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003), therefore 64572001 | Disease (disorder) | (http://snomed.info/id/64572001)is the proximal primitive supertype concept.



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 53).

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,

- 116223007 | Complication (disorder) | (http://snomed.info/id/116223007)

Without a stated IS-A relationship to the proximal primitive concept, |Complication (disorder)|, a concept will not classify as a subtype of |Complication|. Hence, all relevant subtypes will not be classified as complications.

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.

Relationship Group

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

- A single relationship group containing only one attribute value pair can exist.
    - When an attribute-value pair is restricted to a single group with no other attribute-value pairs allowed, the attribute-value pair is described as being "self-grouped".
- Multiple attributes-value pairs 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 originated to add clarity to:
    - Clinical finding concepts which require multiple Associated morphology attributes and multiple Finding site attributes; and
    - Procedure concepts which require multiple Method attributes and multiple Procedure site attributes.
- 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 attribute-value pairs is performed in the stated view.

Ungrouped attributes

An attribute-value pair that is not in a relationship group is considered to be in a group on its own. When attribute-value pairs 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.

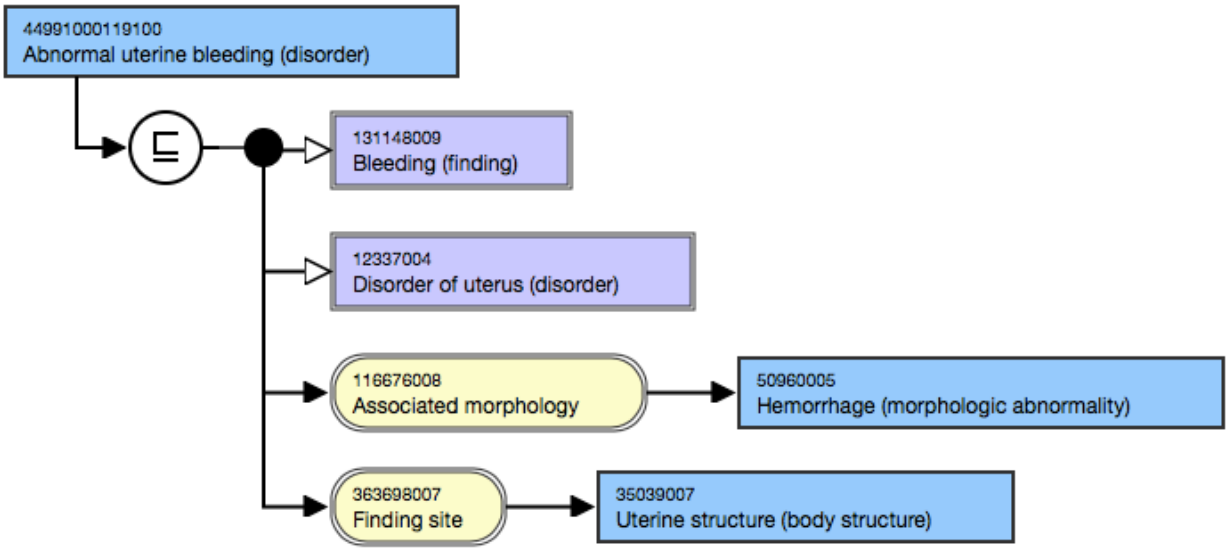


Figure 1: Inferred view of ungrouped attributes values of Hemorrhage (morphologic abnormality) and Uterine structure (body structure)

When the attributes are grouped, the relationships imply meaning towards each other. To continue the example above for 44991000119100 | Abnormal uterine bleeding (disorder) | (http://snomed.info/id/44991000119100), 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 site of the hemorrhage is the uterine structure.

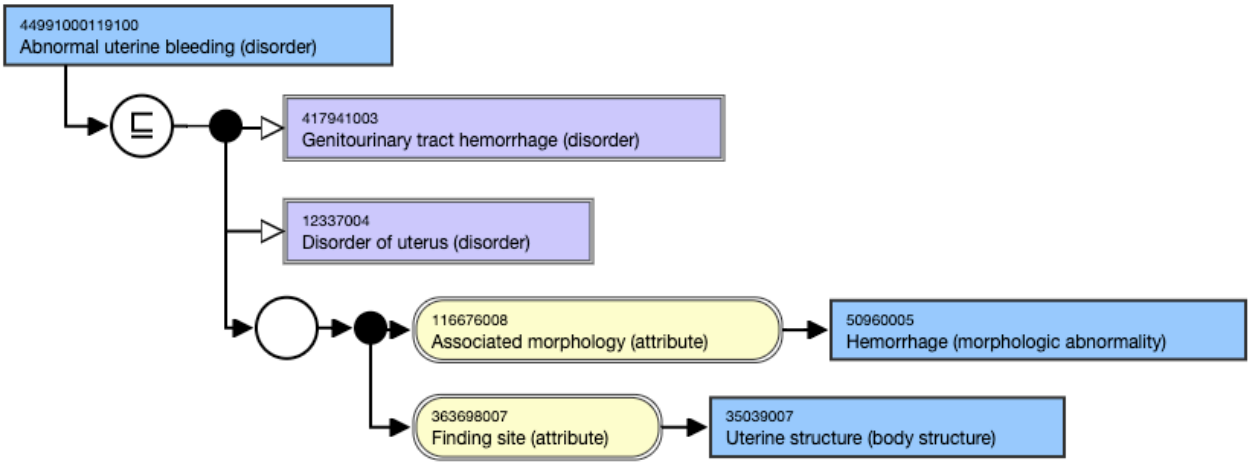


Figure 2: Inferred view of grouped attribute values of Hemorrhage (morphologic abnormality) and Uterine structure (body structure)

Note the difference in the inferred parents between the ungrouped and grouped attributes. This is explained in more detail below.

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) | (http://snomed.info/id/50434004) and one of its supertypes, 63296004 | Excision of aorta (procedure) | (http://snomed.info/id/63296004) .

The meaning of the supertype concept, 63296004 | Excision of aorta (procedure) | (http://snomed.info/id/63296004) (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) | (http://snomed.info/id/405813007)and 260686004 | Method (attribute) | (http://snomed.info/id/260686004) are grouped.

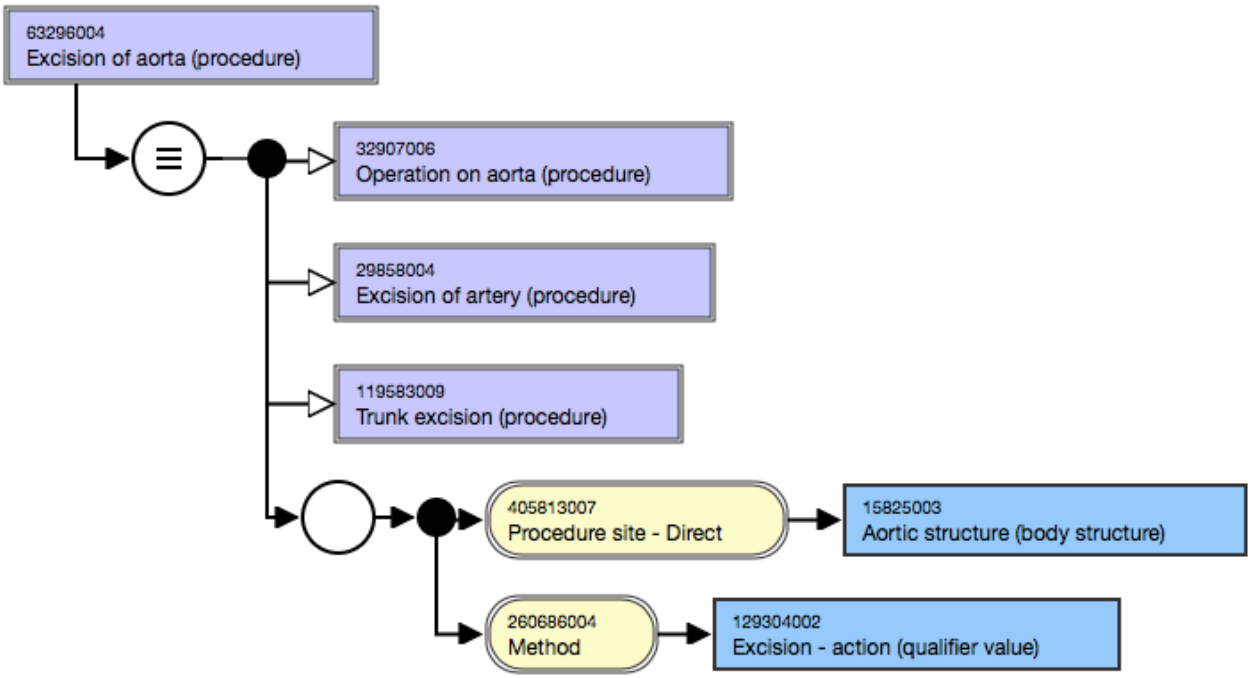


Figure 3: Inferred view of Excision of aorta (procedure) with grouping of attribute-value pair

In the following diagram, the more general supertype concepts, 65801008 | Excision (procedure) | (http://snomed.info/id/65801008) and 118809006 | Procedure on aorta (procedure) | (http://snomed.info/id/118809006) are the proximal supertype concepts.

50434004 | Excision of lesion of aorta (procedure) | (http://snomed.info/id/50434004) is a logical subtype of 63296004 | Excision of aorta (procedure) | (http://snomed.info/id/63296004). However, the attributes of the concept 50434004 | Excision of lesion of aorta (procedure) | (http://snomed.info/id/50434004) are not grouped. Thus, the classifier interprets the definitions as non-related and 50434004 | Excision of lesion of aorta (procedure) | (http://snomed.info/id/50434004) is not inferred as a subtype of 63296004 | Excision of aorta (procedure) | (http://snomed.info/id/63296004). This is because the attribute-value pairs in the subtype concept are not grouped, i.e are not explicitly stated. From a machine-processing perspective, each attribute value pair 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) | (http://snomed.info/id/63296004), being interpreted more broadly.

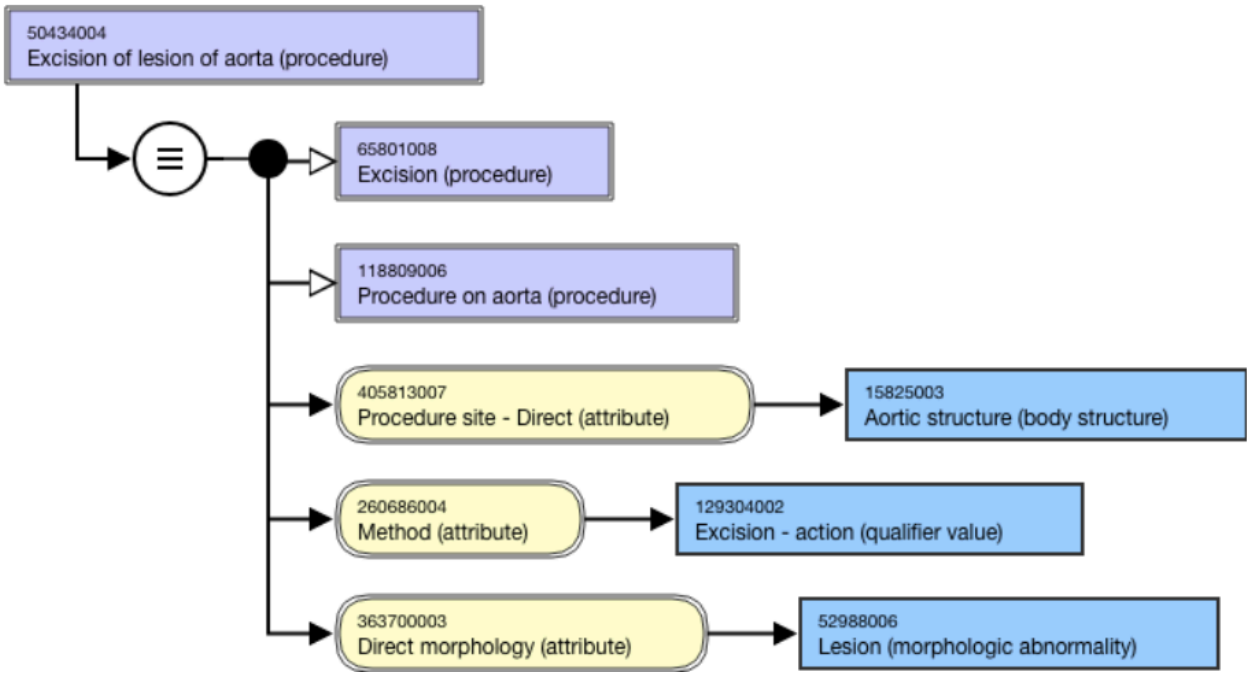


Figure 4: Inferred view of Excision of lesion of aorta (procedure) without grouping of attribute-value pairs

In the following diagram the attributes of the concept 50434004 | Excision of lesion of aorta (procedure) | (http://snomed.info/id/50434004) 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) | (http://snomed.info/id/50434004) to be inferred as a subtype of 63296004 | Excision of aorta (procedure) | (http://snomed.info/id/63296004).

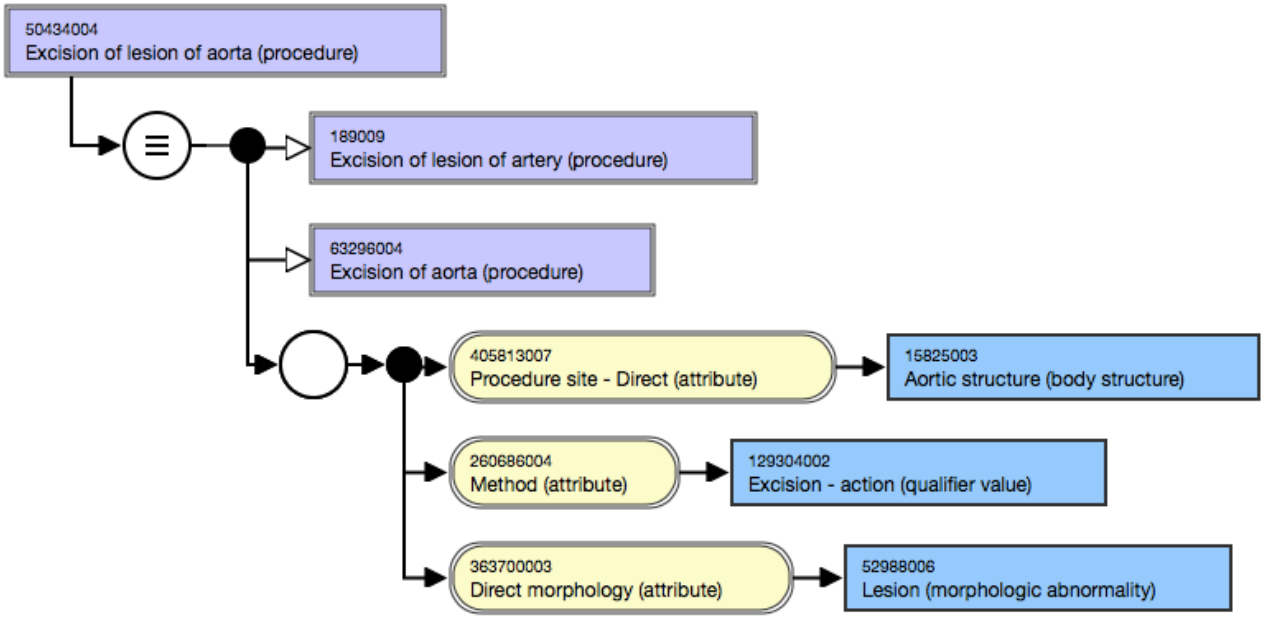


Figure 5: Inferred view of Excision of lesion of aorta (procedure) with grouping of attribute-value pairs

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) | (http://snomed.info/id/53627009). Each 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) and its respective target value are placed in a relationship group with the attribute 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) with its target value of 20946005 | Fracture, closed (morphologic abnormality) | (http://snomed.info/id/20946005).

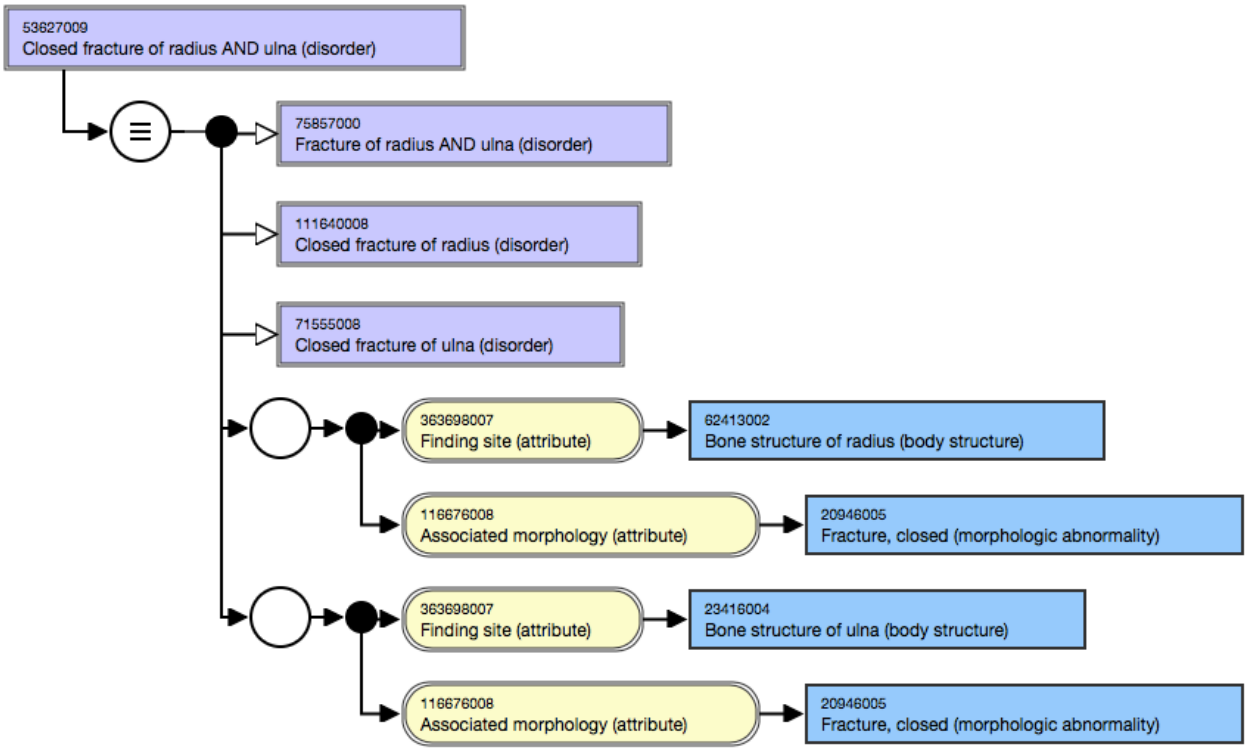


Figure 6: Inferred view of Associated morphology (attribute) with its value of Fracture, closed (morphologic abnormality) in two separate relationship groups

Procedure hierarchy

In the 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) 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) | (http://snomed.info/id/302619004) in 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.

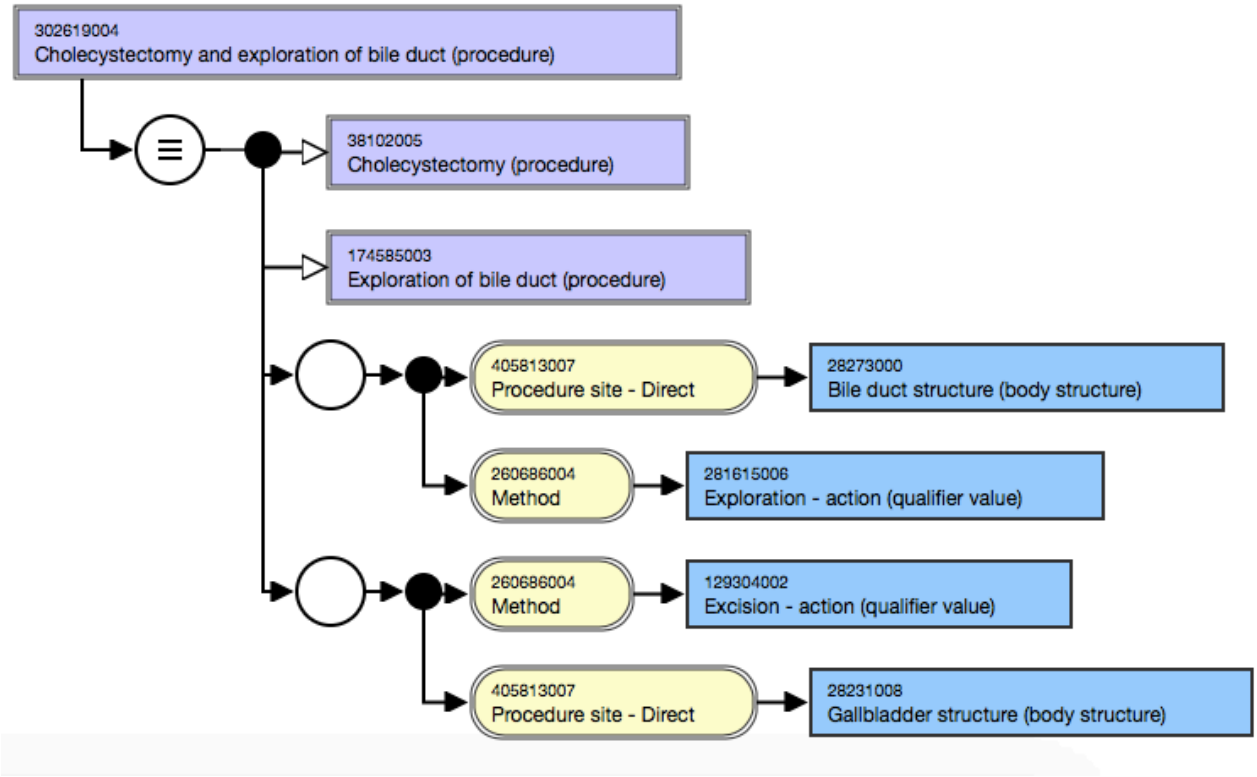


Figure 7: Inferred view of a Procedure hierarchy relationship group: combining attributes around Method (attribute)

Modeling

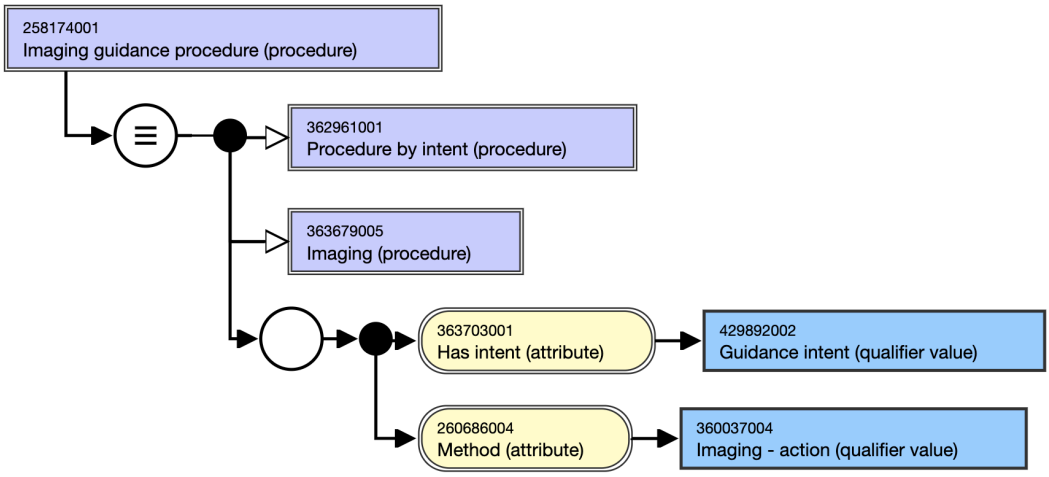
When there is no Method stated, the 363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007) (or its subtype either Procedure site-direct or Procedure site-indirect) is always grouped with 405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004) (or its subtype either Direct morphology or Indirect morphology) for that site.

The 260870009 | Priority (attribute) | (http://snomed.info/id/260870009) 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.

Procedures with intent

The 363703001 | Has intent (attribute) | (http://snomed.info/id/363703001) should only be applied where the intent of the procedure is explicit in the FSN e.g. 61887001 |Diagnostic procedure on tendon sheath (procedure)|. The attribute should be grouped with the attributes that represent the procedure with that intent.

For example, 258174001 | Imaging guidance procedure (procedure) | (http://snomed.info/id/258174001) has the 363703001 | Has intent (attribute) | (http://snomed.info/id/363703001) grouped with the |Method (attribute)|.



This policy has yet to be fully applied. Legacy concepts exist without the 363703001 | Has intent (attribute) | (http://snomed.info/id/363703001) being grouped, especially in the areas of diagnostic and therapeutic intent.

Clinical Finding/Disorder hierarchy

In the Clinical finding hierarchy:

- The 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) and 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) attributes are always grouped when both are present and related.
    - As with Procedure relationship groups, when there is more than one 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) or 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) attribute, then more than one relationship group is required.
    - 246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002)concept and/or the 246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003) attributes, that are also stated and related to the 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) and 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) attributes, should be included in that relationship group.
        - As in the following diagram, when the 246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003) attribute is an organism, the 370135005 | Pathological process (attribute) | (http://snomed.info/id/370135005) attribute is also included in that relationship group, with the target value of either 441862004 | Infectious process (qualifier value) | (http://snomed.info/id/441862004) or 442614005 | Parasitic process (qualifier value) | (http://snomed.info/id/442614005).
- The Interprets and Has interpretation attribute-value pairs 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 attribute pairs are also grouped together where both are present and related to each other.

Relationship group clarification

A relationship group that uses ***before, during*** , ***after*** , ***due to*** , ***clinical course*** , or ***temporally related to*** should never be grouped with another relationship group; these attributes are "self-grouped". This means w hen modeling concepts, a uthors place these attributes in a relationship group individually with no other attributes .

- Note: *726633004 | Temporally related to (attribute) | (http://snomed.info/id/726633004)* only applies to perioperative procedures and to a limited number of clinical findings.

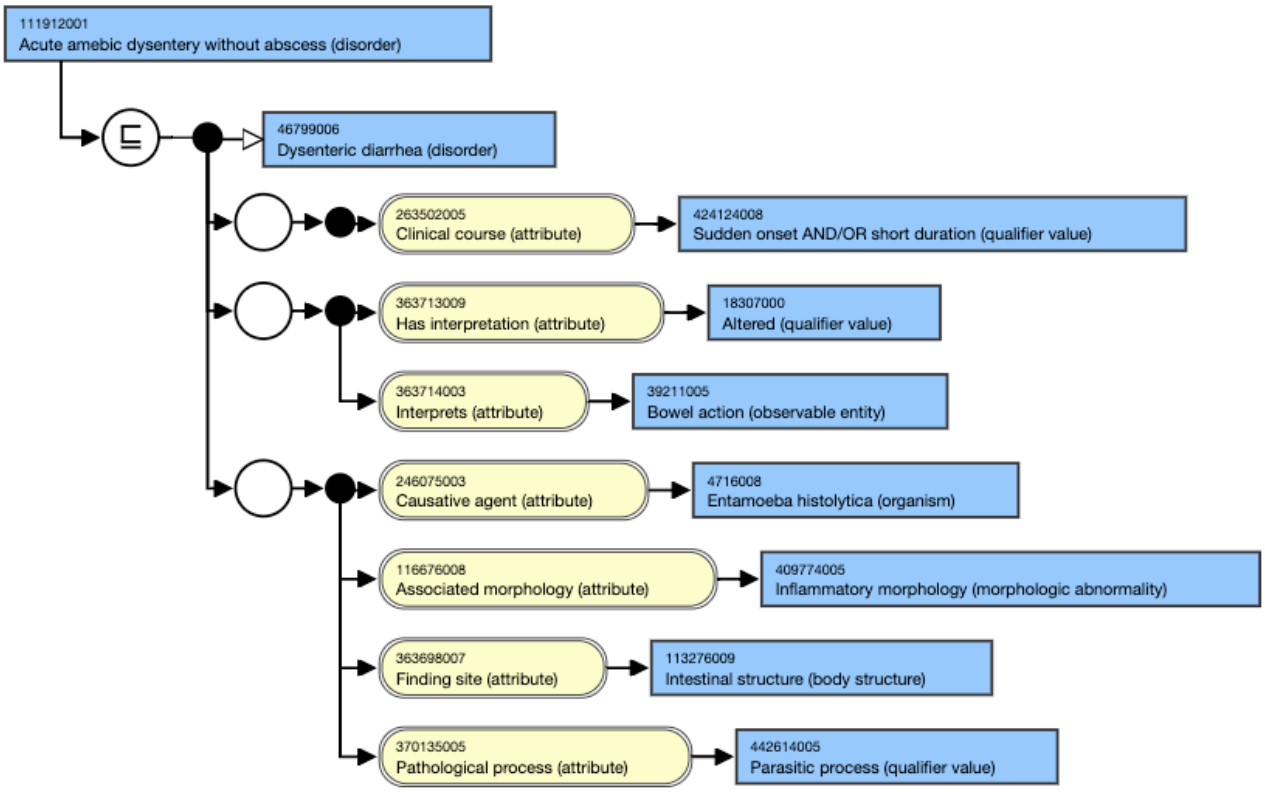
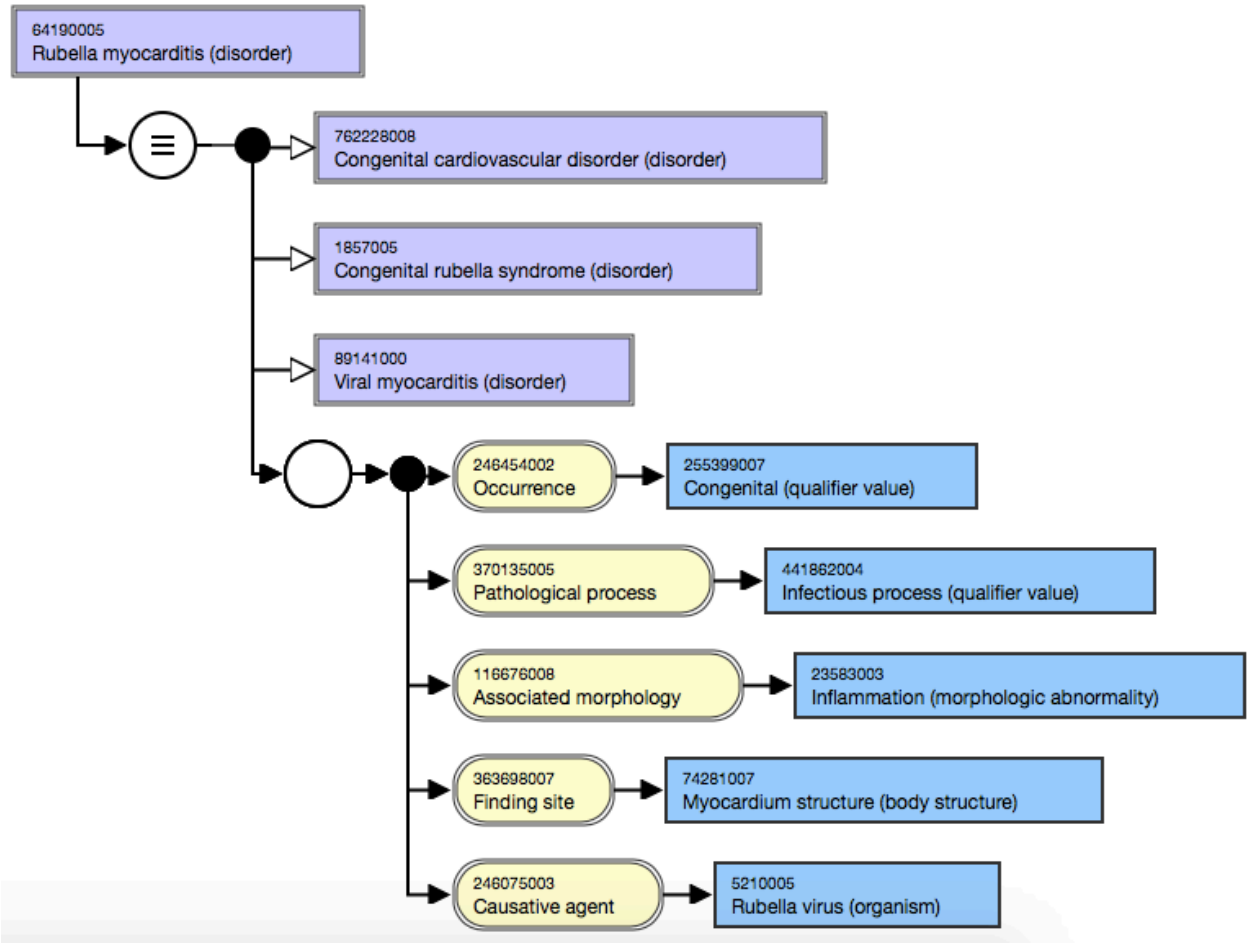


Figure 8: Stated view of a disorder hierarchy concept with Causative agent and Pathological process attribute-value pairs in the same relationship group



Situation with Explicit Context hierarchy

For 413350009 | Finding with explicit context (situation) | (http://snomed.info/id/413350009)concepts, the following four attributes are grouped:

- 408729009 | Finding context (attribute) | (http://snomed.info/id/408729009)
- 246090004 | Associated finding (attribute) | (http://snomed.info/id/246090004)
- 408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000)
- 408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007)

For example, 704008007 | No family history of asthma (situation) | (http://snomed.info/id/704008007) *IS A* 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009),

- 408729009 | Finding context (attribute) | (http://snomed.info/id/408729009), 410516002 | Known absent (qualifier value) | (http://snomed.info/id/410516002)
- 246090004 | Associated finding (attribute) | (http://snomed.info/id/246090004) , 195967001 | Asthma (disorder) | (http://snomed.info/id/195967001)
- 408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000) , 410511007 | Current or past (actual) (qualifier value) | (http://snomed.info/id/410511007)
- 408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007), 444148008 | Person in family of subject (person) | (http://snomed.info/id/444148008)

For 129125009 | Procedure with explicit context (situation) | (http://snomed.info/id/129125009)concepts the following four attributes are grouped:

- 408730004 | Procedure context (attribute) | (http://snomed.info/id/408730004)
- 363589002 | Associated procedure (attribute) | (http://snomed.info/id/363589002)

- 408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000)
- 408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007)

For example, 704503005 | Advice given about pelvic floor exercise (situation) | (http://snomed.info/id/704503005) *IS A* 129125009 | Procedure with explicit context (situation) | (http://snomed.info/id/129125009)

- 408730004 | Procedure context (attribute) | (http://snomed.info/id/408730004), 385658003 | Done (qualifier value) | (http://snomed.info/id/385658003)
- 363589002 | Associated procedure (attribute) | (http://snomed.info/id/363589002), 420227002 | Recommendation to (procedure) | (http://snomed.info/id/420227002)
- 408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000), 410512000 | Current or specified time (qualifier value) | (http://snomed.info/id/410512000)
- 408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007), 125676002 | Person (person) | (http://snomed.info/id/125676002)

Observable Entity hierarchy

When defining 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002) concepts, attribute-value pairs are self-grouped. Each observable entity represents only one property being observed.For example, 400975005 | Standing diastolic blood pressure (observable entity) | (http://snomed.info/id/400975005) is represented using multiple attributes with each in its own relationship group.

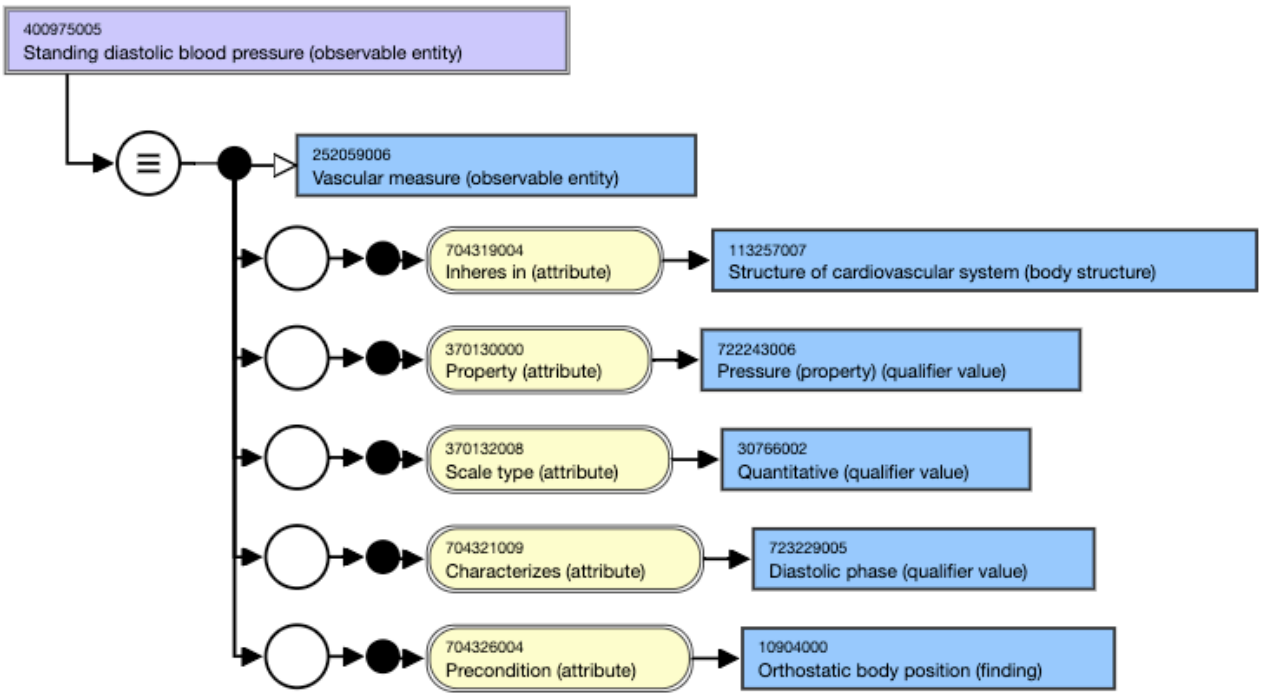


Figure 9: Stated view of a concept from the Observable entity hierarchy with self-grouped attributes

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. ***Those without Concept Models are marked with an asterisk.**

HRCM Attribute tables

On the pages that follow, there are tables generated by the Human Readable Concept Model (HRCM). They contain the Attribute Summaries for those domains with attributes, the information on *Group(ed)*, *Cardinality*, and *In-group cardinality* for each, and the Range constraints for each.

The HRCM tables only give ranges for pre-coordinated concepts. There may be post-coordination values that are not included here.

For information on the definitions of Grouped, Cardinality, and In-group cardinality, please see: IHTSDO Authoring Projects>Projects>MRCM Project>Process for the maintenance of MRCM rules

Modeling: precoordination patterns

SNOMED CT relies on the rules for *usefulness* to avoid excessive precoordination (see *Does It Belong in SNOMED CT?*).

Approved precoordination patterns have been created and are available at: Pre-coordination Naming Patterns JIRA Project. For additional information about the fields used in precoordination, see: What the fields in the Pre-coordination Pattern JIRA Project mean.

Body Structure

Definition	Examples
Includes Anatomical structures and Morphologic abnormalities (subtype of body structure)	Body structure • 38033009 | Amputation stump (body structure) | (http://snomed.info/id/38033009) • 91134007 | Mitral valve structure (body structure) | (http://snomed.info/id/91134007) Morphologic abnormality • 189955008 | Biopsy wound (morphologic abnormality) | (http://snomed.info/id/189955008) • 31470003 | Adenosarcoma (morphologic abnormality) | (http://snomed.info/id/31470003) Cell • 250293008 | Agranular white blood cell (cell) | (http://snomed.info/id/250293008) • 57184004 | T lymphocyte (cell) | (http://snomed.info/id/57184004) Cell structure • 4897009 | Cell membrane, prokaryotic (cell structure) | (http://snomed.info/id/4897009) • 362293000 | Entire axon (cell structure) | (http://snomed.info/id/362293000)

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) | (http://snomed.info/id/258331007) require review and reallocation.

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). HRCM 2020-01-31

Domain Information for 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
Domain Constraint	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)
Parent Domain	-
Proximal Primitive Constraint	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
733928003 | All or part of (attribute) | (http://snomed.info/id/733928003)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733931002 | Constitutional part of (attribute) | (http://snomed.info/id/733931002)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733933004 | Lateral half of (attribute) | (http://snomed.info/id/733933004)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	

774081006 | Proper part of (attribute) | (http://snomed.info/id/774081006)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733930001 | Regional part of (attribute) | (http://snomed.info/id/733930001)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733932009 | Systemic part of (attribute) | (http://snomed.info/id/733932009)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	

HRCM 2020-01-31

Domain Information for 91723000 | Anatomical structure (body structure) | (http://snomed.info/id/91723000)	
Domain Constraint	<< 91723000 | Anatomical structure (body structure) | (http://snomed.info/id/91723000)
Parent Domain	123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)
Proximal Primitive Constraint	<< 91723000 | Anatomical structure (body structure) | (http://snomed.info/id/91723000)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 91723000 \| Anatomical structure (body structure) \| (http://snomed.info/id/91723000)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
733928003 | All or part of (attribute) | (http://snomed.info/id/733928003)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733931002 | Constitutional part of (attribute) | (http://snomed.info/id/733931002)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733933004 | Lateral half of (attribute) | (http://snomed.info/id/733933004)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
272741003 | Laterality (attribute) | (http://snomed.info/id/272741003)	0	0..1	0..0	<< 182353008 | Side (qualifier value) | (http://snomed.info/id/182353008)	
774081006 | Proper part of (attribute) | (http://snomed.info/id/774081006)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	

733930001 | Regional part of (attribute) | (http://snomed.info/id/733930001)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	
733932009 | Systemic part of (attribute) | (http://snomed.info/id/733932009)	0	0..*	0..0	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004)	

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.

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. W e 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.

The Anatomical Concept Model can be found in Appendix B.

Section links

Biliary tract (see page)
Mouth (see page)
Tongue (see page)
Endocrine system (see page)
Genitourinary system (see page)
Urinary system/tract (see page)
Urinary tract proper (see page)
Lower urinary tract (see page)
Obstetric and gravid (see page)
Prostate lobes (see page)
Integumentary system (see page)
Skin, skin-associated mucosa (see page)
Skin regions, skin of <named body part> (see page)
Scalp (see page)
Soft tissue (see page)
Lymphatic, Immune, Hematologic, Hematopoietic systems (see page)
Lymphatic system (see page)
Lymphoid system (see page)
Immune system (see page)
Mononuclear phagocyte system (see page)
Dendritic cell system (see page)
Hematologic system (see page)
Hematopoietic system (see page)
Blood (see page)
Regional lymph nodes of lungs (see page)
Musculoskeletal system (see page)
Skeletal system, bony skeleton (see page)
Bone (see page 84)
Non-ossified bone (see page)
Bone marrow, bone cavity (see page)
Structure of (named bone), bone structure of (named bone) (see page)
Long bone, short bone (see page)
Sternum, manubrium, body, xiphoid (see page)
Teeth, maxilla, mandible (see page)
Joints, joint regions (see page)
Shoulder girdle (see page)
Intertarsal joint structure (see page)
Arm, leg and upper, lower extremities (see page)
Shoulder and hip regions, upper and lower limbs (see page)
Axilla (see page)
Tendon (see page)
Muscle function (see page)

Nervous system (see page)

Nerve (see page)

Supratentorial brain (see page)

Respiratory system (see page)

Respiratory tract (see page)

Upper aerodigestive tract (see page)

Upper respiratory tract (see page)

Lower respiratory tract (see page)

Lower respiratory system (see page)

Interarytenoid fold or larynx (see page)

Nasal turbinates (see page)

Ear (see page)

Eye (see page)

Choroid (see page)

Retinal vein (see page)

Orbital region (see page)

General anatomical concepts

Body parts, body 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 don't 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 below: Nervous system; neural tree).

⚠ Laterality, Digits

For information on laterality, see: 5. Laterality (draft)

See also 8. Naming convention for anatomy (draft) for information on naming concepts referring to digits

⚠ Combined site (body structure)

The concepts under 116007004 | Combined site (body structure) | (http://snomed.info/id/116007004) 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 a ny part of two or more sites or all of the referred sites in the description. The combined site (body structure) concepts will be inactivated.

Body systems

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) | (http://snomed.info/id/11124005) vs. 279316009 | Atrioventricular (non-mitral, non-tricuspid) valve structure (body structure) | (http://snomed.info/id/279316009)
- 91134007 | Mitral valve structure (body structure) | (http://snomed.info/id/91134007) vs. 312523009 | Left (non-mitral) atrioventricular valve structure (body structure) | (http://snomed.info/id/312523009)
- 46030003 | Tricuspid valve structure (body structure) | (http://snomed.info/id/46030003) vs. 244344000 | Entire right (non-tricuspid) atrioventricular valve (body structure) | (http://snomed.info/id/244344000)

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,

- 459176007 | Abscess of right atrioventricular (not morphologically tricuspid) valve (disorder) | (http://snomed.info/id/459176007)represents an abscess of the right atrioventricular valve that has been developed abnormally from the beginning vs. 431189009 | Abscess of tricuspid valve (disorder) | (http://snomed.info/id/431189009).

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) | (http://snomed.info/id/81040000): 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) | (http://snomed.info/id/128260003): 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) | (http://snomed.info/id/45341000): 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) | (http://snomed.info/id/430757002): 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) | (http://snomed.info/id/122972007): This means any vein that drains the lung. A synonym is *vein of lung*. *Pulmonary veins* are vein of the lung, but *pulmonary vein* and *vein of lung* are not synonyms.

⚠ No concept

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.

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 left common carotid and the arch of the aorta which gives rise to the right 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 specifiying 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* above, 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
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
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; 119253004 | Upper aerodigestive tract structure (body structure) |

The *SNOMED CT* concept 361922007 | Entire upper aerodigestive tract (body structure) | (http://snomed.info/id/361922007) has 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) | (http://snomed.info/id/732049009).

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. 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.

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.

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) | (http://snomed.info/id/122489005) and 431938005 | Structure of urinary tract proper (body structure) | (http://snomed.info/id/431938005).

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) | (http://snomed.info/id/41368006)
- 249273002 | Finding of urinary tract proper (finding) | (http://snomed.info/id/249273002)
- 7163005 | Urinary tract obstruction (disorder) | (http://snomed.info/id/7163005)
- 255150000 | Carcinoma in situ of urinary tract proper (disorder) | (http://snomed.info/id/255150000)

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) | (http://snomed.info/id/25990002) has a parent, 431491007 | Structure of upper urinary tract proper (body structure) | (http://snomed.info/id/431491007).

Lower urinary tract

The lower urinary tract, 19787009 | Lower urinary tract structure (body structure) | (http://snomed.info/id/19787009), 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 in *SNOMED 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) | (http://snomed.info/id/113295002) 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) | (http://snomed.info/id/707861009) 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) | (http://snomed.info/id/400199006) 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 extremity, *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.

Scalp

Formal definitions of scalp include layers beneath the skin. Therefore we make a distinction between 41695006 | Scalp structure (body structure) | (http://snomed.info/id/41695006) and 43067004 | Skin structure of scalp (body structure) | (http://snomed.info/id/43067004).

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)|

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)|

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)|

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.

Mononuclear phagocytic system / 127908000 |Mononuclear phagocyte system structure (body structure)|

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)|

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)|

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)|

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) | (http://snomed.info/id/87612001) is a body fluid, not strictly part of either the hematopoietic or cardiovascular systems.

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 CT 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.

Bone

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) | (http://snomed.info/id/3138006). 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) | (http://snomed.info/id/90780006). 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) | (http://snomed.info/id/118966000). Groups of bones, e.g. spine, skull, bony pelvis.
4. 128530007 | Entire bony skeleton (body structure) | (http://snomed.info/id/128530007). *Pars ossea systematis skeletalis, bone part* of the skeletal system.
5. 113192009 | Skeletal system structure (body structure) | (http://snomed.info/id/113192009). 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) | (http://snomed.info/id/60168000) is not the same as 44462005 | Osteitis (disorder) | (http://snomed.info/id/44462005).

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) | (http://snomed.info/id/12611008). 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 example, 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.

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) | (http://snomed.info/id/70925003) or 91609006 | Bone structure of mandible (body structure) | (http://snomed.info/id/91609006). Teeth are part of the 4335006 | Upper jaw region structure (body structure) | (http://snomed.info/id/4335006) and 48077000 | Lower jaw region structure (body structure) | (http://snomed.info/id/48077000).

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) | (http://snomed.info/id/70258002)	344001 | Ankle region structure (body structure) | (http://snomed.info/id/344001)
74670003 | Wrist joint structure (body structure) | (http://snomed.info/id/74670003)	8205005 | Wrist region structure (body structure) | (http://snomed.info/id/8205005)
85537004 | Glenohumeral joint structure (body structure) | (http://snomed.info/id/85537004)	16982005 | Shoulder region structure (body structure) | (http://snomed.info/id/16982005)

Shoulder girdle

272691005 | Bone structure of shoulder girdle (body structure) | (http://snomed.info/id/272691005). 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.

Intertarsal joint structure 27949001 |Intertarsal joint structure (body structure)|; 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) | (http://snomed.info/id/27162001) 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) | (http://snomed.info/id/127863007) . Dislocations of the subtalar joint usually involve the 127864001 | Structure of talonavicular joint (body structure) | (http://snomed.info/id/127864001). The subtalar and talonavicular joints constitute the talocalcaneonavicular joint.

Arm, leg and upper, lower extremities

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. *Stedman's Medical Terminology* defines lower leg as *the segment of the inferior limb between the knee and the ankle.*
- 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) | (http://snomed.info/id/53120007) includes the hand, whereas 40983000 | Upper arm structure (body structure) | (http://snomed.info/id/40983000) does not; *61685007 | Lower limb structure (body structure) | (http://snomed.info/id/61685007)* includes the foot, whereas 30021000 | Lower leg structure (body structure) | (http://snomed.info/id/30021000) does not.

NOTE: The word *l imb* appears in the FSN of the body structure, while the word *extremity* appears as a synonym. Therefore, w hen constructing an FSN for a new clinical finding concept, this precedent should be followed:

FSN: 61685007 | Lower limb structure (body structure) | (http://snomed.info/id/61685007)

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)*. The *FMA* defines the upper limb as the free upper limb and the pectoral girdle (of which the shoulder region is part) and the 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) | (http://snomed.info/id/699617006), i.e. the lower limb not including the pelvic girdle. There is not a concept for the *free upper limb*.

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) | (http://snomed.info/id/91470000) 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 |Structure of muscle and/or tendon|. Muscle and tendon are two separate anatomical entities.

For example, the 61352006 | Structure of achilles tendon (body structure) | (http://snomed.info/id/61352006) i s not a 53451005 | Triceps surae muscle structure (body structure) | (http://snomed.info/id/53451005) (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.

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)|

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.

Upper aerodigestive tract; 119253004 |Upper aerodigestive tract structure (body structure)|.

This phrase has several meanings. The SNOMED CT concept 361922007 | Entire upper aerodigestive tract (body structure) | (http://snomed.info/id/361922007) has 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)|

Includes the nasal cavity, paranasal sinuses, nasopharynx, oropharynx, and larynx

Lower respiratory tract; 82094008 |Lower respiratory tract structure (body structure)|

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)|

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) | (http://snomed.info/id/102295003) 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) | (http://snomed.info/id/105585004) 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,

- 118648008 | Inferior nasal turbinate bone structure (body structure) | (http://snomed.info/id/118648008)
- 122491002 | Middle nasal turbinate bone structure (body structure) | (http://snomed.info/id/122491002)

- 122492009 | Superior nasal turbinate bone structure (body structure) | (http://snomed.info/id/122492009)
- 122493004 | Supreme nasal turbinate bone structure (body structure) | (http://snomed.info/id/122493004)

Turbinates, which include bone, overlying mucous membranes, and other tissue,

- 6553002 | Inferior nasal turbinate structure (body structure) | (http://snomed.info/id/6553002)
- 122491002 | Middle nasal turbinate bone structure (body structure) | (http://snomed.info/id/122491002)
- 65289004 | Superior nasal turbinate structure (body structure) | (http://snomed.info/id/65289004)
- 33415007 | Supreme nasal turbinate structure (body structure) | (http://snomed.info/id/33415007)

The 118648008 | Inferior nasal turbinate bone structure (body structure) | (http://snomed.info/id/118648008) 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.

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) | (http://snomed.info/id/84301002). 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) | (http://snomed.info/id/42859004)). The 61671002 | Structure of internal acoustic meatus of temporal bone (body structure) | (http://snomed.info/id/61671002) (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.

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) | (http://snomed.info/id/85003000) has the synonym *retinal vein*.
- 280927000 | Entire central vein of the retina (body structure) | (http://snomed.info/id/280927000) has the synonym *entire central retinal vein*.

Orbital region

371398005 | Eye region structure (body structure) | (http://snomed.info/id/371398005) has a synonym of *orbital region structure* which subsumes *bony orbit*, *entire eye*, and *ocular adnexa*.

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.

(See also, Appendix, Concept Models: *Anatomical Concept Model*)

Morphologic Abnormality Modeling

The morphologic abnormality hierarchy is 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. 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.

Section links

Combined morphologies (see page)

Tumor morphology (see page)

Congenital anomaly (see page)

Degenerative abnormality, degeneration (see page)

Abscess (see page)

Fracture (see page)

Combined morphologies

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.

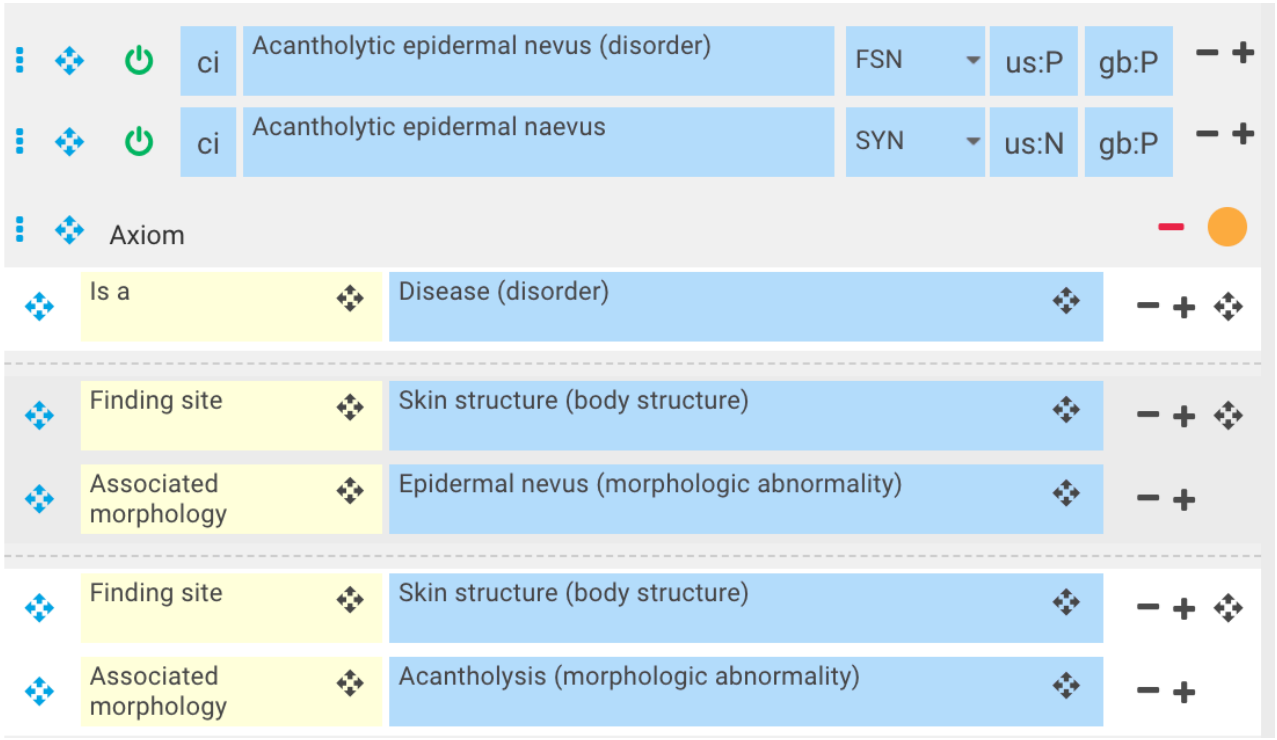
⚠ Combined morphology

It is inappropriate to add more than two morphological concepts into a single concept, i.e. combining 2 morphological concepts which already represent a combined concept is not permitted.

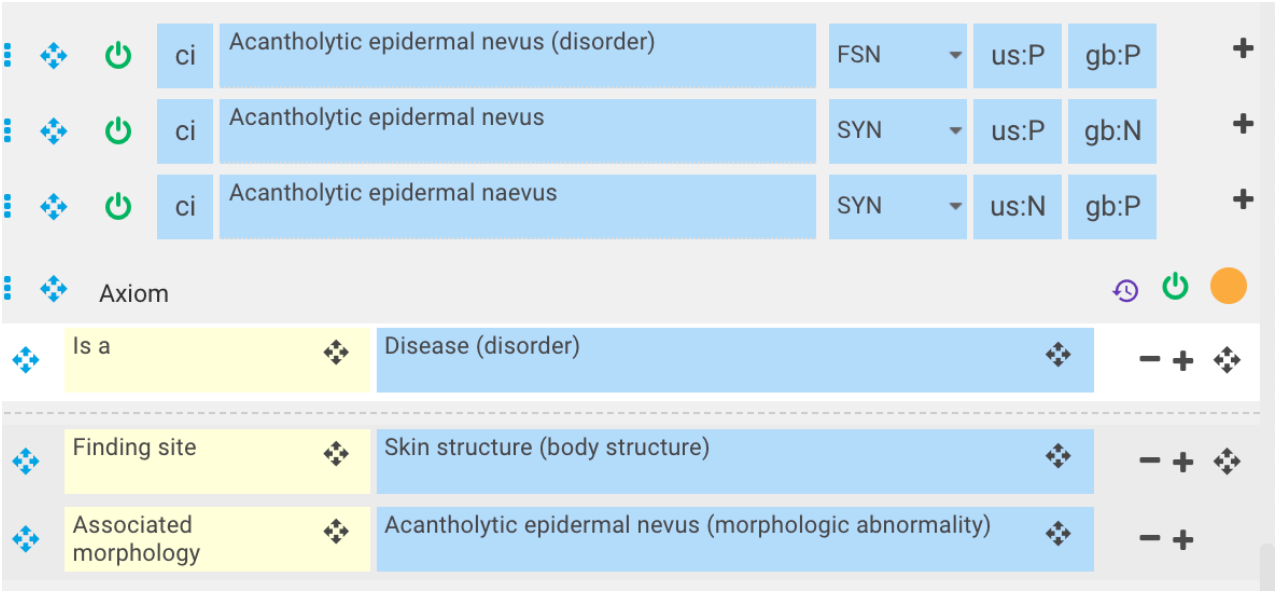
Keep the newly created morphologic abnormality concept primitive as all morphologic abnormality concepts should be primitive.

For example,
If 400067002 | Acantholytic epidermal nevus (disorder) | (http://snomed.info/id/400067002) had the same finding site of |Skin 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:



Model as in the stated view of this diagram with a combined morphology:



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.

Specifically, there are histology types that refer to an organ by means of reference to the architecture, that is the particular histology. For example, Lymphoepithelioma-like carcinoma as enumerated by CAP (and ICD-O). The topographical reference is made to a morphology that is similar to, but distinct from, lymphoepthlium.

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 specific to a cell type.

Exception

Some ICD-O codes include *Not Otherwise Specified (NOS)*. These concepts are not acceptable in SNOMED CT.

For more information

- ICD-O @ http://www.iacr.com.fr (http://www.iacr.com.fr/index.php?option=com_content&view=category&layout=blog&id=100&Itemid=577).

Congenital anomaly

Disorders which involve congenital anomalies are defined with Occurrence (attribute) = Congenital (qualifier value), Associated morphology (attribute) = Morphologic abnormality (qualifier value) and 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.

Degenerative abnormality, degeneration

A distinction should be made between 107669003 | Degenerative abnormality (morphologic abnormality) | (http://snomed.info/id/107669003) and 33359002 | Degeneration (morphologic abnormality) | (http://snomed.info/id/33359002).

- 33359002 | Degeneration (morphologic abnormality) | (http://snomed.info/id/33359002) is a child of 107669003 | Degenerative abnormality (morphologic abnormality) | (http://snomed.info/id/107669003).
- 107669003 | Degenerative abnormality (morphologic abnormality) | (http://snomed.info/id/107669003) 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) | (http://snomed.info/id/116676008) of 33359002 | Degeneration (morphologic abnormality) | (http://snomed.info/id/33359002), 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) | (http://snomed.info/id/33359002) and 107669003 | Degenerative abnormality (morphologic abnormality) | (http://snomed.info/id/107669003) 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.

Abscess

There are two types of abscesses: septic and sterile. Most abscesses are septic, which means that they are the result of an infection. If a concept has a meaning (based on its FSN and text definition) that does not specify whether the abscess is sterile or septic, then the concept should not be modeled as septic; the concept's logic definition uses 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) with the value 44132006 | Abscess (morphologic abnormality) | (http://snomed.info/id/44132006).

Fracture

Although most fractures are traumatic, there are some pathological fractures. In the vast majority of cases, fractures are traumatic. 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) | (http://snomed.info/id/21351003)	Bone structure of phalanx of foot	Fracture
704168008 | Pathological fracture of phalanx of foot (disorder) | (http://snomed.info/id/704168008)	Bone structure of phalanx of foot	Pathologic fracture

1076491000119102 | Nontraumatic complete rupture of muscle or tendon structure of rotator cuff of left shoulder (disorder) | (http://snomed.info/id/1076491000119102)

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) | (http://snomed.info/id/4147007) is not a finding, but 300848003 | Mass of body structure (finding) | (http://snomed.info/id/300848003) 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) | (http://snomed.info/id/300923002) 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.

Clinical Finding/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) | (http://snomed.info/id/167222005) Disorder • 39579001 | Anaphylaxis (disorder) | (http://snomed.info/id/39579001)

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 ", i.e. the name of something that can be observed and represents a question or assessment which can produce an answer or result (e.g. | systolic blood pressure|, |color of iris|, |gender|.

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 sub-hierarchy of *Disorder*. Concepts that are descendants of *disease (disorder)* are always and necessarily abnormal clinical states.

This subtype allows diseases to be subtypes of other disorders, as well as subtypes of findings.

C oncepts with a semantic tag of *disorder*, must have a parent of Disease (disorder) and not Clinical finding (finding) .

For example,

- 95617006 \| Neonatal cyanosis (disorder) \| (http://snomed.info/id/95617006) has the parent, Disease (disorder); it is a subtype of 3415004 \| Cyanosis (finding) \| (http://snomed.info/id/3415004).

The distinction between a disorder and a finding may be difficult to define. There are, however, distinct characteristics of each.

Disorder vs Finding	
	Characteristics
Disorder	• Always and necessarily abnormal • Necessarily have an underlying pathological process

Disorder vs Finding	
	• 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

When authoring in this domain, these are the approved attributes and allowable ranges. They are from the Human Readable Concept Model (HRCM). HRCM 2020-01-31

Domain Information for 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003)	
Domain Constraint	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003)
Parent Domain	-
Proximal Primitive Constraint	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
255234002 | After (attribute) | (http://snomed.info/id/255234002)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id /404684003) OR	

				<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006)	
116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008)	1	0..*	[New]0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
	1	0..*	0..*		
47429007 | Associated with (attribute) | (http://snomed.info/id/47429007)	1	0..*	0..*	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
288556008 | Before (attribute) | (http://snomed.info/id/288556008)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003)	1	0..*	0..1	<< 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
263502005 | Clinical course (attribute) | (http://snomed.info/id/263502005)	1	0..*	0..1	<< 288524001 | Courses (qualifier value) | (http://snomed.info/id/288524001)	
42752001 | Due to (attribute) | (http://snomed.info/id/42752001)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
371881003 | During (attribute) | (http://snomed.info/id/371881003)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
	1	0..*	0..1	<< 288526004 | Episodicities (qualifier value) | (http://snomed.info/id/288526004)	

246456000 | Episodicity (attribute) | (http://snomed.info/id/246456000)					
419066007 | Finding informer (attribute) | (http://snomed.info/id/419066007)	1	0..*	0..1	<< 420158005 | Performer of method (person) | (http://snomed.info/id/420158005) OR << 419358007 | Subject of record or other provider of history (person) | (http://snomed.info/id/419358007) OR << 444018008 | Person with characteristic related to subject of record (person) | (http://snomed.info/id/444018008)	
418775008 | Finding method (attribute) | (http://snomed.info/id/418775008)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
363698007 | Finding site (attribute) | (http://snomed.info/id/363698007)	1	0..*	[New]0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
	1	0..*	0..*		
363713009 | Has interpretation (attribute) | (http://snomed.info/id/363713009)	1	0..*	0..1	<< 260245000 | Finding values (qualifier value) | (http://snomed.info/id/260245000) OR << 263714004 | Colors (qualifier value) | (http://snomed.info/id/263714004)	
719722006 | Has realization (attribute) | (http://snomed.info/id/719722006)	1	0..*	0..1	<< 719982003 | Process (qualifier value) | (http://snomed.info/id/719982003)	
363714003 | Interprets (attribute) | (http://snomed.info/id/363714003)	1	0..*	0..1	<< 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002) OR << 108252007 | Laboratory procedure (procedure) | (http://snomed.info/id/108252007) OR << 386053000 | Evaluation procedure (procedure) | (http://snomed.info/id/386053000)	
246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002)	1	0..*	0..1	<< 282032007 | Periods of life (qualifier value) | (http://snomed.info/id/282032007)	
370135005 | Pathological process (attribute) | (http://snomed.info/id/370135005)	1	0..*	0..1	<< 769247005 | Abnormal immune process (qualifier value) | (http://snomed.info/id/769247005) OR << 441862004 | Infectious process (qualifier value) | (http://snomed.info/id/441862004) OR << 472963003 | Hypersensitivity process (qualifier value) | (	

				http://snomed.info/id/472963003) OR << 308490002 | Pathological developmental process (qualifier value) | (http://snomed.info/id/308490002)	
246112005 | Severity (attribute) | (http://snomed.info/id/246112005)	1	0..*	0..1	<< 272141005 | Severities (qualifier value) | (http://snomed.info/id/272141005)	
726633004 | Temporally related to (attribute) | (http://snomed.info/id/726633004)	1	0..*	0..*	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	

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Clinical Finding Defining Attributes

Relationship group clarification

The attributes ***before, during***, ***after***, ***due to***, ***clinical course***, or ***temporally related to*** must not be placed in a relationship group with other attributes. Each attribute must be the only attribute in the relationship group.

The Human Readable Concept Model (HRCM) *groupedproperty* correctly indicates that these attributes are put into a relationship group during classification (see the Clinical Finding Attributes Summary table on the previous page).

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.

For example,

- 123948009 \| Post-viral disorder (disorder) \| (http://snomed.info/id/123948009) occurs \| After (attribute) \| (http://snomed.org/fictid#) 34014006 \| Viral disease (disorder) \| (http://snomed.info/id/34014006)

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) \| (http://snomed.info/id/75694006) has the *Associated morphology of* *409774005 \| Inflammatory morphology (morphologic abnormality) \| (http://snomed.info/id/409774005)*

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,

- 444231005 | Thymoma (disorder) | (http://snomed.info/id/444231005)
- 80400009 | External hyperostosis (morphologic abnormality) | (http://snomed.info/id/80400009)

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) | (http://snomed.info/id/70529004) has | Associated morphology (attribute) | (http://snomed.org/fictid#) of 43961000 | Lymphoid hyperplasia (morphologic abnormality) | (http://snomed.info/id/43961000) and a | *Finding site (attribute)* | *(http://snomed.org/fictid#)* of 45679000 | Appendiceal lymphoid nodule (body structure) | (http://snomed.info/id/45679000)

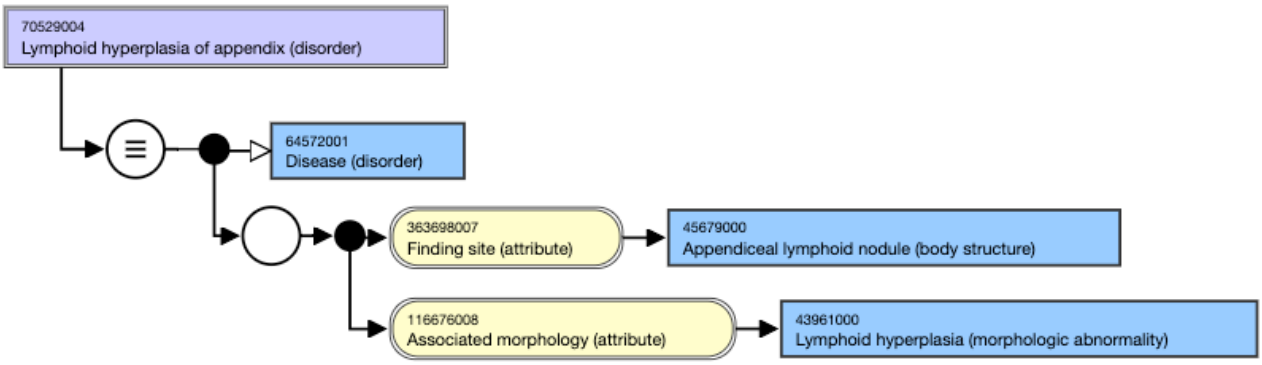


Figure 1: Stated view of Lymphoid hyperplasia of appendix (disorder)

Associated with

47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) 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) | (http://snomed.info/id/47429007). It may be ambiguous and difficult to apply consistently.

Exceptions include,

- Device infections, i.e an infection of the tissue surrounding an implanted or inserted device, not due to the device itself.
  - 47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) is used to associate the device with the infection.
- 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). There is no intolerance process that serves as the value for 719722006 | Has realization (attribute) | (http://snomed.info/id/719722006).
  - 47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) is used to associate the intolerance to the substance.

This attribute may be appropriate when creating concepts that group specific associations.

For example,

- 6211002 | Polyarthritis associated with another disorder (disorder) | (http://snomed.info/id/6211002)

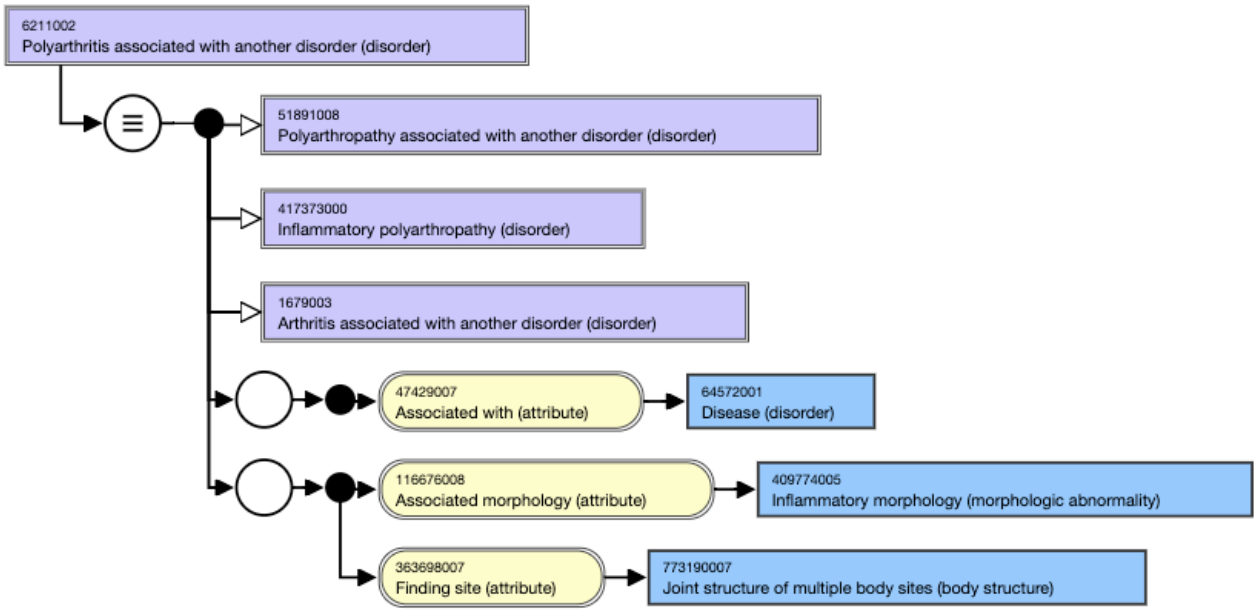


Figure 2: Inferred view of concept using the |Associated with (attribute)|

Before

This attribute is used to model pre-procedure complications (e.g, preoperative complication) . It represents temporal associations between procedures and related disorders.

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) | (http://snomed.info/id/4989003) has the *246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003)* of 18213006 | Electricity (physical force) | (http://snomed.info/id/18213006)

Clinical course

This attribute is used to represent both the course and onset of a disease or condition.

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. However, few conditions with chronic (long-term) durations require rapid vs. gradual onset subtyping. Thus, there is no clear need for separating the rapidity of onset from the duration of a disease. This attribute, that combines onset and course, has been more reproducible and useful than two attributes that attempt to separate the meanings.

For example,

- 74973004 | Chronic fibrosing pancreatitis (disorder) | (http://snomed.info/id/74973004) has a 263502005 | Clinical course (attribute) | (http://snomed.info/id/263502005) of 90734009 | Chronic (qualifier value) | (http://snomed.info/id/90734009)

⚠ 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) | (http://snomed.info/id/4532008) does not necessarily have a clinical course of sudden onset and/or short duration, but rather implies polymorphonuclear infiltration (84499006 | Chronic inflammation (morphologic abnormality) | (http://snomed.info/id/84499006) implies mononuclear cell infiltration, not necessarily a chronic course, although inflammation with a chronic course is highly correlated with a lymphocytic infiltration)

Normally, 263502005 | Clinical course (attribute) | (http://snomed.info/id/263502005) is not grouped with other attributes. However, an exception to this rule exists with the 719722006 | Has realization (attribute) | (http://snomed.info/id/719722006). Role grouping the clinical course is exclusive to the | Has realization (attribute) | (http://snomed.org/fictid#) when the clinical course describes the realization and not the entire concept itself.

For example,

- 788781001 | Delayed allergy to red meat (finding) | (http://snomed.info/id/788781001) groups 263502005 | Clinical course (attribute) | (http://snomed.info/id/263502005) of 788800008 | Delayed onset (qualifier value) | (http://snomed.info/id/788800008) with 719722006 | Has realization (attribute) | (http://snomed.info/id/719722006) of 769260004 | Immunoglobulin E-mediated allergic process (qualifier value) | (http://snomed.info/id/769260004). Each is contained in a separate role group with a causative agent of either 226915003 | Red meat (substance) | (http://snomed.info/id/226915003) or 788778006 | Galactose-alpha-1,3 galactose (substance) | (http://snomed.info/id/788778006). A tick bite causes the 788779003 | Allergy to galactose-alpha-1,3 galactose (finding) | (http://snomed.info/id/788779003), which in turn causes the 788781001 | Delayed allergy to red meat (finding) | (http://snomed.info/id/788781001).

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 or worsens another disorder, rather than causing it directly, the more general | Associated with (attribute) | (http://snomed.org/fictid#) is used instead).

For example,

- 43959009 | Cataract of eye due to diabetes mellitus (disorder) | (http://snomed.info/id/43959009)

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.

For example,

- 10901000087102 | Hypotension during surgery (disorder) | (http://snomed.info/id/10901000087102) 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) | (http://snomed.info/id/246456000) of 255217005 | First episode (qualifier value) | (http://snomed.info/id/255217005) 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) | (http://snomed.info/id/418775008).

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) | (http://snomed.info/id/713071004) has the 418775008 | Finding method (attribute) | (http://snomed.info/id/418775008) of 84100007 | History taking (procedure) | (http://snomed.info/id/84100007)

Finding site

This attribute specifies the body site affected by a condition.

For example,

- 90708001 | Kidney disease (disorder) | (http://snomed.info/id/90708001) has 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) of 64033007 | Kidney structure (body structure) | (http://snomed.info/id/64033007)

Has interpretation

This attribute refers to and designates the judgment aspect being evaluated or interpreted (e.g. presence, absence, degree, normality, abnormality, etc.). Interprets and Has Interpretation are grouped together in a relationship group without any other attributes.

For example,

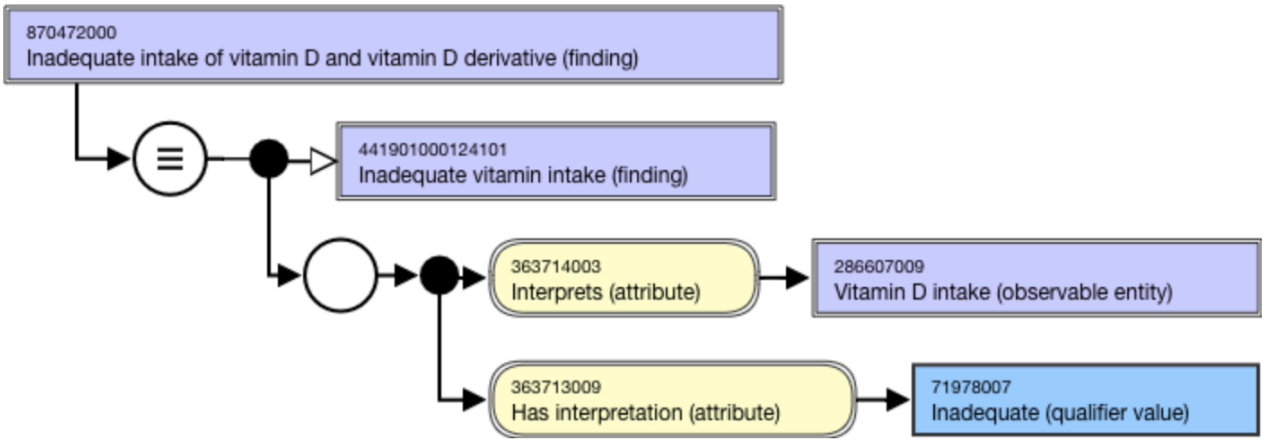


Figure 3: Inferred view of Inadequate intake of vitamin D and vitamin D derivative (finding)

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,

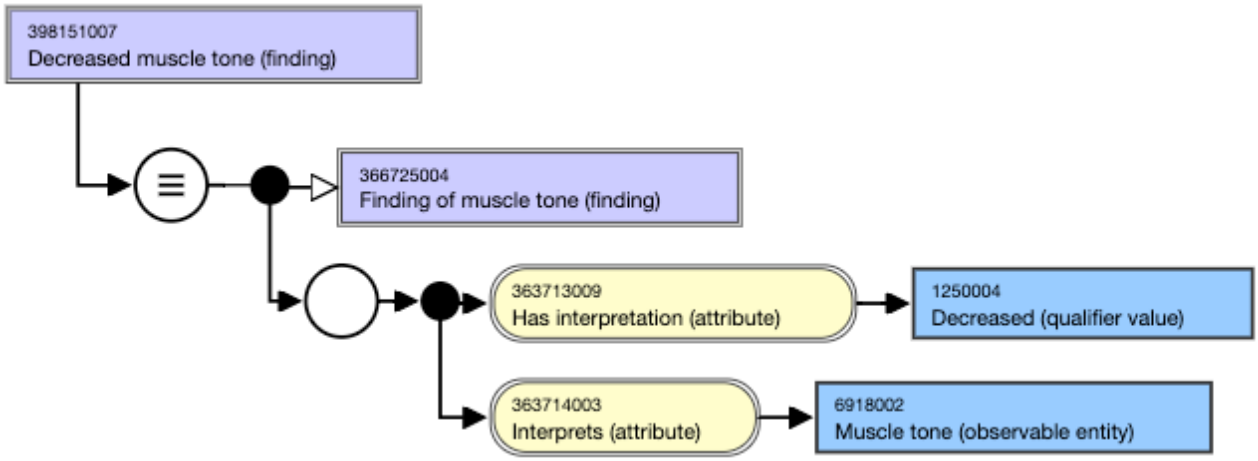


Figure 4: Stated view of |Decreased muscle tone (finding)|

Modeling

For concepts in the 118245000 | Measurement finding (finding) | (http://snomed.info/id/118245000) subhierarchy, the value for 363714003 | Interprets (attribute) | (http://snomed.info/id/363714003) should be an Evaluation procedure or a Laboratory procedure, not an Observable entity.

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) | (http://snomed.info/id/719722006) of 472964009 | Allergic process (qualifier value) | (http://snomed.info/id/472964009) and 246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003) of 105590001 | Substance (substance) | (http://snomed.info/id/105590001). See template at Allergy to [substance] (finding) 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) | (http://snomed.info/id/192611004) has the 246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002) of 255398004 | Childhood (qualifier value) | (http://snomed.info/id/255398004)

Modeling

Multiple values of 246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002) 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) | (http://snomed.info/id/441862004) and its subtype 442614005 | Parasitic process (qualifier value) | (http://snomed.info/id/442614005) are included in the range for 370135005 | Pathological process (attribute) | (http://snomed.info/id/370135005). These are used in modeling the 40733004 | Infectious disease (disorder) | (http://snomed.info/id/40733004) subhierarchy.

For example,

- 17322007 | Disease caused by parasite (disorder) | (http://snomed.info/id/17322007) has the 370135005 | Pathological process (attribute) | (http://snomed.info/id/370135005) of 442614005 | Parasitic process (qualifier value) | (http://snomed.info/id/442614005)

370135005 | Pathological process (attribute) | (http://snomed.info/id/370135005)must not be used for values that could overlap with 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008).

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) | (http://snomed.info/id/708039003)

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.

Symptom intensity should be considered a separate dimension from *disease severity.* 246112005 | Severity (attribute) | (http://snomed.info/id/246112005) is not applied to 162465004 | Symptom severity (finding) | (http://snomed.info/id/162465004) because:

- *Severe* may be interpreted in different ways, depending on the set of values/value set available. Consider the different meaning of severity in each of the following sets of values:
  - 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.

Consequently, 246112005 | Severity (attribute) | (http://snomed.info/id/246112005) cannot be used for all Clinical findings that may be serious or life-threatening. Nevertheless, it is still useful to subclass certain concepts and to differentiate between severities of a single disorder.

Modeling

Generally, 246112005 | Severity (attribute) | (http://snomed.info/id/246112005) is not used to model concepts precoordinated in the International Release, but there are some exceptions. This attribute can be used as a qualifier in postcoordination.

Temporally related to

This attribute applies to perioperative complications in the clinical finding hierarchy. The attribute has a subhierarchy that specifies a period of time occurring before, during, or after a procedure; e.g. p erioperative complications refer to complications temporally related to a surgical procedure. They include preoperative, intraoperative, and postoperative complications and are modeled with a relationship consisting of 726633004 | Temporally related to (attribute) | (http://snomed.info/id/726633004) or an appropriate subtype.

Clinical Finding/Disorder Naming Conventions

The fully specified name (FSN) for a concept must be specific. The preferred term (PT) can be a word-order variant that is more clinician-friendly. For a Clinical finding/Disorder concept, name the morphologic abnormality before naming the anatomical site.

For example,

- 399525009 | Inflammation of ampulla of Vater (disorder) | (http://snomed.info/id/399525009), *Inflammation* is the morphologic abnormality and *ampulla of Vater is* the finding site

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.

- FSN: Disease of kidney
- PT: Can be either 'Kidney disease' or 'Renal disease'

Those conditions which are not described by an anatomical site, such as "Metabolic disease" or "Hereditary disease" or "Bacterial disease", are exempt from the |Disease of x| naming pattern. "Metabolic disease" is not improved by specifying "Disease of metabolism", and there is no more specific way to say "Hereditary disease" without making it convoluted.

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*)

- 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) | (http://snomed.info/id/417683006)

At risk of X/At risk for X

Use of *at risk of X* and *at risk for X* are both acceptable when naming concepts.

- Choose which sounds most natural.
- Synonyms may include the wording *at risk of X* and *at risk for X*, but adding both is not required.
- Creating separate concepts, one with *at risk of X* and one with *at risk for X*, is not permitted.

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 Head of Terminology

For the most part, e xisting *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.

Region

If the 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) 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) | (http://snomed.info/id/274205003) has a finding site of 371398005 | Eye region structure (body structure) | (http://snomed.info/id/371398005).

- FSN: Burn of eye region (disorder)
- PT: Burn of eye region

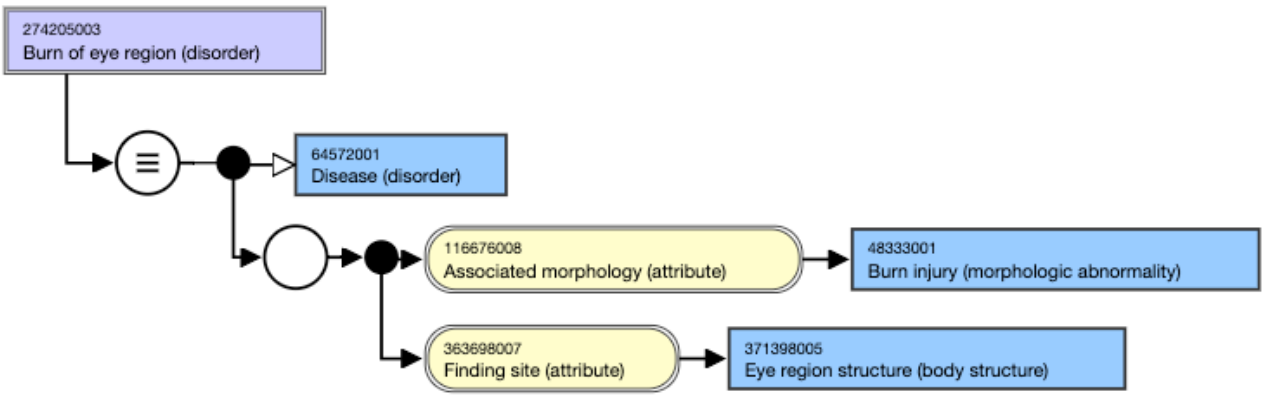


Figure 1: Stated view of |Burn of eye region (disorder)|

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)|

Adverse reaction to substances, multiple substances

A description for a ny concept that names a substance should be consistent with the Substance hierarchy description rules.

For example, 292121007 | Sulfasalazine adverse reaction (disorder) | (http://snomed.info/id/292121007)

- FSN: Sulfasalazine adverse reaction (disorder)
- PT: Sulfasalazine adverse reaction

For example, 292986000 | Ampicillin + flucloxacillin adverse reaction (disorder) | (http://snomed.info/id/292986000)

- FSN: Adverse reaction to ampicillin and/or flucloxacillin (disorder)
- PT: Adverse reaction to ampicillin and/or floxacillin (*US English*)
- PT: Adverse reaction to ampicillin and/or flucloxacillin (*GB English*)

> **Information**
>
> The modeling approach for multiple-ingredient concepts is a temporary solution. It incorrectly asserts an 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.

Adverse reaction caused by organisms

A description for any concept that names an organism should be consistent with the Organism hierarchy description rules.

- Use the scientific name for the organism in the FSN, e.g. Adverse reaction caused by Artemisia vulgaris pollen (disorder)
- Use the common name in the preferred term, e.g. Adverse reaction caused by mugwort
- The synonym should match the FSN, e.g. Adverse reaction caused by Artemisia vulgaris pollen

Allergic and nonallergic hypersensitivity (pseudoallergic) dispositions

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.

Allergic and nonallergic hypersensitivity (pseudoallergic) dispositions are the propensity to develop adverse allergic or nonallergic hypersensitivity (pseudoallergic) disorders.

Disposition	Patterns and examples
FSN	Patterns: • Allergy to X (finding) • Allergy to X and Y (finding) • X and Y in alphabetical order for concepts representing multiple substances For example, • Allergy to abacavir (finding)

Disposition	Patterns and examples
	• Allergy to Artemisia vulgaris pollen (finding)
PT	Patterns: • Allergy to X • Allergy to X and Y • X and Y in alphabetical order for concepts representing multiple substances For example, • Allergy to abacavir • Allergy to mugwort pollen

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:

Reaction	Patterns and examples
	• 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 *c ontact 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)
PT	Pattern: • Intolerance to X Example, • Intolerance to milk

Allergy to x vaccine

The terming and modeling editorial guidance for Allergy to X vaccine (for single and multiple ingredient vaccines) are located at:

- Allergy to X vaccine

Adverse reaction to x vaccine

The terming and modeling editorial guidance for Adverse reaction to X vaccine (for single and multiple ingredient vaccines) are located at:

- Adverse reaction to X vaccine

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) | (http://snomed.info/id/870465001)

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 the IHTSDO Authoring Projects; Anatomy Projects webpage Laterality (draft).
- See also Naming convention for anatomy (draft) for information on naming concepts referring to digits.

Right, left disorder concepts

Descriptions

- FSN: X (morphologic abnormality) of *right/left* X (body structure)
- PT: *Right/left* (disorder)

For example, 1089071000119109 | Inflammation of left mastoid (disorder) | (http://snomed.info/id/1089071000119109)

- FSN: Inflammation of left mastoid (disorder)
- PT: Left mastoiditis

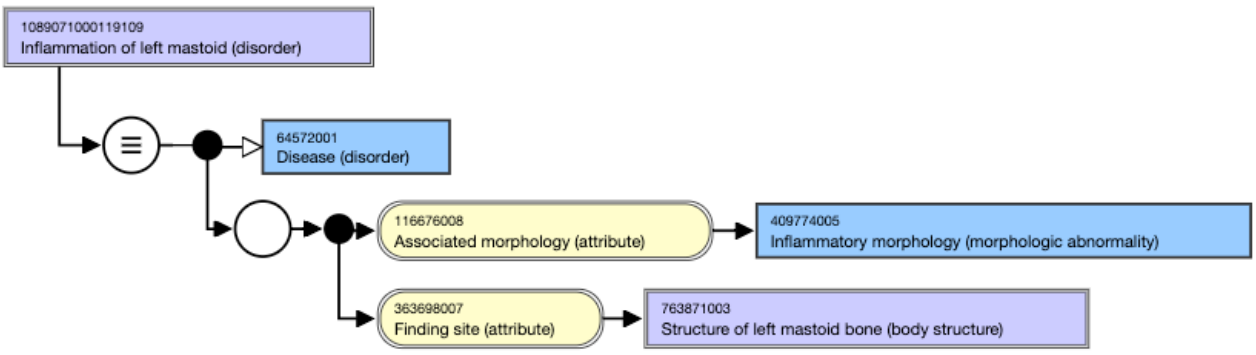


Figure 1: Stated view of |Inflammation of left mastoid (disorder)|

Bilateral disorder concepts

Descriptions

- FSN: X (morphologic abnormality) of bilateral (body structure)
- PT: Bilateral X (disorder)
- SYN: X (disorder) of bilateral (body structure)
- SYN: X (disorder) of both (body structure)

For example, 1084011000119100 | Inflammation of bilateral mastoids (disorder) | (http://snomed.info/id/1084011000119100)

- FSN: Inflammation of bilateral mastoids (disorder)
- PT: Bilateral mastoiditis
- SYN: Inflammation of bilateral mastoids
- SYN: Inflammation of both mastoids

Modeling of bilateral disorders

Bilateral disorders (or procedures) should be modeled using two relationship groups, one for each lateralized body structure.

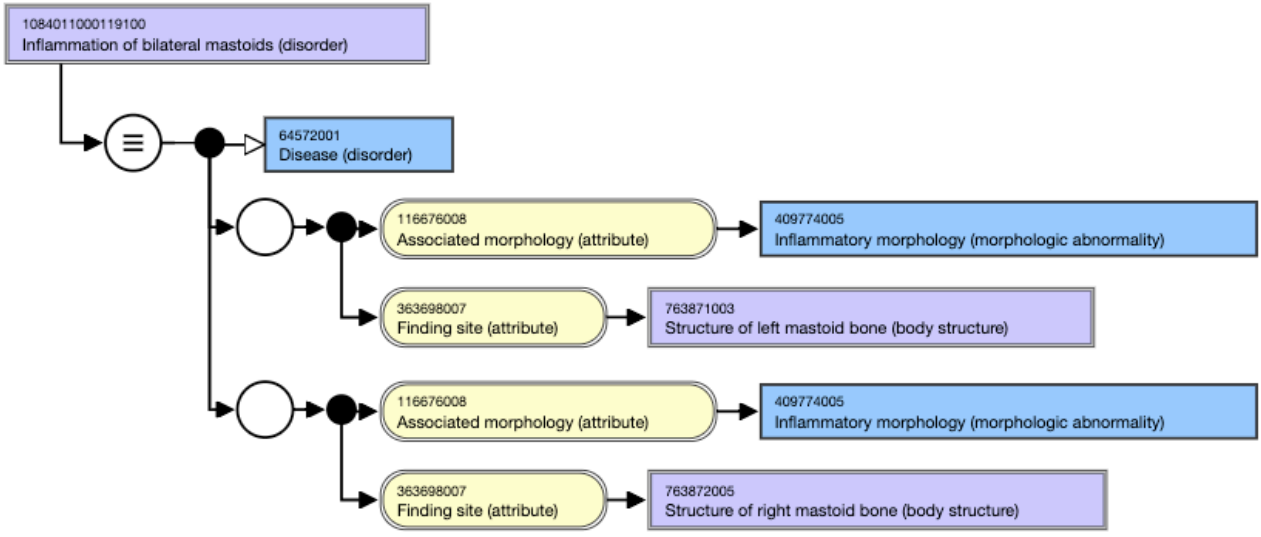


Figure 2: Stated view of |Inflammation of bilateral mastoids (disorder)|

Structure, Structure of

Lateralized disorder (and procedure) concepts 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) | (http://snomed.info/id/266005). a disorder concept with this body structure is 724056005 | Malignant neoplasm of lower lobe of right lung (disorder) | (http://snomed.info/id/724056005).
- For the body structure concept, 266005 | Structure of lower lobe of right lung (body structure) | (http://snomed.info/id/266005), a procedure with this body structure is 726425007 | Lobectomy of lower lobe of right lung (procedure) | (http://snomed.info/id/726425007).

Disorder Modeling

A disorder is always and necessarily an *abnormal clinical state*.

Disorder modeling information is as follows:

Specific Disorder Modeling

Topic links (by disorder type)

Ischemic disorder (see page)
Ischemic heart disease (see page)
Arrhythmia (see page)
Lesion (see page)
Trauma, injury (see page)
Friction injury, abrasion (see page)
Rupture (see page)
Traumatic disorders (see page)
Tumor vs. neoplasm (see page)
Primary vs secondary neoplastic disorders (see page)
Neoplasia (see page)
Neoplasm vs. hamartoma (see page)
Nevus (see page)
Infectious disease, inflammatory disorder (see page)
Pneumonia vs. Pneumonitis (see page)
Post-infectious Disorders (see page)
Bacterial disorders with organism and/or toxin (see page)
Hypersensitivity (see page)
Iatrogenic (see page)
Congenital (see page)
Congenital vs. acquired (see page)
Hereditary (see page)
Familial (see page)
Developmental (see page)
Genetic, developmental, congenital, and physical (see page)
Malformation, deformation, anomaly (see page)
Hematologic, lymphatic (see page)
Hematologic disorders, lymphoid and myeloid neoplasms (see page)
Coagulation, hemostasis, thrombosis (see page)
Hernias (see page)
Osteoarthritis (see page)
Multisystem disorders (see page)
Mental health disorders (see page)
Death (see page)

Poisoning (see page)

Vaccine-related overdose (see page)

Obstruction (see page)

Combining Morphologic Abnormalities (see page)

Remission (see page)

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.

Arrhythmia

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) | (http://snomed.info/id/72654001), are under 698247007 | Cardiac arrhythmia (disorder) | (http://snomed.info/id/698247007)

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) | (http://snomed.info/id/44808001) and placed under 698247007 | Cardiac arrhythmia (disorder) | (http://snomed.info/id/698247007).

Lesion

The word *lesion* can be used to refer to both structural and functional abnormalities. If a disorder (or procedure) refers to a lesion in a way that makes it clear that it is a generic term for a structural abnormality, then the correct modeling approach is to use 116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) = 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003) (For procedures, use 405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)).

Functional lesions should not be modeled using values from the Morphologically abnormal structure hierarchy.

Trauma, injury

The word *trauma* has multiple meanings. The first is physical damage to the body (versus emotional trauma). We assume *trauma* means physical damage unless accompanied by words that make clear it is emotional.

Injury is not synonymous with trauma since injuries, caused by stroke, drowning, or toxins, for example, are non-traumatic. Thus the concept, 417163006 | Traumatic AND/OR non-traumatic injury (disorder) | (http://snomed.info/id/417163006) .

⚠ Traumatic injury (disorder)

417746004 | Traumatic injury (disorder) | (http://snomed.info/id/417746004) is defined as any disorder with a morphology of 19130008 | Traumatic abnormality (morphologic abnormality) | (http://snomed.info/id/19130008).

Friction injury, abrasion

An injury due to *friction* can be represented using 400152004 | Friction injury (morphologic abnormality) | (http://snomed.info/id/400152004), in which case it will not classify as a kind of wound.

For example,

- 47222000 | Friction injury of tooth (disorder) | (http://snomed.info/id/47222000)
- 400068007 | Mechanical irritation (morphologic abnormality) | (http://snomed.info/id/400068007)

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) | (http://snomed.info/id/400061001).

For example,

- 211039006 | Abrasion, chest wall (disorder) | (http://snomed.info/id/211039006)

Rupture

Ruptures can occur either as a result of injury or spontaneously. The word *rupture*, when applied to muscles and tendons, implies a traumatic injury (e.g. 239731008 | Rupture of lateral collateral ligament of knee (disorder) | (http://snomed.info/id/239731008)). *Rupture,* when applied to an internal organ, may be either traumatic or spontaneous (e.g. 4240001 | Rupture of aorta (disorder) | (http://snomed.info/id/4240001), 88294009 | Rupture of ovary (disorder) | (http://snomed.info/id/88294009), etc).

Rupture has the *subtype* morphologies, 415747007 | Traumatic rupture (morphologic abnormality) | (http://snomed.info/id/415747007) and 125672000 | Nontraumatic rupture (morphologic abnormality) | (http://snomed.info/id/125672000) . It is important to make this distinction, at a minimum, in order to support queries related to the effects of trauma. Modelers choose:

415747007 | Traumatic rupture (morphologic abnormality) | (http://snomed.info/id/415747007) as the value of associated morphology for concepts involving anatomical sites, such as muscles and tendons, where trauma is involved (in the absence of a specific lesion).

For example,

- 209765005 | Rupture of tendon of thumb (disorder) | (http://snomed.info/id/209765005)

125671007 | Rupture (morphologic abnormality) | (http://snomed.info/id/125671007) as th e value of associated morphology for concepts involving anatomical sites, such as internal organs, where rupture may be traumatic or spontaneous.

For example,

- 46126003 | Rupture of artery (disorder) | (http://snomed.info/id/46126003)

125672000 | Nontraumatic rupture (morphologic abnormality) | (http://snomed.info/id/125672000), when it is stated as such.

For example,

- 268002004 | Non-traumatic tendon rupture (disorder) | (http://snomed.info/id/268002004)

Traumatic disorders

If an *injury/traumatic disorder* does not have a morphology which is a sub-class of 19130008 | Traumatic abnormality (morphologic abnormality) | (http://snomed.info/id/19130008), then an additional relationship group is added to express this relationship. The relationship is only required for traumatic injury concepts.

These disorders often have an FSN prefixed by *injury* or explicitly prefixed by *traumatic*.

Examples of FSNs,

- Injury of brachial plexus trunk (disorder)
-

Most traumatic concepts have the relationship groups, *Finding site* and *Associated morphology*.

For example, 721347007 | Fracture of third cervical vertebra (disorder) | (http://snomed.info/id/721347007) has

- Finding site (attribute) = Bone structure of C3 (body structure)
- Associated morphology (attribute) = Fracture (morphologic abnormality)

Usually, as in the above example, the morphology is a sub-class of 119130008 | Traumatic abnormality (morphologic abnormality) | and thus auto-classifies appropriately. However, some morphologies are not currently sub-classes of Traumatic abnormality, and a traumatic variant does not exist. These morphologies will not auto-classify as an injury.

For example, 722628000 | Traumatic hemorrhage of subdural space of infratentorial region (disorder) | (http://snomed.info/id/722628000)

- Associated morphology (attribute) = Hemorrhage (morphologic abnormality) and
- Finding site (attribute) = Structure of subdural space of infratentorial region (body structure)

In these cases an additional relationship group is added.

For example,

- Finding site (attribute) = Structure of subdural space of infratentorial region (body structure) and
- Associated morphology (attribute) = Traumatic abnormality (morphologic abnormality)

Tumor vs. neoplasm

The word *tumor* has two primary meanings, a mass, regardless of whether it is neoplastic or not, or a neoplastic mass. Neoplasm is preferred since it is less ambiguous than tumor.

For example,

- 92385005 | Benign neoplasm of small intestine (disorder) | (http://snomed.info/id/92385005)

Primary vs secondary neoplastic disorders

SNOMED *CT* follows ICD-O and ICD-10, where secondary malignant neoplasm of (*site X*) is uniformly interpreted to mean that metastasis has occurred *to site X*.

For example,

- 94521000 | Secondary malignant neoplasm of rib (disorder) | (http://snomed.info/id/94521000)

For concepts that describe metastasis *from* a malignant neoplasm, *SNOMED CT* explicitly uses the word *from*.

For example,

- 315006004 | Metastasis from malignant tumor of lung (disorder) | (http://snomed.info/id/315006004)

In *SNOMED CT*, metastases are modeled with two relationship groups, each with an appropriate morphology and site.

For example,

- 712849003 | Primary malignant neoplasm of prostate metastatic to bone (disorder) | (http://snomed.info/id/712849003):
    - IS A (attribute): Disease (disorder)
    - Finding site (attribute): Bone structure (body structure) and Associated morphology (attribute): Neoplasm, metastatic (morphologic abnormality)
    - Associated morphology (attribute): Malignant neoplasm, primary (morphologic abnormality) and Finding site (attribute): Prostatic structure (body structure)

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) | (http://snomed.info/id/126537000), not *neoplasia of bone*.

Neoplastic disease refers to the process of *neoplasia*, leading to the formation of a *neoplasm*.

Where the definition is *primary,* the associated morphology: 86049000 | Malignant neoplasm, primary (morphologic abnormality) | (http://snomed.info/id/86049000) is used.

Where the definition is *primary* or *secondary,* the morphology: 367651003 | Malignant neoplasm of primary, secondary, or uncertain origin (morphologic abnormality) | (http://snomed.info/id/367651003) is used.

Where the concept expresses a specific morphology, the FSN will alway contains the word *primary*.

For example,

- 9541000119105 | Primary adenocarcinoma of gallbladder (disorder) | (http://snomed.info/id/9541000119105)
    - Finding site (attribute): Gallbladder structure (body structure)
    - Associated morphology (attribute): Adenocarcinoma (morphologic abnormality)

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) | (http://snomed.info/id/399981008) has six subtypes:

- angiomatosis
- hamartoma
- hemangioma
- lymphangioma
- melanocytic nevus
- neoplastic disease

The SNOMED CT concept 400177003 | Neoplasm and/or hamartoma (morphologic abnormality) | (http://snomed.info/id/400177003) 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?
- 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.

Infectious disease and/or inflammatory disorder

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) | (http://snomed.org/fictid#) with the specified organism
- | Pathological process (attribute) | (http://snomed.org/fictid#) with the type of infectious process
- | Associated morphology (attribute) | (http://snomed.org/fictid#) with Inflammatory morphology or subtype
- | Finding site (attribute) | (http://snomed.org/fictid#) with a body structure when known

An infectious cause should neither be assumed nor modeled when the FSN does not specify it. For inflammatory conditions whose FSNs do *not* specify an infective cause, the modeling should exclude a Causative agent and Pathological process and should include only:

- | Associated morphology (attribute) | (http://snomed.org/fictid#) of Inflammatory morphology or subtype
- | Finding site (attribute) | (http://snomed.org/fictid#) with a body structure when known

Example of inflammatory *and* infectious disorder:

441551009 | Inflammation of larynx caused by virus (disorder) | (http://snomed.info/id/441551009)(synonym, Viral laryngitis) includes a | Causative agent (attribute) | (http://snomed.org/fictid#) of | Virus (organism) | (http://snomed.org/fictid#) and a | Pathological process (attribute) | (http://snomed.org/fictid#) of | Infectious process (qualifier value) | (http://snomed.org/fictid#).

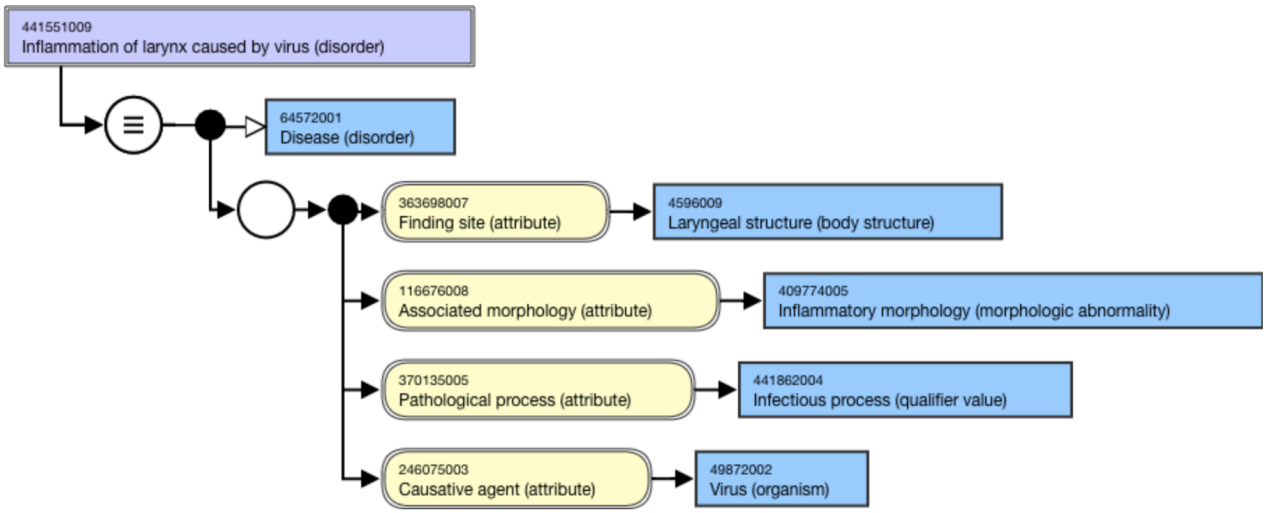


Figure 1: Stated view of 441551009 |Inflammation of larynx caused by virus (disorder)|

Example of inflammatory disorder *not* specified as infectious:

446292002 | Necrotizing inflammation of lymph node (disorder) | (http://snomed.info/id/446292002) (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) | (http://snomed.org/fictid#) and a | Finding site (attribute) | (http://snomed.org/fictid#).

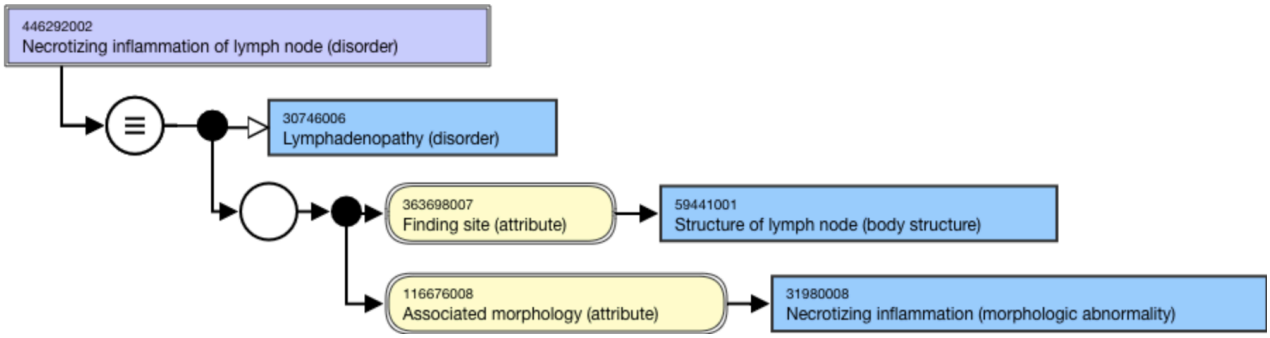


Figure 1: Stated view of 446292002 |Necrotizing inflammation of lymph node (disorder)|

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) | (http://snomed.info/id/233604007) is 707496003 | Inflammation and consolidation (morphologic abnormality) | (http://snomed.info/id/707496003).

The morphologic abnormality for 205237003 | Pneumonitis (disorder) | (http://snomed.info/id/205237003) is 409774005 | Inflammatory morphology (morphologic abnormality) | (http://snomed.info/id/409774005).

Post-infectious disorders

Post-infectious disorders are not subtypes of infectious disorders. The *After* attribute is used for linking post-infectious disorders with their associated infections.

Bacterial disorders with organism and/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

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) | (http://snomed.info/id/276202003) is modeled with a causative agent of 30917009 | Clostridium tetani (organism) | (http://snomed.info/id/30917009) 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) | (http://snomed.info/id/76902006) is modeled with a causative agent of 30917009 | Clostridium tetani (organism) | (http://snomed.info/id/30917009) as well as 26159005 | Clostridium tetani toxin (substance) | (http://snomed.info/id/26159005).

Hypersensitivity

473010000 | Hypersensitivity condition (finding) | (http://snomed.info/id/473010000) is a primitive concept. It subsumes 473011001 | Allergic condition (finding) | (http://snomed.info/id/473011001) and 609405001 | Non-allergic hypersensitivity condition (finding) | (http://snomed.info/id/609405001).

473010000 | Hypersensitivity condition (finding) | (http://snomed.info/id/473010000) is a direct descendant of 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003).

473011001 | Allergic condition (finding) | (http://snomed.info/id/473011001) and 609405001 | Non-allergic hypersensitivity condition (finding) | (http://snomed.info/id/609405001) 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).

Disorders of immune function

Allergic reaction

419076005 | Allergic reaction (disorder) | (http://snomed.info/id/419076005) has a causative agent (attribute) of 105590001 | Substance (substance) | (http://snomed.info/id/105590001).

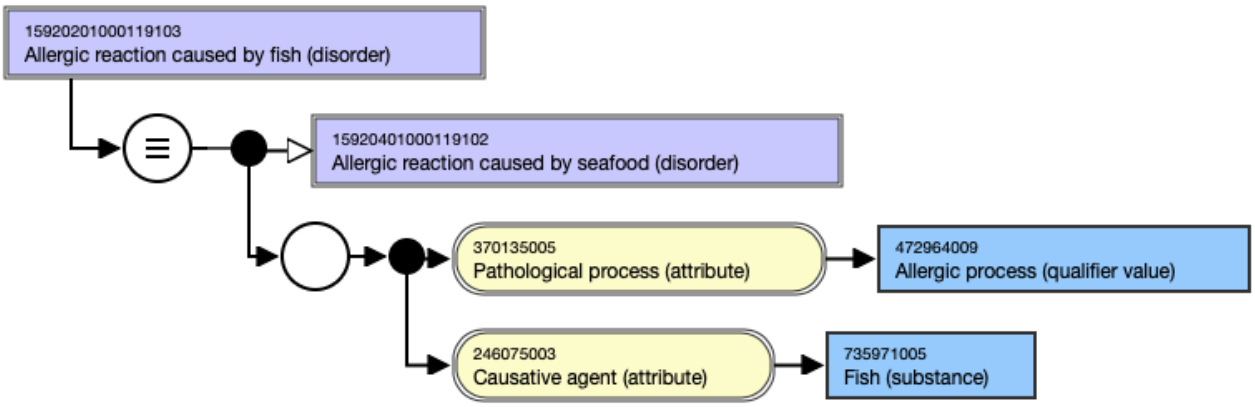


Figure 3: Stated view of 15920201000119103 |Allergic reaction caused by fish (disorder)|

Modeling 414029004 | Disorder of immune function (disorder) | (http://snomed.info/id/414029004) with 769247005 | Abnormal immune process (qualifier value) | (http://snomed.info/id/769247005) allows allergic and autoimmune disorders to correctly classify as *disorders of immune function*.

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 groups:

116676008 | Associated morphology (attribute) | (http://snomed.info/id/116676008) and 363698007 | Finding site (attribute) | (http://snomed.info/id/363698007) representing the abnormal structure

Pathological process: 472963003 | Hypersensitivity process (qualifier value) | (http://snomed.info/id/472963003), or one of its descendants

246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003): substance (if specified)

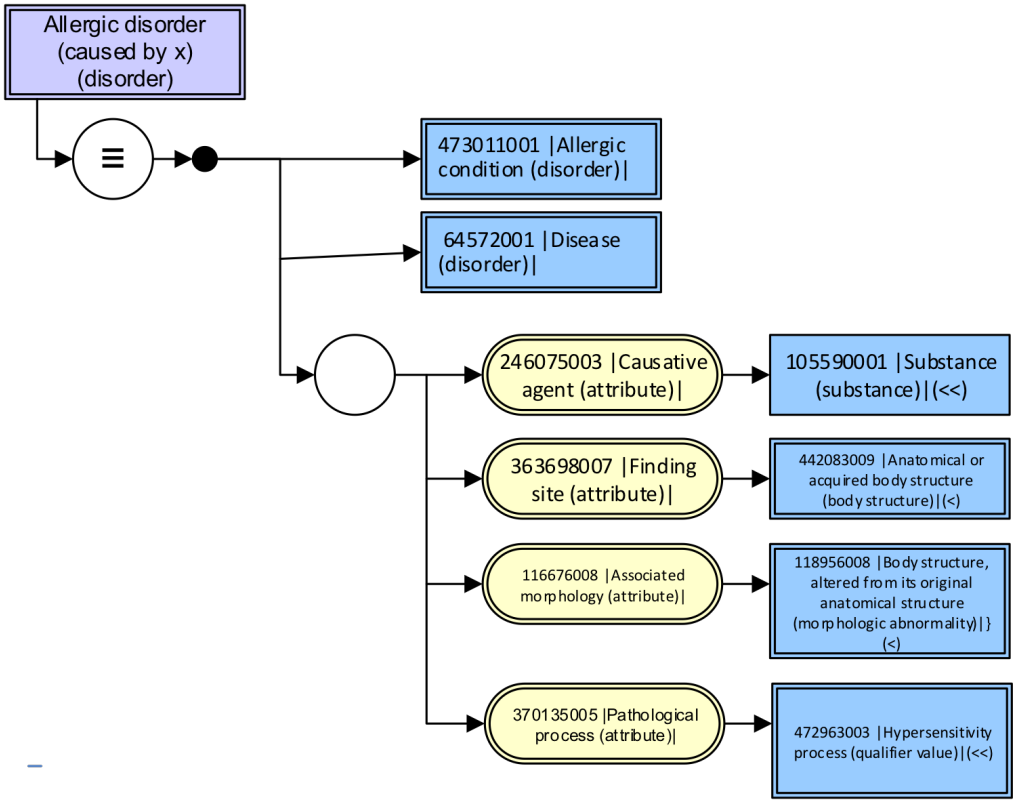
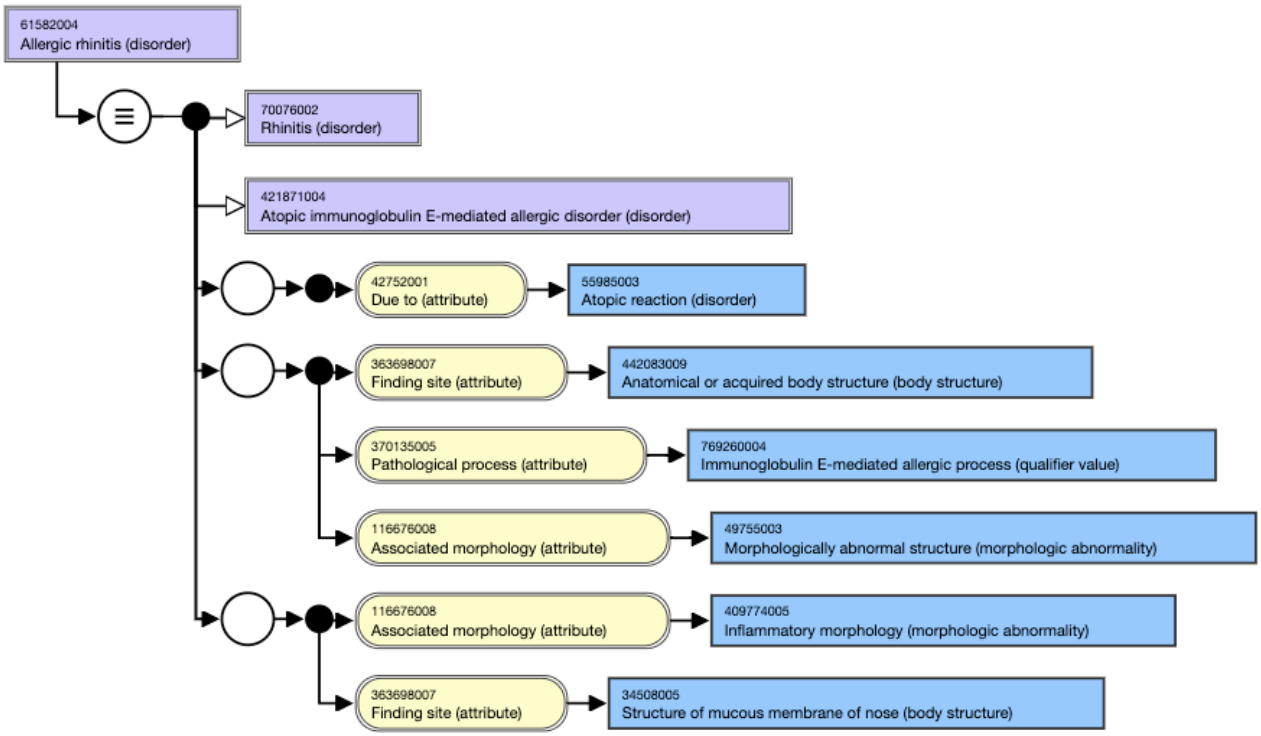


Figure 4: Allergic and nonallergic hypersensitivity (pseudoallergic) disease model
For example,



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.

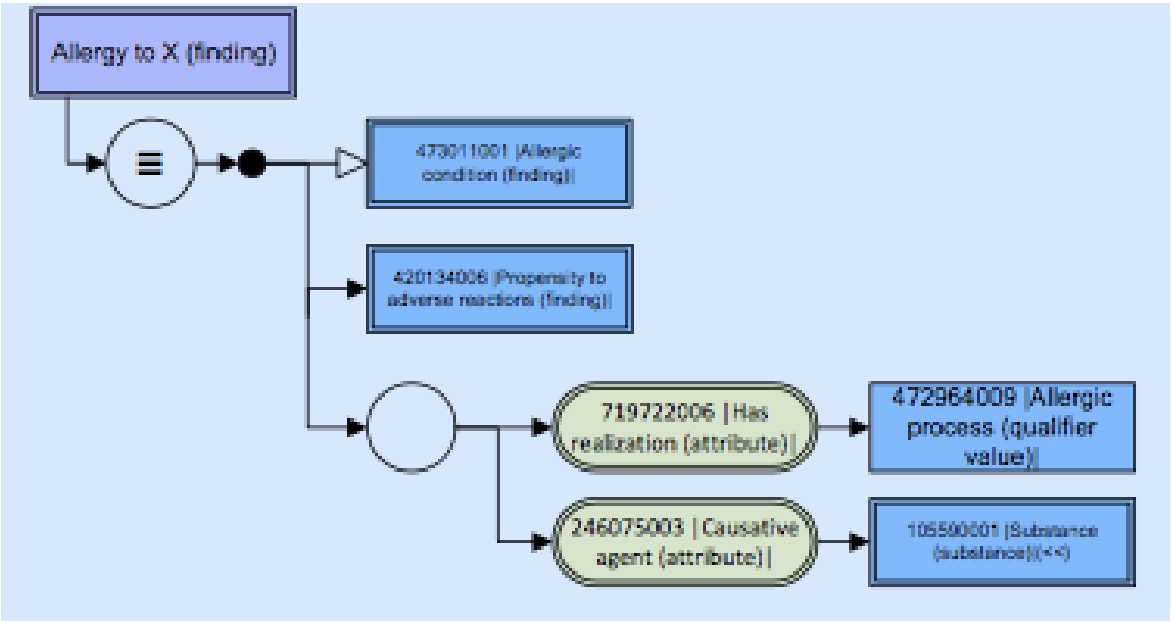


Figure 5: Allergic and nonallergic hypersensitivity (pseudoallergic) disposition model

For example,

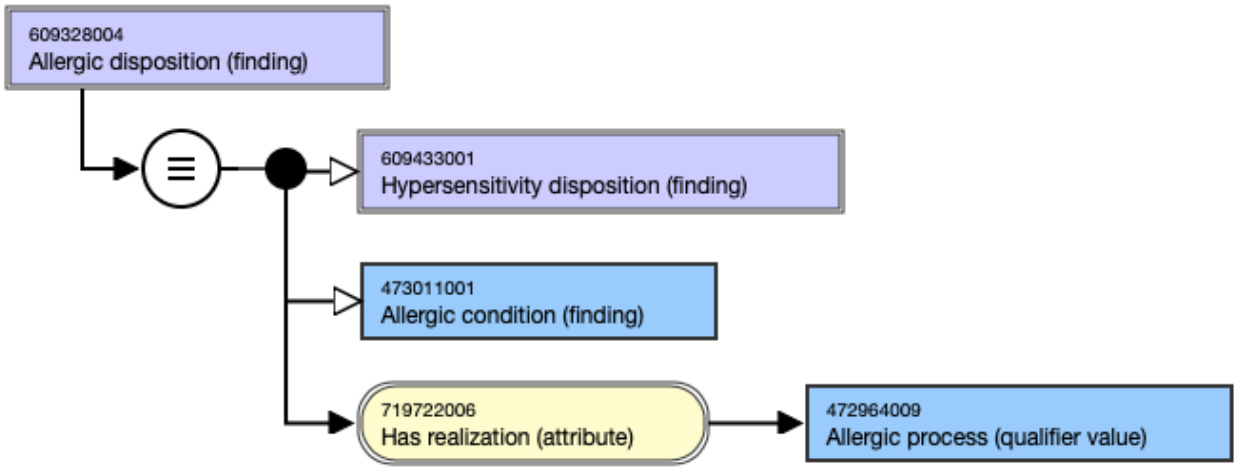


Figure 6: Allergic disposition (finding) modeling

Allergic and nonallergic hypersensitivity (pseudoallergic) reaction

Allergic and nonallergic hypersensitivity (pseudoallergic) reactions are adverse reactions and allergic conditions. Like diseases/disorders, they are defined by underlying pathological processes.

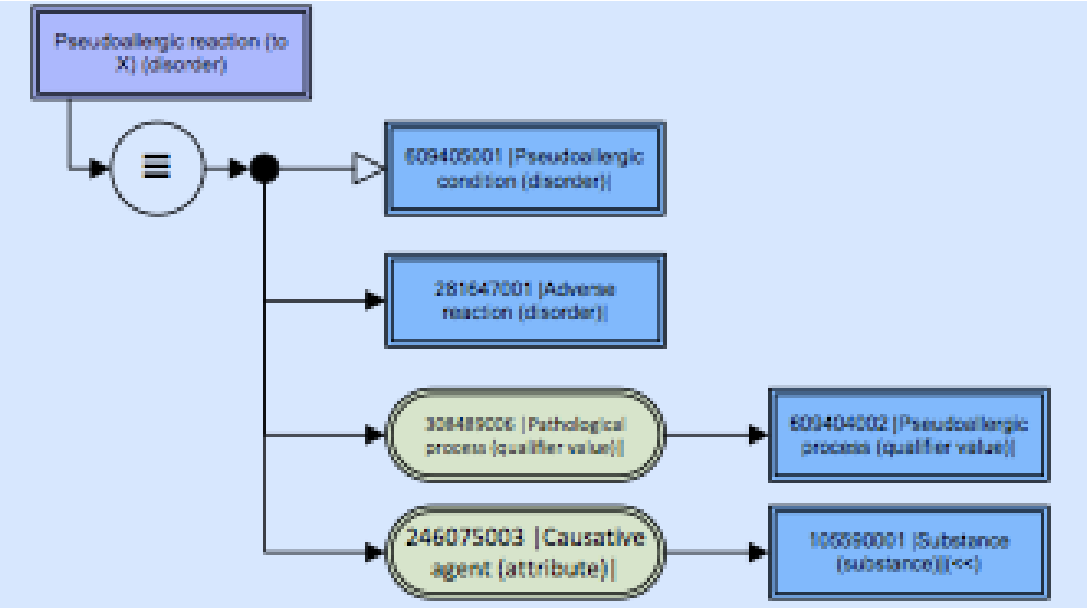
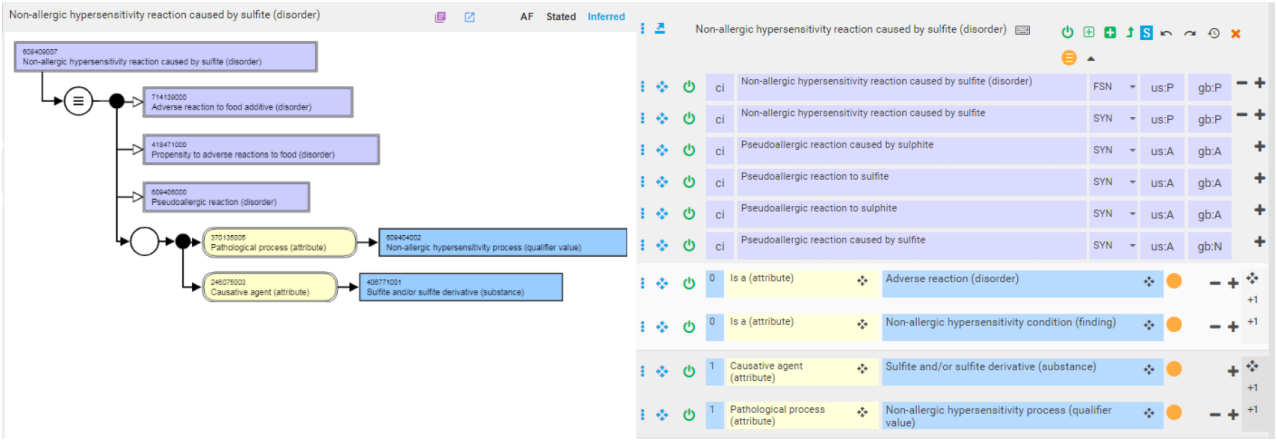


Figure 7: Allergic and nonallergic hypersensitivity (pseudoallergic) reaction model

For example,



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) | (http://snomed.info/id/47429007) is used to model intolerance to substances.

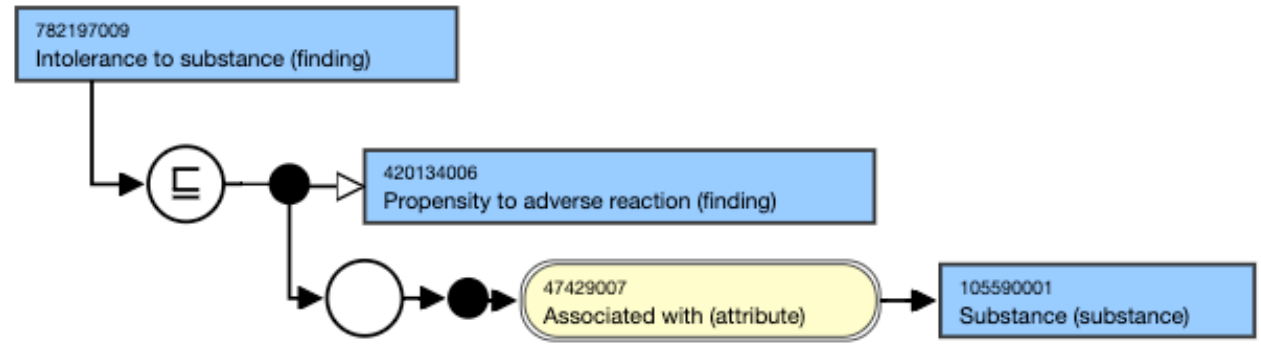
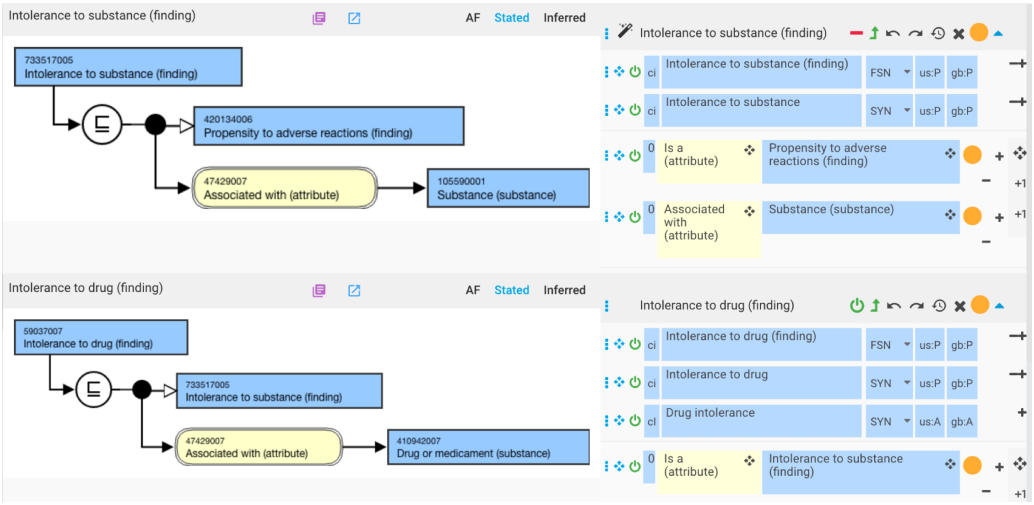


Figure 8: Stated view of |Intolerance to substance (finding)| model

For example,



Iatrogenic

Adding to the iatrogenic disorder hierarchy is discouraged. An iatrogenic disorder should remain as a primitive concept. It should be a child of 116223007 | Complication (disorder) | (http://snomed.info/id/116223007). *Iatrogenic* is not available as a value of 263547006 | Pathogenesis (attribute) | (http://snomed.info/id/263547006).

Subtypes of 12456005 | Iatrogenic disorder (disorder) | (http://snomed.info/id/12456005) that have FSNs without the word *iatrogenic*, should be remodeled by inactivating the IS_A relationship to 12456005 | Iatrogenic disorder (disorder) | (http://snomed.info/id/12456005).

Concepts with *iatrogenic* in the FSN should be modeled with an IS_A relationship to 12456005 | Iatrogenic disorder (disorder) | (http://snomed.info/id/12456005).

For example,

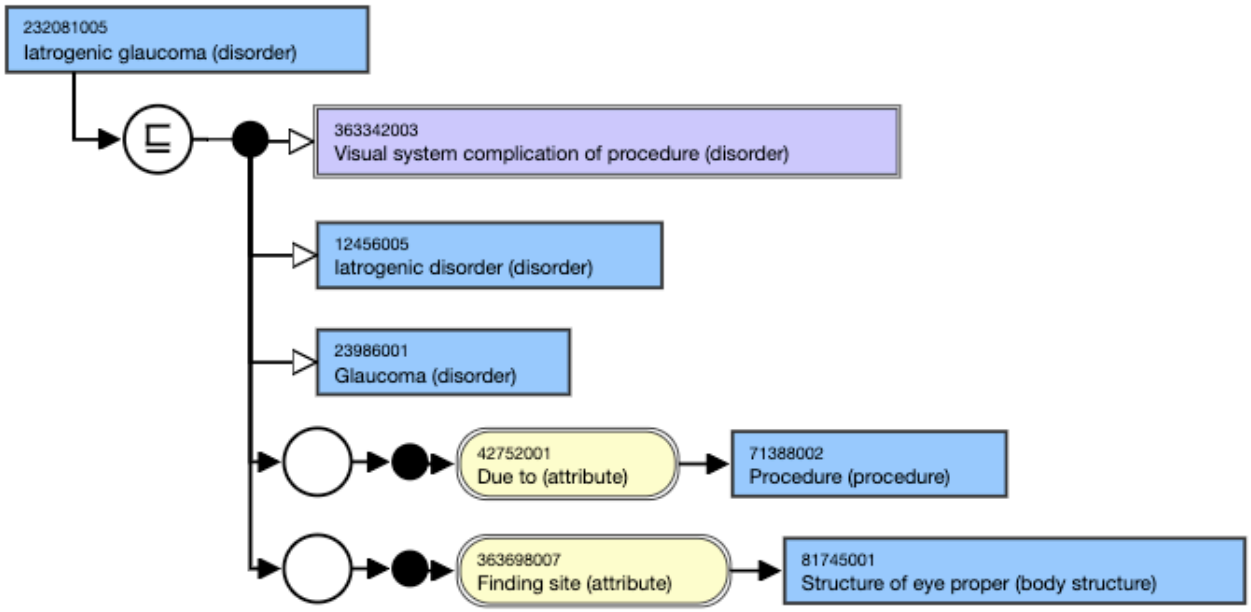


Figure 9: Inferred view of 232081005 |Iatrogenic glaucoma (disorder)| using IS_A 12456005 |Iatrogenic disorder (disorder)|

Congenital

The concept 66091009 | Congenital disease (disorder) | (http://snomed.info/id/66091009), means present at birth. Though the word *congenital* may be applied to genetic disorders, the term *genetic* is preferred for those disorders.

The logical definition of a congenital disorder must include:

Occurrence = Congenital (qualifier value).

It may also include:

Finding site = X (body structure)

Associated morphology = X (morphologic abnormality)

Pathological process = Pathological development process (qualifier value)

The relationship, | Pathological process (attribute) | (http://snomed.org/fictid#) = | Pathological developmental process (qualifier value) | (http://snomed.org/fictid#), is required when the concept definition includes an | Associated morphology (attribute) | (http://snomed.org/fictid#).

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) | (http://snomed.info/id/66091009).

Congenital X (morphologic abnormality) concepts are being inactivated hence Congenital anomaly disorder grouper concepts, such as 9904008 | Congenital anomaly of cardiovascular system (disorder) | (http://snomed.info/id/9904008) , 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) | (http://snomed.info/id/399898009)not 102283003 | Congenital misalignment (morphologic abnormality) | (http://snomed.info/id/102283003).

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) | (http://snomed.info/id/871598001)

Congenital versus acquired

Disorders may be either *congenital* or *acquired*. The *acquired* form should only exist when there is a need to differentiate from the congenital form not but not when no congenital variant exists.

Congenital disorders are modeled using 246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002) of 255399007 | Congenital (qualifier value) | (http://snomed.info/id/255399007). 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) | (http://snomed.info/id/33534005) is modeled with 246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002) of 255399007 | Congenital (qualifier value) | (http://snomed.info/id/255399007)

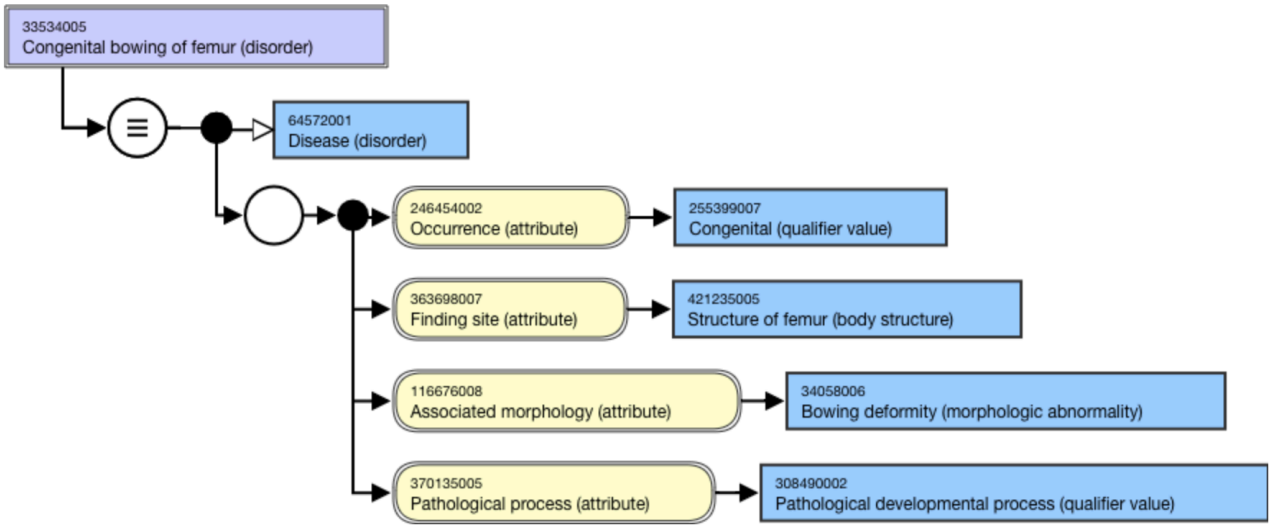
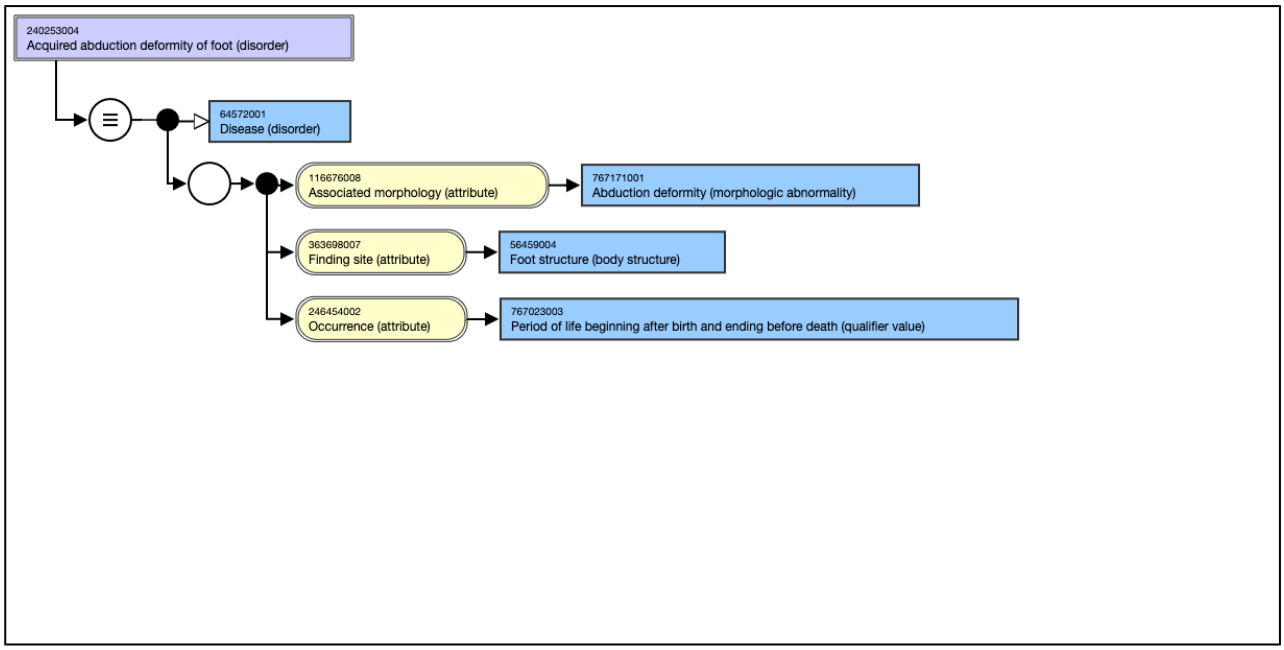


Figure 10: Stated view of 33534005 |Congenital bowing of femur (disorder)|

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, see 240253004 |Acquired abduction deformity of foot (disorder)|



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) | (http://snomed.info/id/14333004)).

Modeling: Acquired disorders

When revising acquired disorders, remove any acquired morphologies and replace with general parent morphologies, e.g. replace 127560004 | Acquired deformity (morphologic abnormality) | (http://snomed.info/id/127560004) with 6081001 | Deformity (morphologic abnormality) | (http://snomed.info/id/6081001). 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*.

Hereditary

It may be a challenge to classify a condition as a 32895009 | Hereditary disease (disorder) | (http://snomed.info/id/32895009). *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.

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*.

Developmental

Developmental is a useful label for disorders that affect developing structures or functions that may occur during pre- or postnatally. They may be present at birth or develop later.

Genetic, developmental, congenital, and physical

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?

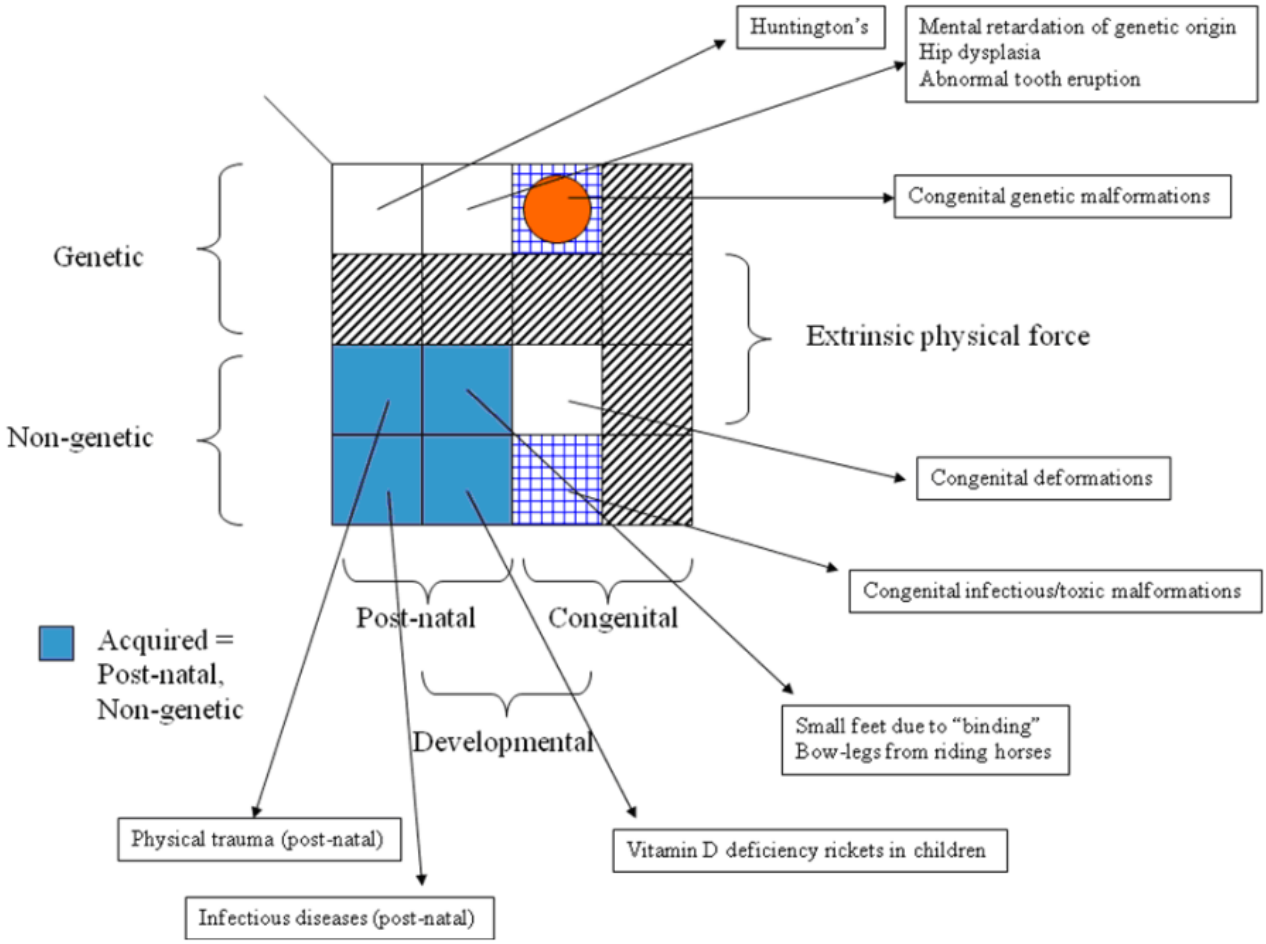


Figure 11: The relationships of genetic, congenital, developmental, and acquired disorders**Explanation of Figure**

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.

Malformation, deformation, anomaly

A *deformation* is a structural abnormality that is due to an extrinsic physical force. Newly created concepts representing a deformity should be considered disorders.

Malformations are structural abnormalities that result from intrinsically disordered development. The word *anomaly* is, by itself, ambiguous. It may mean: any abnormality including non-structural ones; malformation; both malformation and deformation. Concepts with the word *anomaly* must be evaluated for ambiguity.

For example,

- *Congenital anomaly of <x structure>* is definitely structural, 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*.

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) | (http://snomed.info/id/118599009) has 128930002 | Hodgkin lymphoma - category (morphologic abnormality) | (http://snomed.info/id/128930002). The body site involved (especially specific lymph node groups or skin sites).

For example,

- 400122007 | Primary cutaneous T-cell lymphoma (disorder) | (http://snomed.info/id/400122007) 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.

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).

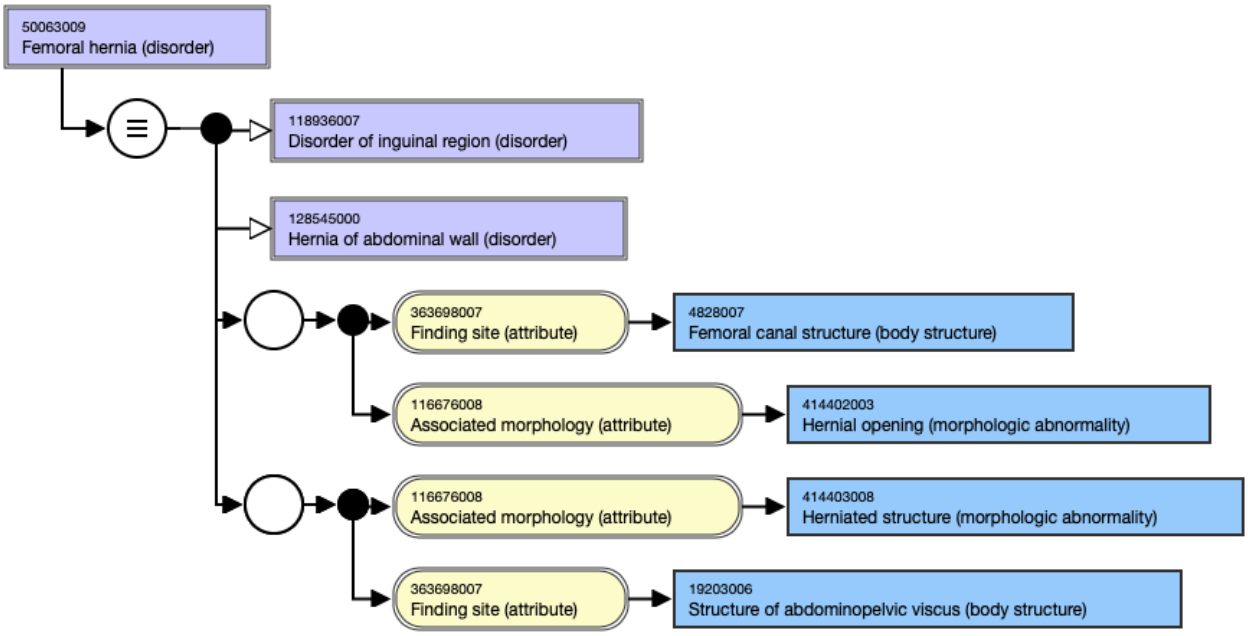
Coagulation, hemostasis, thrombosis

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*.

Hernias

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 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) | (http://snomed.info/id/50063009) is modeled with finding site = 19203006 | Structure of abdominopelvic viscus (body structure) | (http://snomed.info/id/19203006) to represent the herniated structure.



Osteoarthritis

396275006 | Osteoarthritis (disorder) | (http://snomed.info/id/396275006) is regarded as a degenerative disease, despite the *-itis* in its name. Because of this, 396275006 | Osteoarthritis (disorder) | (http://snomed.info/id/396275006) is not a *subtype* of arthritis in the disorder hierarchy but instead, the more general, 399269003 | Arthropathy (disorder) | (http://snomed.info/id/399269003). 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 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.

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,

- In 702410002 | Iris coloboma with ptosis, hypertelorism, and mental retardation (disorder) | (http://snomed.info/id/702410002), the coloboma of the iris is not always present. This 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.

For example,

- 717909004 | Bilateral microtia with deafness and cleft palate syndrome (disorder) | (http://snomed.info/id/717909004)

A multisystem disorder with an eponymous syndrome name should be included as a synonym only.

Mental health disorders

Dependence-related concepts which express the current existence of abuse are acceptable.

For example,

- 191816009 | Drug dependence (disorder) | (http://snomed.info/id/191816009)

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)

Concepts describing *full* or *partial remission* are acceptable but not the phase of the remission. The patterns are:

- X in full remission
- X in partial remission

For example,

- 46244001 | Recurrent major depression in full remission (disorder) | (http://snomed.info/id/46244001)
- 5703000 | Bipolar disorder in partial remission (disorder) | (http://snomed.info/id/5703000)

Unacceptable examples,

- 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. *Co-occurrent* and *Due to*, and *Due to situations* are acceptable, but not simple *Co-occurrent*.

For example,

- 724665004 | Perceptual disturbances co-occurrent and due to sedative withdrawal (disorder) | (http://snomed.info/id/724665004)

Concepts containing X without Y are considered on a case-by-case basis.

For example,

- 724735003 | Oppositional defiant disorder without chronic irritability-anger (disorder) | (http://snomed.info/id/724735003)

Unacceptable example,

- Bipolar type II disorder with current episode moderately depressive without psychotic symptoms

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) | (http://snomed.info/id/127337006). 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*.

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 overdose

For the January 2020 Release, vaccine-related overdose concepts in the Clinical Finding/Disorder hierarchy were inactivated. They were replaced with concepts in the Event hierarchy, see 788094008 | Excessive dose of vaccine administered (event) | (http://snomed.info/id/788094008) 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*.

Vaccine-related poisoning

Vaccine-related poisoning concepts have been inactivated.

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, w hen 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. A t 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.

Combining Morphologic Abnormalities to Prevent Multiple Groups

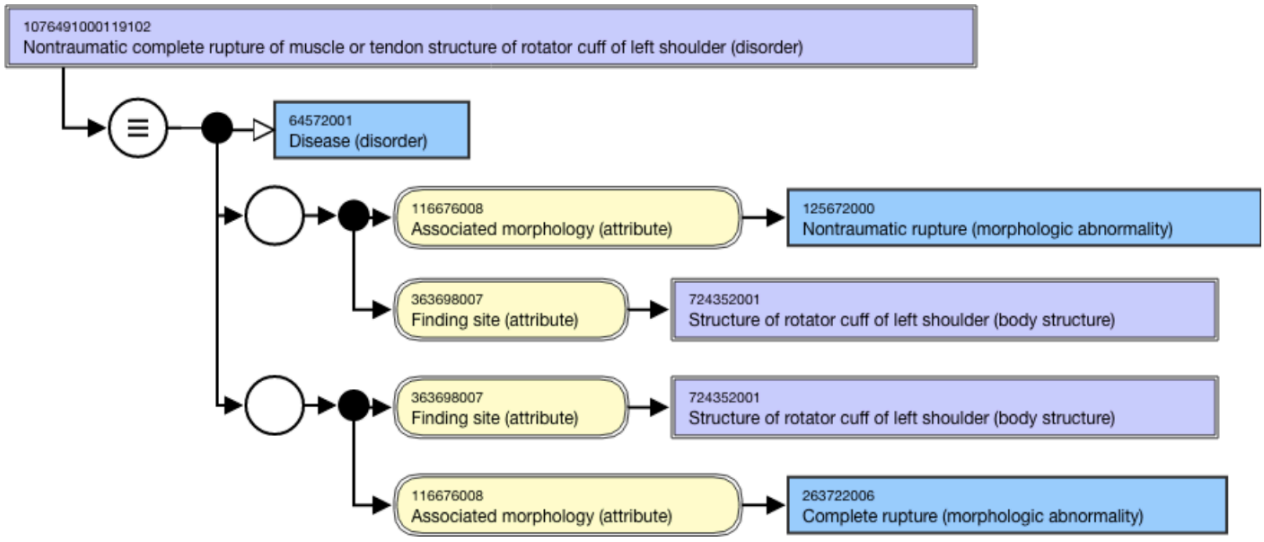
When modeling a concept requiring two role groups with the same body structure but two different morphologies (because a combined morphology does not exist), then those morphologic abnormalities can be combined to create a single |(morphologic abnormality)| concept. Keep the newly-created morphologic abnormality concept primitive as all morphologic abnormality concepts are primitive.

Example: Modeling			
Concept	Associated morphology	Associated morphology	Associated (combined) morphology
400067002 | Acantholytic epidermal nevus (disorder) | (http://snomed.info/id/400067002)	25201003 | Epidermal nevus (morphologic abnormality) | (http://snomed.info/id/25201003)	43327007 | Acantholysis (morphologic abnormality) | (http://snomed.info/id/43327007)	787085004 | Acantholytic epidermal nevus (morphologic abnormality) | (http://snomed.info/id/787085004)

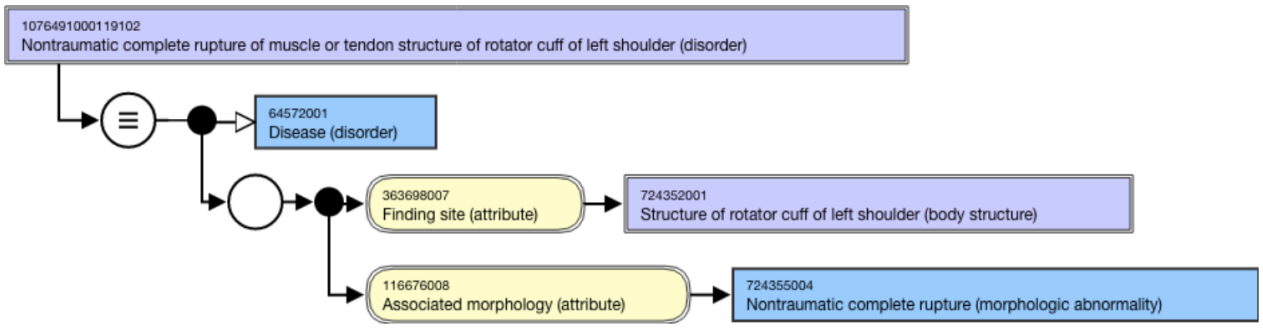
Another example is 1076491000119102 | Nontraumatic complete rupture of muscle or tendon structure of rotator cuff of left shoulder (disorder) | (http://snomed.info/id/1076491000119102).

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 this:



Model like this:

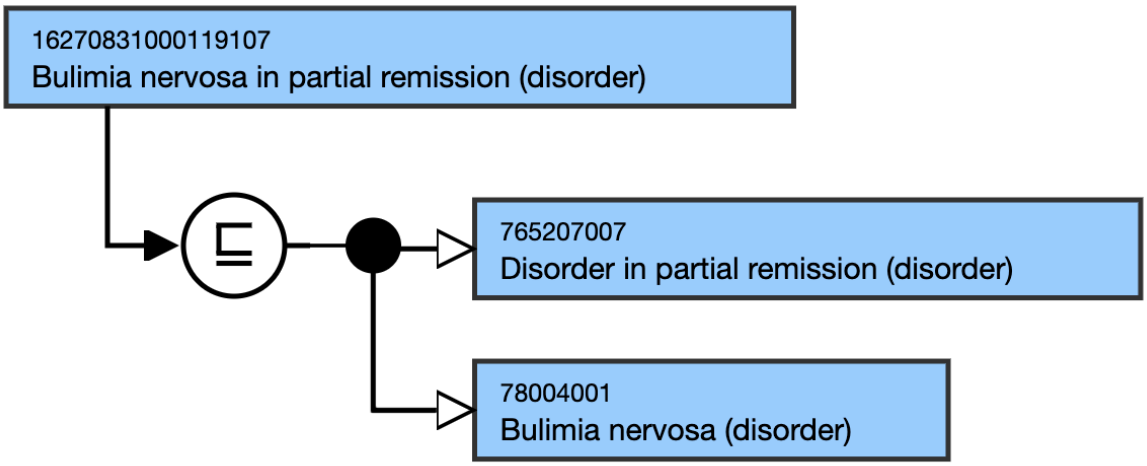


Disorder in remission

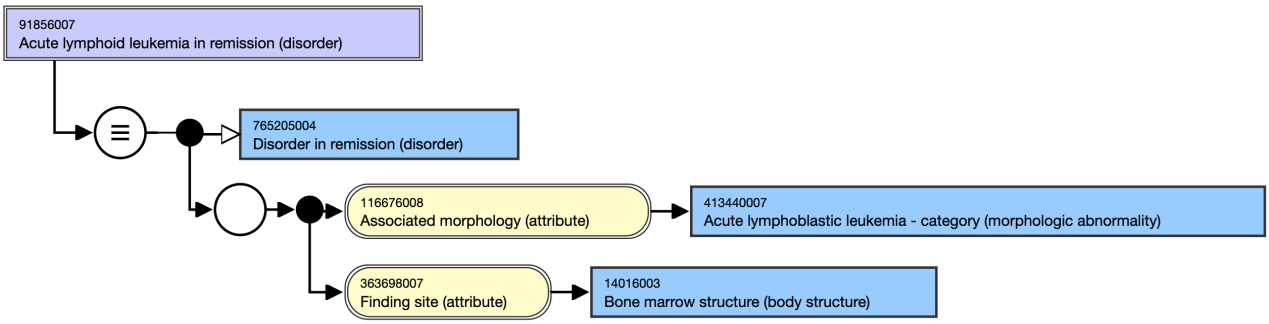
<X> disorder in remission concepts require a stated relationship to the appropriate primitive *Disorder in remission* supertype, in addition to the appropriate supertype for the disorder. With the latter, where the primitive supertype for the disorder is |Disease (disorder)|, only the *Disorder in remission* supertype will be required.

For example,

16270831000119107 | Bulimia nervosa in partial remission (disorder) | (http://snomed.info/id/16270831000119107) has stated parents of 78004001 | Bulimia nervosa (disorder) | (http://snomed.info/id/78004001) and 765207007 | Disorder in partial remission (disorder) | (http://snomed.info/id/765207007).



91856007 | Acute lymphoid leukemia in remission (disorder) | (http://snomed.info/id/91856007) has only one stated parent of 765205004 | Disorder in remission (disorder) | (http://snomed.info/id/765205004) because a potential supertype of 64572001 | Disease (disorder) | (http://snomed.info/id/64572001) would be unnecessary.



Disorder Combination Modeling

There are many disorders that can occur in combination in the same patient. Guidance on the modeling and terming of FSNs for disorder combinations simplifies available options to achieve consistency. C linically significant disorder combinations are represented in Snomed by a single concept so that implementers can document temporal, causal, and/or other relationships between the conditions.

As a means of expressing an association between conditions, one of the following associations is used:

- Simple co-occurrence: where two or more conditions have no known causal or temporal relationship but are found together more often than by random chance
- Causation 1: where the cause is another finding or disorder, an event, or procedure
- Causation 2: where the cause is a physical force, physical object, organism, or substance

Causality

Whether *Y* follows *X* incidentally or *Y* is caused by *X*, is fundamentally different. Causal relationships between disorders are represented using the 42752001 | Due to (attribute) | (http://snomed.info/id/42752001)when *X* is not merely a risk factor for Y, and it is reasonable to believe that the association between *X* and *Y* is not just coincidental.

When modeling a *disorder due to another disorder*, do not use 116223007 | Complication (disorder) | (http://snomed.info/id/116223007) as a supertype.

When modeling a *disorder due to a procedure*, use 116223007 | Complication (disorder) | (http://snomed.info/id/116223007) as a supertype.

Truth Table

When considering disorder combinations two questions can be asked:

1. Is there a *causal* relationship?
2. What is the *temporal* relationship?

The following truth table provides the possible combinations/answers. It allows authors to assign combination disorders to one category, to which the appropriate modeling and FSN construction is applied. The stricter rules for FSN construction do not prevent the addition of more familiar connectives in other descriptions, for example *with*, or *associated with*.

		Is there a stated causal relationship?		
		Yes, cause is another finding, disorder, or event	Yes, cause is a physical object or force, organism, or substance	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 Y X after Y	NA	X after Y
	X precedes Y	X due to Y X before Y	NA	X before Y
	X occurs during Y	X due to Y X during Y	NA	X during Y
	X occurs before, during, and/or after Y	X due to Y X temporally related to Y	NA	X temporally related to Y

- *Temporally related to* and subtypes, *before* and *during* are only approved to model perioperative complications
- All *after* relationships are considered to be sequelae
    - Sequelae which are also complications (late complications) are modeled using both *due to* and *after* relationships

Modeling

Document multiple conditions in a single statement only for syndromes or strong associations based on a common predisposing factor.

Simple co-occurrence

Simple co-occurrence

Default modeling pattern	Default FSN
Assign each participating disorder 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, such as: • Named syndromes, such as 398114001 | Ehlers-Danlos syndrome (disorder) | (http://snomed.info/id/398114001) • Manifestations of systemic disorders, such as 83901003 | Sjögren's syndrome (disorder) | (http://snomed.info/id/83901003) 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* PT: Eponyms may be used if available and acceptable

Examples:

41931000119102 | Sinusitis co-occurrent with nasal polyps (disorder) | (http://snomed.info/id/41931000119102)

714203003 | Acute bronchitis co-occurrent with bronchiectasis (disorder) | (http://snomed.info/id/714203003)

Incorrectly named legacy examples (not to be repeated):

Psoriasis-eczema overlap condition (disorder)

Hay fever with asthma (disorder)

Modeling

There are complications which likely exist prior to a disorder or procedure.

For example, the legacy term, 609454008 | Induced termination of pregnancy complicated by acute necrosis of liver (disorder) | (http://snomed.info/id/609454008)

- *Acute necrosis of liver* is the complication however, temporally it is neither *due to* nor *during*. It was likely to be present prior to the procedure.
- The concept will be inactivated. The concepts, 714812005 | Induced termination of pregnancy (procedure) | (http://snomed.info/id/714812005) and 197269008 | Acute necrosis of liver (disorder) | (http://snomed.info/id/197269008), should be used for documentation in the medical record.

Pattern Variance

- The requestor submission FSN may be used as preferred term even if it does not comply with the above recommended pattern.
- Exceptions may exist to the above policy which will need to be reviewed on a case-by-case basis.

Causation 1

Cause is another finding, disorder, event or procedure

Default modeling pattern	Default FSN construction
Assign the resultant caused disorder as a supertype (or ensure that the caused disorder is present in the ancestor tree following classification). Assign the causal disorder as the target of a *due to* relationship. Add concept 116223007 | Complication (disorder) | (http://snomed.info/id/116223007) as a supertype only if caused disorder is the result of a procedure	Where X occurs due to another disorder, procedure, or event Y (which is no longer necessarily present), construct an FSN of the form: *X due to Y*

Examples:

735200002 | Absence of lower limb due to diabetes mellitus (disorder) | (http://snomed.info/id/735200002)

735621005 | Adhesions due to endometriosis (disorder) | (http://snomed.info/id/735621005)

Incorrectly named legacy examples (not to be repeated):

Neutropenia associated with acquired immunodeficiency syndrome (disorder)

Dilated cardiomyopathy secondary to granuloma (disorder)

There are approximately 600 legacy concepts modeled as *co-occurrent and due to*. They should remain pending further analysis. Do not add new concepts as *co-occurrent and due to*, instead model with the *due to* attribute.

Umbilical cord complication

- Model as IS A 362972006 | Disorder of labor / delivery (disorder) | (http://snomed.info/id/362972006) due to X (disorder).
- The concept, *48287005 | Umbilical cord complication (disorder) | (http://snomed.info/id/48287005)*, is to be inactivated.

Causation 2

Cause is a material entity; means of exposure/introduction are not significant (if significant, then the causal factor is an *event* and treated as Causation 1)

Default modeling pattern	Default FSN and PT

Causation 2	
Assign the caused disorder as a supertype or ensure that the caused disorder is present in the ancestor tree following classification Assign the causal factor as the target of a *Causative agent* relationship	Where X occurs due to exposure to material entity Y, construct an FSN of the form: *X caused by Y*
Examples:	
291000119100 | Contact dermatitis caused by chemical (disorder) | (http://snomed.info/id/291000119100) 17322007 | Disease caused by parasite (disorder) | (http://snomed.info/id/17322007)	
Incorrectly named legacy examples (not to be repeated):	
Choking due to airways obstruction (finding) Coma associated with diabetes mellitus (disorder)	

Temporal sequencing, without necessary implication of causation	
Modeling captures and emphasizes *non-overlap*. Explicit causation may be captured using both *due to* AND *after* relationships, as in the truth table above.	
Default modeling pattern	Default FSN construction
Assign the *second/following* disorder as a supertype, or ensure that the caused disorder is present in the ancestor tree following classification Assign the *first/followed* disorder or procedure as the target of an *after* relationship For two or more disorders, assign a super type of 362977000 | Sequela (disorder) | (http://snomed.info/id/362977000) if a causal relationship is also stated For disorders due to a procedure, assign an additional supertype of 116223007 | Complication (disorder) | (http://snomed.info/id/116223007) if a causal relationship is also stated	Where *X* occurs after *Y* (and it is not specified that *X* is due to *Y* although causality is frequently implied), construct the FSN as: *X following Y* Where *X* occurs after *Y* (and it is specified that *X* is due to *Y*), construct the FSN as: *X due to and following Y*
Examples:	
402490007 | Calcinosis following localized fat necrosis (disorder) | (http://snomed.info/id/402490007) 391103005 | Adverse event following complementary therapy (disorder) | (http://snomed.info/id/391103005)	

Associated with attribute

In general, 47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) 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 strongly suspected or known 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) | (http://snomed.info/id/47429007) is appropriate :

1. General grouping concepts which aggregate more specific associations

   e.g. 6211002 | Polyarthritis associated with another disorder (disorder) | (http://snomed.info/id/6211002) subsumes two children

   201972000 | Allergic arthritis of multiple sites (disorder) | (http://snomed.info/id/201972000) modeled with *42752001 | Due to (attribute) | (http://snomed.info/id/42752001)* of 419076005 | Allergic reaction (disorder) | (http://snomed.info/id/419076005)

   422565003 | Post-infective polyarthritis (disorder) | (http://snomed.info/id/422565003) modeled with *255234002 | After (attribute) | (http://snomed.info/id/255234002)* of 40733004 | Infectious disease (disorder) | (http://snomed.info/id/40733004)

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.

Causative agent attribute

Many *X caused by Y* phenomena can be represented by 246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003). This approach is used where the causal factor is a material entity and the means of exposure /introduction are not significant (if significant, then the causal factor is an event).

***Caused by* a substance or physical force**	
Default modeling pattern	Default FSN construction
Assign the caused disorder as a supertype (or ensure that the caused disorder is present in the ancestor tree following classification) Assign the causal factor as the target of a Causative agent relationship	Where *X* occurs due to exposure to a substance or physical force *Y*, construct an FSN of the form *X* caused by *Y*
Example:	
291000119100 | Contact dermatitis caused by chemical (disorder) | (http://snomed.info/id/291000119100)	
Legacy example (not to be repeated):	
Laser-induced burn (disorder)	

For all combined disorders where a cause can be either a disorder (eg, gallstones) or a material agent (eg, alcohol):

Model as *caused by* material agent if it is the direct cause.

For example,

- 445507008 | Inflammation of pancreas caused by alcohol (disorder) | (http://snomed.info/id/445507008)

Model as *due to* disorder if it is the indirect cause.

For example,

- Suggested change: Megaloblastic anemia caused by alcoholism (disorder) to Megaloblastic anemia due to alcoholism (disorder)

Infectious complications

For infectious complications, use the 246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003) if the complication is the direct result of the presence of the infectious agent. Otherwise, use either *due to* or *after* or *due to and after* X infection.

Infectious Complications	
103611000119102 | Cirrhosis of liver due to hepatitis B (disorder) | (http://snomed.info/id/103611000119102)	Due to: 66071002 | Viral hepatitis type B (disorder) | (http://snomed.info/id/66071002)
195888009 | Proteus pneumonia (disorder) | (http://snomed.info/id/195888009)	Caused by: 50517009 | Genus Proteus (organism) | (http://snomed.info/id/50517009)
123949001 | Post-streptococcal reactive arthritis (disorder) | (http://snomed.info/id/123949001)	After: 302809008 | Streptococcus pyogenes infection (disorder) | (http://snomed.info/id/302809008)

Exception to naming convention for combined disorders

Disorder combination modeling

Disorder combination modeling:

- Covers only combinations of two disorders. Frequently, combinations include more (including syndromes).
- 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.

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,

For example,

- 10692681000119108 | Aspirin exacerbated respiratory disease (disorder) | (http://snomed.info/id/10692681000119108), instead of Disorder of respiratory system exacerbated by aspirin (disorder)
  - Definition: nasal polyps, chronic rhino-sinusitis, asthma made worse by NSAIDs
- 724136006 | Diabetic mastopathy (disorder) | (http://snomed.info/id/724136006) instead of Disorder of breast due to diabetes mellitus (disorder)
  - Definition: inflammation and fibrosis of breast due to diabetes mellitus

Loss of relationships by modeling with Due to attribute

There are certain combined disorders where a causal relationship may exist between the disorders, but using the 42752001 | Due to (attribute) | (http://snomed.info/id/42752001) may result in loss of important relationships that could be stated in an axiom. Identifying these instances may prove challenging and may be best implemented at the time of template creation for complex associations.

For more information

- SNOMED International website @ http://www.snomed.org/snomed-ct/learn-more.
- Appendix B: Concept Models, Disorder Combinations

(See also, Appendix, Concept Models: *Disorder Combinations*)

Heuristics for Co-occurent Genomic Disorders

Germline chromosomal abnormality co-occurrent and causing disorder: 41040004 |Complete trisomy 21 syndrome (disorder)|

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-occurrent and causing disorder: 190905008 |Cystic fibrosis (disorder)|

Modeling for germline mutations causing conditions, such as cystic fibrosis, should have *co-occurrent* mutations, *Occurrence* = congenital, and *Due to* the mutation finding.

For example,

- Cystic fibrosis *co-occurrent* and *due to* G542X mutation

Somatic NSV (NCBI structural variant) co-occurrent 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* the associated somatic mutation finding.

For example,

- Melanoma co-occurrent and due to BRAF V600E mutation

Somatic IHC (immunohistochemical) finding co-occurrent but not etiologic: Estrogen-receptor status in breast cancer

Somatic mutations which do not have a causative role in the development of a malignancy should be modeled as *Co-occurrent* with two supertype concepts, but should not be modeled as *due to* the mutation.

For example,

- Breast cancer co-occurrent with positive estrogen-receptor assay

Complication and Sequela Modeling

Complication and sequela attributes

Complications and sequelae are modeled using the Causal and Temporal attributes under the *Associated with* attribute hierarchy:

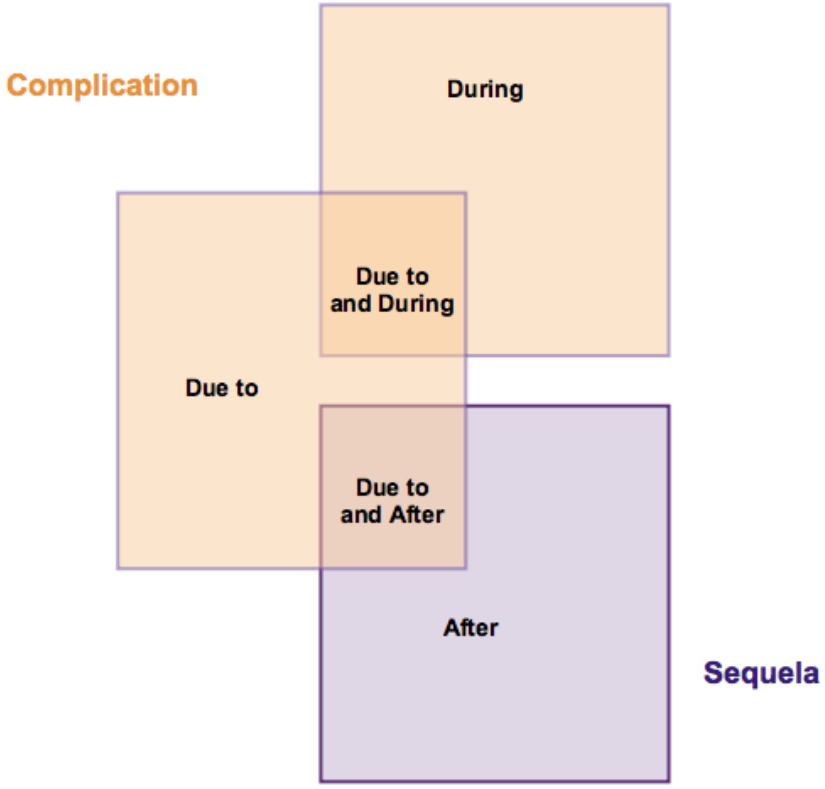
- Associated with (attribute)
  - Causative agent (attribute)
  - Due to (attribute)
  - Temporally related to (attribute)
    - During (attribute)
    - After (attribute)

A *complication* is a disorder caused by another disorder, procedure, or event which is not a natural progression or expected outcome of its cause; temporally may be During and After the causative disorder, procedure, or event.

When there is a causal relationship with the preceding disorder, procedure, or event, a sequela may also be a complication i.e. the resultant disorder is not a natural progression or expected outcome of the preceding disorder, procedure, or event.

A *sequela*, by definition, is a disorder that is a consequence, but not an unexpected outcome, that follows another disorder, procedure, or event.

Complication and sequela relationships



Modeling

If a request is received for inclusion of a concept with an FSN containing *complication* or *sequela and* it is unclear whether the relationship is causal and/or temporal, request additional information from the submitter.

A concept should always be modeled, primarily, according to its relationship to a procedure when the nature of these relationships are clear.

- Causation: *Due to*
- Temporal relationship, i.e *Temporally related to*: *During, After*

For those occasions for which it is clear that an ensuing disorder starts during a procedure, but persists after the procedure has been completed, both during and after attributes may be used in the model. 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.

For example,

123948009 | Post-viral disorder (disorder) | (http://snomed.info/id/123948009) occurs After 34014006 | Viral disease (disorder) | (http://snomed.info/id/34014006)

The words *complication* and *sequela* may or may not be part of an FSN.

Naming conventions for FSNs

Complication: X due to Y

Sequela: X following Y

Complication & Sequela: X due to and following Y

Modeling

- This modeling facilitates auto-classification. However, in SNOMED CT both 116223007 | Complication (disorder) | (http://snomed.info/id/116223007) and 362977000 | Sequela (disorder) | (http://snomed.info/id/362977000) are primitive, which means the relationship to these two concepts has to be explicitly modeled with an IS_A relationship.
- The semantic pattern *Complication of* implies *Due to*.
  - For new requests with the FSNs stating *complication of*, the FSN should be written as *complication due to* and modeled accordingly.
  - There are legacy SNOMED CT terms for which there are duplicates, one with *complication of* and one with *complication due to*. The duplicates will eventually be removed.

Complication and Sequela Allowable Relationships		
Attribute	IS A Sequela	IS A Complication
Due to	Possible/Allowable	Necessarily true
During	Not allowable	Possible/allowable
After	Necessarily true	Possible/allowable

Types of complications and sequelae

The three types are as follows:

- Only the cause is specified
- Only a temporal relationship is specified
- Both a cause and a temporal relationship to the cause are specified

Types of Complications and Sequelae			
Complications			
Type	Disorder / Disorder	Modeling	Notes
Cause only	11307961000119106 | Pathological fracture of pelvis due to neoplastic disease (disorder) | (http://snomed.info/id/11307961000119106)	*Due to* X due to Y Create an IS A relationship to 116223007 | Complication (disorder) | (http://snomed.info/id/116223007)	*Due to* can be used to assert causality, at any point in a causal chain, between a condition or procedure and another resultant condition, when there is no explicit temporal relationship
	NA	*Before*	

Types of Complications and Sequelae			
Temporal only		X before Y	Use to model pre-procedure complications (e.g, preoperative complication), without causal relationships Model with *Before*, but without assigning a parent of Complication or a causal relationship
	These concepts are modeled with the Combined disorder guidelines.	*During* X during Y	Use to model a disorder that occurs during a procedure (e.g, intraoperative complication), but without a causal relationship O nly use when understood in the FSN (e.g. intraoperative complication or X complication during Y
Causal + Temporal	These concepts are modeled with the Combined disorder guidelines.	*Due to and During* X due to and during Y	Use 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 are specified A *Due to and During* relationship, makes the concept analogous to the use of the A *fter* relationship
		Due to and After X due to and following Y	Use to model a disorder that occurs after a disorder or procedure (e.g. postoperative complication), with a causal relationship Both a cause and a temporal relationship to the cause are specified
Sequelae			
Type	Disorder / Disorder	Modeling	Notes
Temporal only	NA	*After* X following Y Create an IS_A relationship to 362977000 | Sequela (disorder) | (http://snomed.info/id/362977000)	Use to model a disorder that occurs after a procedure Does not assert or exclude a causal relationship; instead it emphasizes a sequence of events (e.g. every post-viral disorder occurs after a viral disease) A disorder that follows a procedure is a sequela, unless the disorder and procedure are arbitrarily associated
Causal + Temporal	• 230691006 | Cerebrovascular accident due to occlusion of cerebral artery (disorder) | (http://snomed.info/id/230691006)	*Due to and After* X due to and following Y	Use to model a disorder that occurs after a disorder or procedure (e.g. postoperative complication), with a causal relationship Both a cause and a temporal relationship to the cause are specified

Sequelae and Late Effects

ICD uses the phrase *late effects*, which is equivalent to sequela. Thus it should be modeled with *after* (and *due to* if there is a causal relationship) and with an IS A relationship to 362977000 | Sequela (disorder) | (http://snomed.info/id/362977000).

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)

Surgical complications, sequelae, and late effects

Not all surgical sequelae are complications of surgery, but rather expected late effects.

Postoperative complications are complications following surgery, but not necessarily due to the surgery and, thus, are modeled only with an *after* relationship.

Naming conventions for surgical sequelae (temporal only)

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 postoperative complications (temporal only)

FSN: Postoperative X (disorder)

PT: Postoperative X

For example,

- Postoperative infection (disorder)
- Postoperative ileus (disorder)
- Postoperative hypothyroidism (disorder)

Naming conventions for postoperative complications due to surgery

Complications that occur after surgery and are modeled with a parent of 116223007 |Complication (disorder)| and with | after | (http://snomed.org/fictid#) | surgical procedure | (http://snomed.org/fictid#).

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)

Modeling for transplantation rejection vs. failure

Transplantation rejection

- IS A = disease
- clinical course = acute/chronic etc.
- after = transplantation of x (procedure)
- finding site = transplanted x body structure

Transplantation failure

- IS A = complication
- clinical course = acute/chronic etc.
- after = transplantation of x (procedure)
- finding site = transplanted x body structure

Exceptions

Perioperative complications

Peri-operative 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 | complication | (http://snomed.org/fictid#)and a relationship consisting of | temporally related to | (http://snomed.org/fictid#) or an appropriate subtype with a value of 387713003 |Surgical procedure (procedure)|.

Such complications do not necessarily imply a causal relationship to the surgery itself as they may be related to any disorder, event or procedure occurring prior, during and/or after surgery. For this reason, perioperative complications do not have a stated causal relationship unless an underlying cause is clearly stated in the FSN.

Preoperative complications

A preoperative *complication* can occur prior to surgery. Strictly, it 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 intra-operative or post-operative complication. Such concepts should be modeled using the | before | (http://snomed.org/fictid#), but not assigned a parent of complication or a causative relationship.

For example,

- | preoperative hyponatremia | (http://snomed.org/fictid#)
- | preoperative anxiety | (http://snomed.org/fictid#)

Determining the causal relationship

Most combined disorders have a direct or indirect causal relationship. Concepts containing the words *following, after, post,* or *sequela* in the FSN, and/or are modeled using the *after* attribute, should be considered to be *sequela,* and usually *complications* as well.

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) | (http://snomed.info/id/398156002) • 223565009 | Nigeria (geographic location) | (http://snomed.info/id/223565009)

Event

Definition	Examples
Occurrences impacting health or health care; not procedures or interventions	• 242039002 | Abuse of partner (event) | (http://snomed.info/id/242039002) • 405621004 | Tracheal intubation event (event) | (http://snomed.info/id/405621004)

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 2020-01-31

Domain Information for 272379006 | Event (event) | (http://snomed.info/id/272379006)	
Domain Constraint	<< 272379006 | Event (event) | (http://snomed.info/id/272379006)
Parent Domain	-
Proximal Primitive Constraint	<< 272379006 | Event (event) | (http://snomed.info/id/272379006)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 272379006 | Event (event) | (http://snomed.info/id/272379006)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
255234002 | After (attribute) | (http://snomed.info/id/255234002)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006)	
47429007 | Associated with (attribute) | (http://snomed.info/id/47429007)	1	0..*	0..*	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id	

				/105590001) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)
288556008 | Before (attribute) | (http://snomed.info/id/288556008)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
246075003 | Causative agent (attribute) | (http://snomed.info/id/246075003)	1	0..*	0..1	<< 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)
42752001 | Due to (attribute) | (http://snomed.info/id/42752001)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
371881003 | During (attribute) | (http://snomed.info/id/371881003)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
246454002 | Occurrence (attribute) | (http://snomed.info/id/246454002)	1	0..*	0..1	<< 282032007 | Periods of life (qualifier value) | (http://snomed.info/id/282032007)
726633004 | Temporally related to (attribute) | (http://snomed.info/id/726633004)	1	0..*	0..*	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)

⚠ Authoring guidelines for the use of attributes in the Event hierarchy are being established.

Event Modeling

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.

Event attributes

Under review at this time.

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.

Modeling

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*.

Observable Entity

Definition	Examples
Information about a quality/property to be observed and how it will be observed	• 416540001 | Calcium deposit observable (observable entity) | (http://snomed.info/id/416540001) • 276885007 | Core body temperature (observable entity) | (http://snomed.info/id/276885007)

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.

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.

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.

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) | (http://snomed.info/id/703117000).

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

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 2020-01-31

Domain Information for 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002)	
Domain Constraint	<< 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002)
Parent Domain	-
Proximal Primitive Constraint	<< 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 363787002 | Observable entity (observable entity) | (http://snomed.info/id/363787002)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
704321009 | Characterizes (attribute) | (http://snomed.info/id/704321009)	1	0..*	0..1	<< 719982003 | Process (qualifier value) | (http://snomed.info/id/719982003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
246093002 | Component (attribute) | (http://snomed.info/id/246093002)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
704327008 | Direct site (attribute) | (http://snomed.info/id/704327008)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
719722006 | Has realization (attribute) | (http://snomed.info/id/719722006)	1	0..*	0..1	<< 719982003 | Process (qualifier value) | (http://snomed.info/id/719982003)	
718497002 | Inherent location (attribute) | (http://snomed.info/id/718497002)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR	

				<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
704319004 | Inheres in (attribute) | (http://snomed.info/id/704319004)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008) OR << 125676002 | Person (person) | (http://snomed.info/id/125676002)	
704326004 | Precondition (attribute) | (http://snomed.info/id/704326004)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 703763000 | Precondition value (qualifier value) | (http://snomed.info/id/703763000) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
704322002 | Process agent (attribute) | (http://snomed.info/id/704322002)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical /	

				biologic product (product) | (http://snomed.info/id/373873005) OR << 105590001 | Substance | (http://snomed.info/id/105590001)	
704323007 | Process duration (attribute) | (http://snomed.info/id/704323007)	1	0..1	0..1	<< 7389001 | Time frame (qualifier value) | (http://snomed.info/id/7389001)	
704324001 | Process output (attribute) | (http://snomed.info/id/704324001)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 719982003 | Process (qualifier value) | (http://snomed.info/id/719982003)	
370130000 | Property (attribute) | (http://snomed.info/id/370130000)	1	0..1	0..1	<< 118598001 | Property of measurement (qualifier value) | (http://snomed.info/id/118598001)	
704325000 | Relative to (attribute) | (http://snomed.info/id/704325000)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
719715003 | Relative to part of (attribute) | (http://snomed.info/id/719715003)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	

370132008 | Scale type (attribute) | (http://snomed.info/id/370132008)	1	0..1	0..1	<< 30766002 | Quantitative | (http://snomed.info/id/30766002) OR << 26716007 | Qualitative | (http://snomed.info/id/26716007) OR << 117363000 | Ordinal value | (http://snomed.info/id/117363000) OR << 117365007 | Ordinal or quantitative value | (http://snomed.info/id/117365007) OR << 117362005 | Nominal value | (http://snomed.info/id/117362005) OR << 117364006 | Narrative value | (http://snomed.info/id/117364006) OR << 117444000 | Text value | (http://snomed.info/id/117444000)	
246501002 | Technique (attribute) | (http://snomed.info/id/246501002)	1	0..*	0..1	<< 272394005 | Technique (qualifier value) | (http://snomed.info/id/272394005) OR << 273249006 | Assessment scales (assessment scale) | (http://snomed.info/id/273249006)	
370134009 | Time aspect (attribute) | (http://snomed.info/id/370134009)	1	0..1	0..1	<< 7389001 | Time frame (qualifier value) | (http://snomed.info/id/7389001)	
704320005 | Towards (attribute) | (http://snomed.info/id/704320005)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
246514001 | Units (attribute) | (http://snomed.info/id/246514001)	1	0..1	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id/767524001)	
424226004 | Using device (attribute) | (http://snomed.info/id/424226004)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	

Observable Entity Defining Attributes

The observable model has been scarcely implemented in current SNOMED content, so the following defining attributes that correspond to the *Observable Entity Attributes Summary* table will have many hypothetical examples.

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) | (http://snomed.info/id/704321009) of excretion process
- Estimated 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) | (http://snomed.info/id/246093002)* 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) | (http://snomed.info/id/415974002) has the 704327008 | Direct site (attribute) | (http://snomed.info/id/704327008) of tympanic membrane structure

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) | (http://snomed.info/id/282097004) 719722006 | Has realization (attribute) | (http://snomed.info/id/719722006) of walking

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) | (http://snomed.info/id/718497002) 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,

- Volume of 24-hour urine sample (observable entity) has 704319004 | Inheres in (attribute) | (http://snomed.info/id/704319004) of 24 hour urine sample

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) | (http://snomed.info/id/163033001) has a 704326004 | Precondition (attribute) | (http://snomed.info/id/704326004) of recumbent body position

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 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 may refine the meaning of the process named as the value of 704321009 | Characterizes (attribute) | (http://snomed.info/id/704321009), or it may simply repeat the meaning that is already there. The process agent can be left unspecified.

For example,

- Substance rate of secretion of somatotropin by pituitary following clonidine per os (observable entity) has the 704322002 | Process agent (attribute) | (http://snomed.info/id/704322002) of pituitary gland.

⚠ Process agent and has agent

704322002 | Process agent (attribute) | (http://snomed.info/id/704322002) appears to have the same meaning as Has agent in the Open Biological and Biomedical Ontology (OBO) Relations Ontology.

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) | (http://snomed.info/id/704323007) of 24 hours

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) | (http://snomed.info/id/704324001) of pregnanediol
- Estimated intake of iron in 24 hours (observable entity)| has a 704324001 | Process output (attribute) | (http://snomed.info/id/704324001) of iron

Property

This attribute is used to specify the type of inherent quality or process to be observed. Its values are abstract types of quality (length, odor, concentration) or abstract types of process features (rate, speed).

For example,

- Blood glucose mass concentration (observable entity) has the 370130000 | Property (attribute) | (http://snomed.info/id/370130000) of mass concentration

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) | (http://snomed.info/id/704325000) creatinine
- Neutrophils per 100 leukocytes in blood (observable entity) has 704325000 | Relative to (attribute) | (http://snomed.info/id/704325000) population of all leukocytes in portion of fluid

Relative to part of

This attribute is used to specify the denominator of a relative relational property, su ch 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) | (http://snomed.info/id/719715003) of plasma

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) | (http://snomed.org/fictid#) will not be used. Extensions are permitted to add specific subtypes of observable entities that include the | Scale type (attribute) | (http://snomed.org/fictid#), if desired.

Technique

This attribute is used to specify the systematic method of a procedure used to accomplish a specific activity.

For example,

- Presence of Brucella abortus antibody in serum by latex agglutination (observable entity) has the *246501002 | Technique (attribute) | (http://snomed.info/id/246501002)* of latex agglutination test technique

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) | (http://snomed.info/id/370134009) of Single point in time

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) | (http://snomed.info/id/704320005) of amikacin

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) | (http://snomed.info/id/246514001)* of percentage

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) | (http://snomed.info/id/415921007) has *424226004 | Using device (attribute) | (http://snomed.info/id/424226004)* of skin strip thermometer

Observable Entity Modeling

When observable entity concepts have not been given a value, they *behave* like procedures, with respect to the *concept model* for context.

When observable entities have been given a value, they *behave* like clinical findings, with respect to the *concept model* for context.

Modeling

The observable entity model has been implemented in limited content areas in SNOMED CT thus far. 167 physiological measurement observable entity concepts (body temperature, respiratory rate, heart rate, blood pressure) have been modeled. 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. Vital sign (observable entity) has been inactivated since it could not be universally defined.

Susceptibility observables should be modeled in accordance with the template specified here .

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) | (http://snomed.info/id/416125006)

Modeling: Screening measurements

Measurements done by screening should be specified with *by screening method* added at the end of the description.

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 w hen 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) | (http://snomed.info/id/703015006)

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) | (http://snomed.info/id/115407004)

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: Negative and Positive Values	
Lab test	Value
General culture (scale = nominal)	*No X isolated* (finding) *X* (organism)
Specific culture	*Not isolated* (qualifier value) *Isolated* (qualifier value)
General microscopic testing (Scale = Nominal)	*No X seen* (finding) *X* (organism)
Specific microscopic testing	*Not seen* (qualifier value) *Present* (qualifier value)
Serologic, DNA or other organism specific test	*Not detected* (qualifier value) *Detected* (qualifier value) Rationale: Almost all of these tests are organism-specific

Microbiology Tests: Examples of Negative and Positive Values		
Test Category	Lab observation (lab test) *LOINC*	Result values (lab result) SNOMED CT

Microbiology Tests: Examples of Negative and Positive Values		
General culture	11475-1 - Microorganism *X* Culture (where *X* represents no specific system/specimen is part of the concept)	**Valid value** 168204005 | Salmonella not isolated (finding) | (http://snomed.info/id/168204005) 27268008 | Genus Salmonella (organism) | (http://snomed.info/id/27268008) **Invalid value** Not isolated Isolated
Organism-specific culture	48741-3 Bordetella pertussis; Nasopharynx; Culture	**Valid value** 264887000 | Not isolated (qualifier value) | (http://snomed.info/id/264887000) 46651001 | Isolated (qualifier value) | (http://snomed.info/id/46651001) **Invalid value** Bordetella pertussis not isolated Bordetella pertussis isolated
	10635-1 - Acanthamoeba Eye Culture	**Valid value** 264887000 | Not isolated (qualifier value) | (http://snomed.info/id/264887000) 46651001 | Isolated (qualifier value) | (http://snomed.info/id/46651001) **Invalid value** No Acanthamoeba isolated Acanthamoeba isolated
Specific microscopic testing	14369-3 - Yeast Cervix Ql Wet Prep	**Valid value** 47492008 | Not seen (qualifier value) | (http://snomed.info/id/47492008) 52101004 | Present (qualifier value) | (http://snomed.info/id/52101004) **Invalid value** No yeast seen Yeast seen
Serologic and DNA testing	35727-7 - Chlamydia species DNA; Urethra; PCR /NAAT	**Valid value** 260415000 | Not detected (qualifier value) | (http://snomed.info/id/260415000)

Microbiology Tests: Examples of Negative and Positive Values		
		260373001 | Detected (qualifier value) | (http://snomed.info/id/260373001) **Invalid value** No Chlamydia detected Chlamydia detected

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: http://www.npu-terminology.org/ (http://www.npu-terminology.org/%C2%A0for).
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

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.

For example,

789106008 | Estimated quantity of intake of phosphorous in 24 hours (observable entity) | (http://snomed.info/id/789106008)

FSN: Estimated quantity of intake of phosphorous in 24 hours (observable entity)

PT: Estimated quantity of intake of phosphorous in 24 hours

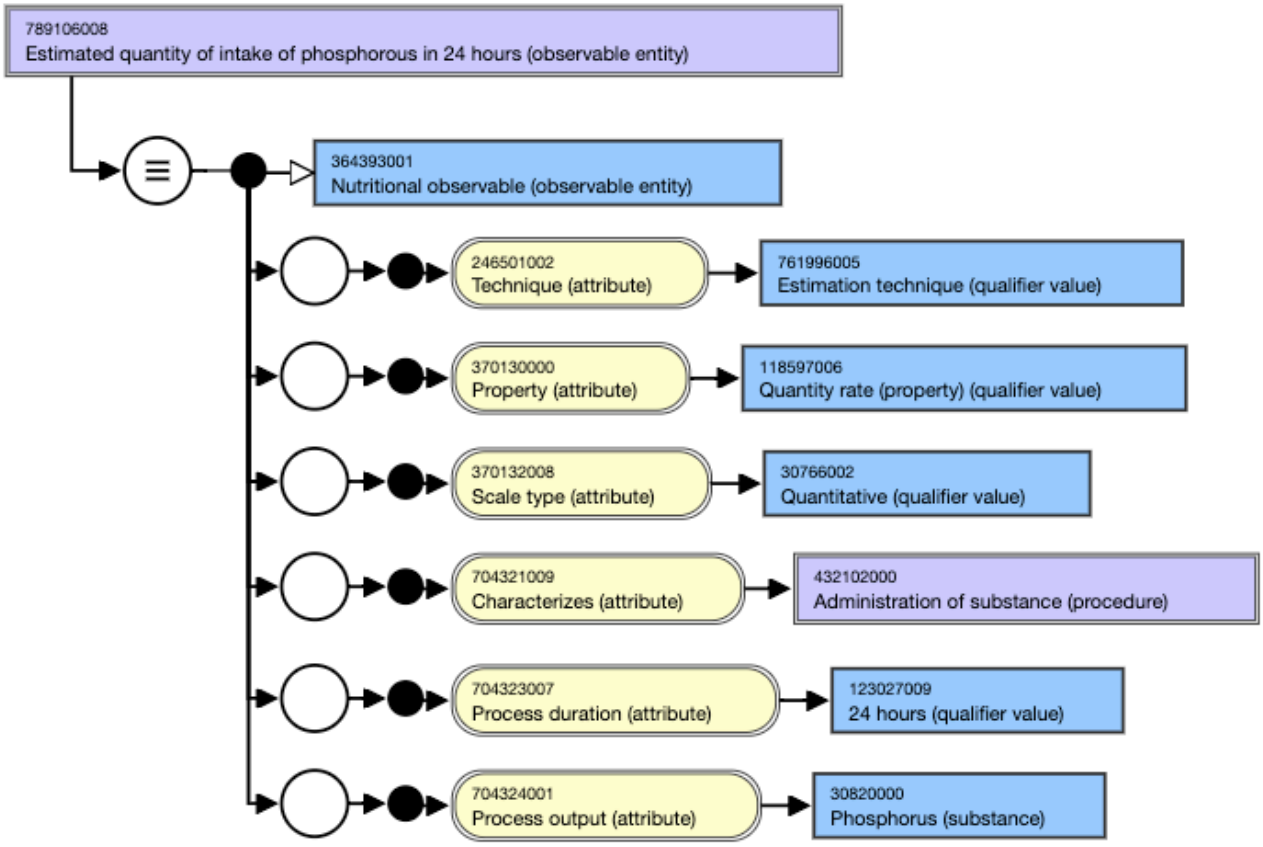


Figure 1: Stated view of 789106008 |Estimated quantity of intake of phosphorous in 24 hours (observable entity)|

Dietary

"Dietary" is considered ambiguous and should not be included in SNOMED CT. Existing content that includes "dietary" will be considered for inactivation.

Organism*

Definition	Examples
Organisms of significance to human medicine	• 3265006 | Genus Candida (organism) | (http://snomed.info/id/3265006) • 710877000 | Beta lactam resistant bacteria (organism) | (http://snomed.info/id/710877000)

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

Organisms with qualifiers

Intrinsic qualifiers

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) | (http://snomed.info/id/8745002)
- 416983001 | Helical Gram-negative bacillus (organism) | (http://snomed.info/id/416983001)

Physiology qualifiers

For example, a non-Linnaean class of bacteria described by physiology

- 59343002 | Anaerobic bacteria (organism) | (http://snomed.info/id/59343002)
- 417454003 | Non-motile Salmonella (organism) | (http://snomed.info/id/417454003)

Resistance / susceptibility qualifiers

For example, A non-Linnaean class of bacteria described by antimicrobial susceptibility

- 712662001 | Carbapenem resistant Enterobacteriaceae (organism) | (http://snomed.info/id/712662001)
- 417943000 | Methicillin susceptible Staphylococcus aureus (organism) | (http://snomed.info/id/417943000)

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.

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 (as determined by the *Organism Project Group*)
- 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.

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 subtypes 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.

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.

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.

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 FSN descriptions contain single word terms indicating the taxonomic rank + the recognized name of that rank + hierarchy designator.

For example,

- 106544002 | Family Enterobacteriaceae (organism) | (http://snomed.info/id/106544002)

Rank

The naming convention is not applied to concepts that only refer to a subgroup of a rank.

For example,

- 113727004 | Vancomycin resistant enterococcus (organism) | (http://snomed.info/id/113727004) is correct. It refers to a subclass of the genus, Enterococcus species that are resistant.

Incorrect example,

- *Vancomycin resistant Genus Enterococcus* is incorrect. It refers to the rank only, Genus Enterococcus.

Official names of organisms may include abbreviations such as "subg." (Kingdom Plantae) and "subsp." and "subgen." (Domain Bacteria). 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)

Preferred Term

The Preferred Term is the official scientific name. They may include abbreviations and/or parentheses.

For example,

- Cypraea (Cypraea) tigris
- Pleione subg. Scopulorum
- Bacillus (subgen. Bacillus Cohn 1872, 174) subtilis
- Staphylococcus succinus subsp. casei

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) | (http://snomed.info/id/698206009)

The subspecies types and variants should be included in the FSN, PT and other descriptions. 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 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,

- 426813007 | Order Acidobacteriales (organism) | (http://snomed.info/id/426813007) 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 genus name but the species name begins with a lower-case letter.

For example,

- 24224000 | Brucella abortus (organism) | (http://snomed.info/id/24224000)

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) | (http://snomed.info/id/114683003) 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) | (http://snomed.info/id/656008)

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

S treptococcus 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 (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) | (http://snomed.info/id/698149000) 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) | (http://snomed.info/id/120683007) 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) | (http://snomed.info/id/407482004)
- 710661004 | Immunoglobulin M antibody to Influenza B virus (substance) | (http://snomed.info/id/710661004)
- 10674911000119108 | Otitis media caused by Influenza A virus (disorder) | (http://snomed.info/id/10674911000119108)

For genus, *virus* is included in the genus name and is not a separate word.

For example,

- 407481006 | Genus Gammainfluenzavirus (organism) | (http://snomed.info/id/407481006)
- 407477006 | Genus Alphainfluenzavirus (organism) | (http://snomed.info/id/407477006)

The disorder *influenza* need not be capitalized.

- For example,
  - 16311000119108 | Pneumonia caused by influenza (disorder) | (http://snomed.info/id/16311000119108)
  - 309789002 | Encephalitis caused by influenza (disorder) | (http://snomed.info/id/309789002)

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 *X* genus 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.

On a case by case basis, requests for name changes are based on the following use cases :

The name of an organism changes.

- Change the FSN for affected concepts, but not the concept ID by creating a new FSN and description
- Retain the old name as a synonym.

A single species is reclassified as multiple species.

- 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.

- 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) | (http://snomed.info/id/337915000) 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) | (http://snomed.info/id/42625000) 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) | (http://snomed.info/id/83033005) may identify the presence of 609326000 | Larva of Strongyloides stercoralis (organism) | (http://snomed.info/id/609326000) and 699572004 | Egg of Strongyloides stercoralis (organism) | (http://snomed.info/id/699572004).

Organism concepts

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) | (http://snomed.info/id/609043009)
- 699572004 | Egg of Strongyloides stercoralis (organism) | (http://snomed.info/id/699572004)

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) | (http://snomed.info/id/47399003), 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.

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, provides useful links to other sources; used by Unified Medical Language System (UMLS) as a QA source)

General

- Integrated Taxonomic Information System (ITIS) (Covers a limited number of organisms)

Pharmaceutical/Biologic Product

The Pharmaceutical / biologic product hierarchy is comprised of multiple smaller hierarchies, e.g. the Medicinal product hierarchy.

Editorial guidelines for the Pharmaceutical / biologic product hierarchy are available on the Drugs Project page here: Drugs Project.

There are frequent iterations of the editorial guidelines for the Pharmaceutical / biologic product hierarchy with the opportunity for review and comment. Announcements, that include links to the current iteration and deadlines for submission of comments, can be found on the project Confluence site.

Definition
A top-level hierarchy to clearly distinguish drug products (products) from their chemical constituents (substances)

Pharmaceutical/Biologic Product Attributes Summary

Editorial guidelines for the 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) hierarchy are available on the Drugs Project page here: Drugs Project .

When authoring in this domain, these are the approved attributes and allowable ranges. They are the Human Readable Concept Model (HRCM). HRCM 2020-01-31

Domain Information for 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)	
Domain Constraint	<< 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)
Parent Domain	-
Proximal Primitive Constraint	<< 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
766953001 | Count of active ingredient (attribute) | (http://snomed.info/id/766953001)	0	0..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
766954007 | Count of base and modification pair (attribute) | (http://snomed.info/id/766954007)	0	0..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
	0	0..1	0..0		

766952006 | Count of base of active ingredient (attribute) | (http://snomed.info/id/766952006)				< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
732943007 | Has basis of strength substance (attribute) | (http://snomed.info/id/732943007)	1	0..*	0..1	< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	
127489000 | Has active ingredient (attribute) | (http://snomed.info/id/127489000)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id /105590001)	
733722007 | Has concentration strength denominator unit (attribute) | (http://snomed.info/id /733722007)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id /767524001)	
733723002 | Has concentration strength denominator value (attribute) | (http://snomed.info/id /733723002)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
733725009 | Has concentration strength numerator unit (attribute) | (http://snomed.info/id /733725009)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id /767524001)	
733724008 | Has concentration strength numerator value (attribute) | (http://snomed.info/id /733724008)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
762951001 | Has ingredient (attribute) | (http://snomed.info/id /762951001)	-				
411116001 | Has manufactured dose form (attribute) | (http://snomed.info/id/411116001)	0	0..1	0..0	<< 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id /736542009)	
762949000 | Has precise active ingredient (attribute) | (http://snomed.info/id/762949000)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id /105590001)	
732947008 | Has presentation strength denominator unit (attribute) | (http://snomed.info/id /732947008)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id /767524001)	
732946004 | Has presentation strength denominator value (attribute) | (http://snomed.info/id /732946004)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	

732945000 | Has presentation strength numerator unit (attribute) | (http://snomed.info/id/732945000)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id/767524001)	
732944001 | Has presentation strength numerator value (attribute) | (http://snomed.info/id/732944001)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
774158006 | Has product name (attribute) | (http://snomed.info/id/774158006)	0	0..1	0..0	<< 774167006 | Product name (product name) | (http://snomed.info/id/774167006)	
774159003 | Has supplier (attribute) | (http://snomed.info/id/774159003)	0	0..1	0..0	<< 774164004 | Supplier (supplier) | (http://snomed.info/id/774164004)	
763032000 | Has unit of presentation (attribute) | (http://snomed.info/id/763032000)	0	0..1	0..0	<< 732935002 | Unit of presentation (unit of presentation) | (http://snomed.info/id/732935002)	
766939001 | Plays role (attribute) | (http://snomed.info/id/766939001)	0	0..*	0..0	<< 766940004 | Role (role) | (http://snomed.info/id/766940004)	

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Domain Information for 781405001 | Medicinal product package (product) | (http://snomed.info/id/781405001)	
Domain Constraint	<< 781405001 | Medicinal product package (product) | (http://snomed.info/id/781405001)
Parent Domain	373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)
Proximal Primitive Constraint	<< 781405001 | Medicinal product package (product) | (http://snomed.info/id/781405001)
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 781405001 \| Medicinal product package (product) \| (http://snomed.info/id/781405001)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
774160008 | Contains clinical drug (attribute) | (http://snomed.info/id/774160008)	1	1..*	1..1	<< 763158003 | Medicinal product (product) | (http://snomed.info/id/763158003)	

766953001 | Count of active ingredient (attribute) | (http://snomed.info/id/766953001)	0	0..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
766954007 | Count of base and modification pair (attribute) | (http://snomed.info/id/766954007)	0	0..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
766952006 | Count of base of active ingredient (attribute) | (http://snomed.info/id/766952006)	0	0..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
784276002 | Count of clinical drug type (attribute) | (http://snomed.info/id/784276002)	0	1..1	0..0	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
732943007 | Has basis of strength substance (attribute) | (http://snomed.info/id/732943007)	1	0..*	0..1	< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	
127489000 | Has active ingredient (attribute) | (http://snomed.info/id/127489000)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id /105590001)	
733722007 | Has concentration strength denominator unit (attribute) | (http://snomed.info/id /733722007)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id /767524001)	
733723002 | Has concentration strength denominator value (attribute) | (http://snomed.info/id /733723002)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
733725009 | Has concentration strength numerator unit (attribute) | (http://snomed.info/id /733725009)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id /767524001)	
733724008 | Has concentration strength numerator value (attribute) | (http://snomed.info/id /733724008)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
762951001 | Has ingredient (attribute) | (http://snomed.info/id /762951001)	-				
411116001 | Has manufactured dose form (attribute) | (http://snomed.info/id/411116001)	0	0..1	0..0	<< 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id /736542009)	
	1	0..*	0..1		

774161007 | Has pack size (attribute) | (http://snomed.info/id/774161007)				< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
774163005 | Has pack size unit (attribute) | (http://snomed.info/id/774163005)	1	0..*	0..1	<< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id/767524001)	
762949000 | Has precise active ingredient (attribute) | (http://snomed.info/id/762949000)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	
732947008 | Has presentation strength denominator unit (attribute) | (http://snomed.info/id/732947008)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id/767524001)	
732946004 | Has presentation strength denominator value (attribute) | (http://snomed.info/id/732946004)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
732945000 | Has presentation strength numerator unit (attribute) | (http://snomed.info/id/732945000)	1	0..*	0..1	< 767524001 | Unit of measure (qualifier value) | (http://snomed.info/id/767524001)	
732944001 | Has presentation strength numerator value (attribute) | (http://snomed.info/id/732944001)	1	0..*	0..1	< 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005)	
774158006 | Has product name (attribute) | (http://snomed.info/id/774158006)	0	0..1	0..0	<< 774167006 | Product name (product name) | (http://snomed.info/id/774167006)	
774159003 | Has supplier (attribute) | (http://snomed.info/id/774159003)	0	0..1	0..0	<< 774164004 | Supplier (supplier) | (http://snomed.info/id/774164004)	
763032000 | Has unit of presentation (attribute) | (http://snomed.info/id/763032000)	0	0..1	0..0	<< 732935002 | Unit of presentation (unit of presentation) | (http://snomed.info/id/732935002)	
766939001 | Plays role (attribute) | (http://snomed.info/id/766939001)	0	0..*	0..0	<< 766940004 | Role (role) | (http://snomed.info/id/766940004)	

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Domain Information for 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id/736542009)	
Domain Constraint	<< 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id/736542009)

Parent Domain	-
Proximal Primitive Constraint	<< 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id/736542009)
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id/736542009)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
736476002 | Has basic dose form (attribute) | (http://snomed.info/id/736476002)	0	0..1	0..0	< 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)	
736472000 | Has dose form administration method (attribute) | (http://snomed.info/id/736472000)	0	0..*	0..0	< 736665006 | Dose form administration method (administration method) | (http://snomed.info/id/736665006)	
736474004 | Has dose form intended site (attribute) | (http://snomed.info/id/736474004)	0	0..*	0..0	< 736479009 | Dose form intended site (intended site) | (http://snomed.info/id/736479009)	
736475003 | Has dose form release characteristic (attribute) | (http://snomed.info/id/736475003)	0	0..1	0..0	< 736480007 | Dose form release characteristic (release characteristic) | (http://snomed.info/id/736480007)	
736473005 | Has dose form transformation (attribute) | (http://snomed.info/id/736473005)	0	0..*	0..0	< 736477006 | Dose form transformation (transformation) | (http://snomed.info/id/736477006)	

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Domain Information for 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)

Domain Constraint	<< 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)
Parent Domain	-
Proximal Primitive Constraint	<< 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
736518005 | Has state of matter (attribute) | (http://snomed.info/id/736518005)	0	1..1	0..0	< 736471007 | State of matter (state of matter) | (http://snomed.info/id/736471007)	

Physical Force*

Definition	Examples
Forces applied to the body that may cause injury	• 87588000 | High altitude (physical force) | (http://snomed.info/id/87588000) • 263762005 | Friction (physical force) | (http://snomed.info/id/263762005)

⚠ Physical Force

The concepts in the *Physical force* hierarchy primarily represent physical forces that may play a role in injuries.

Physical Object

Definition	Examples
Physical devices relevant to health care, or to injuries /accidents	• 469785004 | Heel protector (physical object) | (http://snomed.info/id/469785004) • 40388003 | Implant, device (physical object) | (http://snomed.info/id/40388003)

Editorial guidelines for the Physical object hierarchy are available on the Devices Project page here: Devices Project.

There are frequent iterations of the editorial guidelines for the Physical object hierarchy with the opportunity for review and comment. Announcements and project plans can be found on the project Confluence site.

⚠ Physical Object

Concepts in the *Physical object* hierarchy include natural and man-made objects. One use for these concepts is modeling procedures that use devices (e.g. catheterization).

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) | (http://snomed.info/id/54321008) • 386513007 | Anesthesia management (regime /therapy) | (http://snomed.info/id/386513007)

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) \| (http://snomed.info/id/77018005)
- Administration of medicines, e.g. 39343008 \| Pertussis vaccination (procedure) \| (http://snomed.info/id/39343008)
- Imaging procedures, e.g. 47079000 \| Ultrasonography of breast (procedure) \| (http://snomed.info/id/47079000)
- Education procedures, e.g. 183063000 \| Low salt diet education (procedure) \| (http://snomed.info/id/183063000)
- Administrative procedures, e.g. 305212007 \| Medical records transfer (procedure) \| (http://snomed.info/id/305212007)

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) \| (http://snomed.info/id/386053000), 387713003 \| Surgical procedure (procedure) \| (http://snomed.info/id/387713003), and 433590000 \| Administration of substance via specific route (procedure) \| (http://snomed.info/id/433590000) each have unique defining attributes as seen in their separate tables below. HRCM 2020-01-31

Domain Information for 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
Domain Constraint	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Parent Domain	-
Proximal Primitive Constraint	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Refinement	-

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Author View of Attributes and Ranges for 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
260507000 | Access (attribute) | (http://snomed.info/id/260507000)	1	0..*	0..1	<< 309795001 | Surgical access values (qualifier value) | (http://snomed.info/id/309795001)	
363699004 | Direct device (attribute) | (http://snomed.info/id/363699004)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363700003 | Direct morphology (attribute) | (http://snomed.info/id/363700003)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
363701004 | Direct substance (attribute) | (http://snomed.info/id/363701004)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)	
363702006 | Has focus (attribute) | (http://snomed.info/id/363702006)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
363703001 | Has intent (attribute) | (http://snomed.info/id/363703001)	1	0..*	0..1	<< 363675004 | Intents (nature of procedure values) (qualifier value) | (http://snomed.info/id/363675004)	
363710007 | Indirect device (attribute) | (http://snomed.info/id/363710007)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363709002 | Indirect morphology (attribute) | (http://snomed.info/id/363709002)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
260686004 | Method (attribute) | (http://snomed.info/id/260686004)	1	0..*	0..1	<< 129264002 | Action (qualifier value) | (http://snomed.info/id/129264002)	
260870009 | Priority (attribute) | (http://snomed.info/id/260870009)	1	0..*	0..1	<< 272125009 | Priorities (qualifier value) | (http://snomed.info/id/272125009)	
405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)	1	0..*	0..*		

				<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007)	1	0..*	0..*	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
370131001 | Recipient category (attribute) | (http://snomed.info/id/370131001)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002) OR << 35359004 | Family (social concept) | (http://snomed.info/id/35359004) OR << 133928008 | Community (social concept) | (http://snomed.info/id/133928008) OR << 389109008 | Group (social concept) | (http://snomed.info/id/389109008)	
246513007 | Revision status (attribute) | (http://snomed.info/id/246513007)	1	0..*	0..1	<< 261424001 | Primary operation (qualifier value) | (http://snomed.info/id/261424001) OR << 255231005 | Revision - value (qualifier value) | (http://snomed.info/id/255231005) OR << 257958009 | Part of multistage procedure (qualifier value) | (http://snomed.info/id/257958009)	
425391005 | Using access device (attribute) | (http://snomed.info/id/425391005)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424226004 | Using device (attribute) | (http://snomed.info/id/424226004)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424244007 | Using energy (attribute) | (http://snomed.info/id/424244007)	1	0..*	0..1	<< 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
424361007 | Using substance (attribute) | (http://snomed.info/id/424361007)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

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Domain Information for 386053000 | Evaluation procedure (procedure) | (http://snomed.info/id/386053000)	
Domain Constraint	<< 386053000 | Evaluation procedure (procedure) | (http://snomed.info/id/386053000)
Parent Domain	71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Constraint	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Refinement	[[1..*]] 260686004 | Method | (http://snomed.info/id/260686004) = [[+id(<< 129265001 | Evaluation - action | (http://snomed.info/id/129265001))]]

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Author View of Attributes and Ranges for 386053000 | Evaluation procedure (procedure) | (http://snomed.info/id/386053000)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
260507000 | Access (attribute) | (http://snomed.info/id/260507000)	1	0..*	0..1	<< 309795001 | Surgical access values (qualifier value) | (http://snomed.info/id/309795001)	
246093002 | Component (attribute) | (http://snomed.info/id/246093002)	1	0..*	0..1	<< 123037004 | Body structure (body structure) | (http://snomed.info/id/123037004) OR << 410607006 | Organism (organism) | (http://snomed.info/id/410607006) OR << 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005) OR << 419891008 | Record artifact (record artifact) | (http://snomed.info/id/419891008)	
363699004 | Direct device (attribute) | (http://snomed.info/id/363699004)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363700003 | Direct morphology (attribute) | (http://snomed.info/id/363700003)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
	1	0..*	0..1		

363701004 | Direct substance (attribute) | (http://snomed.info/id/363701004)				<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)
363702006 | Has focus (attribute) | (http://snomed.info/id/363702006)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
363703001 | Has intent (attribute) | (http://snomed.info/id/363703001)	1	0..*	0..1	<< 363675004 | Intents (nature of procedure values) (qualifier value) | (http://snomed.info/id/363675004)
116686009 | Has specimen (attribute) | (http://snomed.info/id/116686009)	1	0..*	0..1	<< 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009)
363710007 | Indirect device (attribute) | (http://snomed.info/id/363710007)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)
363709002 | Indirect morphology (attribute) | (http://snomed.info/id/363709002)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)
370129005 | Measurement method (attribute) | (http://snomed.info/id/370129005)	1	0..*	0..1	<< 127789004 | Laboratory procedure categorized by method (procedure) | (http://snomed.info/id/127789004)
260686004 | Method (attribute) | (http://snomed.info/id/260686004)	1	0..*	0..1	<< 129264002 | Action (qualifier value) | (http://snomed.info/id/129264002)
260870009 | Priority (attribute) | (http://snomed.info/id/260870009)	1	0..*	0..1	<< 272125009 | Priorities (qualifier value) | (http://snomed.info/id/272125009)
405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)
405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)	1	0..*	0..*	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)
363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007)	1	0..*	0..*	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)
	1	0..*	0..1	

405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007)				<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
370130000 | Property (attribute) | (http://snomed.info/id/370130000)	1	0..1	0..1	<< 118598001 | Property of measurement (qualifier value) | (http://snomed.info/id/118598001)	
370131001 | Recipient category (attribute) | (http://snomed.info/id/370131001)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002) OR << 35359004 | Family (social concept) | (http://snomed.info/id/35359004) OR << 133928008 | Community (social concept) | (http://snomed.info/id/133928008) OR << 389109008 | Group (social concept) | (http://snomed.info/id/389109008)	
246513007 | Revision status (attribute) | (http://snomed.info/id/246513007)	1	0..*	0..1	<< 261424001 | Primary operation (qualifier value) | (http://snomed.info/id/261424001) OR << 255231005 | Revision - value (qualifier value) | (http://snomed.info/id/255231005) OR << 257958009 | Part of multistage procedure (qualifier value) | (http://snomed.info/id/257958009)	
370132008 | Scale type (attribute) | (http://snomed.info/id/370132008)	1	0..1	0..1	<< 30766002 | Quantitative | (http://snomed.info/id/30766002) OR << 26716007 | Qualitative | (http://snomed.info/id/26716007) OR << 117363000 | Ordinal value | (http://snomed.info/id/117363000) OR << 117365007 | Ordinal or quantitative value | (http://snomed.info/id/117365007) OR << 117362005 | Nominal value | (http://snomed.info/id/117362005) OR << 117364006 | Narrative value | (http://snomed.info/id/117364006) OR << 117444000 | Text value | (http://snomed.info/id/117444000)	
370134009 | Time aspect (attribute) | (http://snomed.info/id/370134009)	1	0..1	0..1	<< 7389001 | Time frame (qualifier value) | (http://snomed.info/id/7389001)	
	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	

425391005 | Using access device (attribute) | (http://snomed.info/id/425391005)					
424226004 | Using device (attribute) | (http://snomed.info/id/424226004)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424244007 | Using energy (attribute) | (http://snomed.info/id/424244007)	1	0..*	0..1	<< 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
424361007 | Using substance (attribute) | (http://snomed.info/id/424361007)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

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Domain Information for 387713003 | Surgical procedure (procedure) | (http://snomed.info/id/387713003)	
Domain Constraint	<< 387713003 | Surgical procedure (procedure) | (http://snomed.info/id/387713003)
Parent Domain	71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Constraint	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Refinement	[[1..*]] 260686004 | Method | (http://snomed.info/id/260686004) = [[+id(<< 129284003 | Surgical action (qualifier value) | (http://snomed.info/id/129284003))]]

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Author View of Attributes and Ranges for 387713003 | Surgical procedure (procedure) | (http://snomed.info/id/387713003)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
260507000 | Access (attribute) | (http://snomed.info/id/260507000)	1	0..*	0..1	<< 309795001 | Surgical access values (qualifier value) | (http://snomed.info/id/309795001)	
363699004 | Direct device (attribute) | (http://snomed.info/id/363699004)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363700003 | Direct morphology (attribute) | (http://snomed.info/id/363700003)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
	1	0..*	0..1		

363701004 | Direct substance (attribute) | (http://snomed.info/id/363701004)				<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)
363702006 | Has focus (attribute) | (http://snomed.info/id/363702006)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
363703001 | Has intent (attribute) | (http://snomed.info/id/363703001)	1	0..*	0..1	<< 363675004 | Intents (nature of procedure values) (qualifier value) | (http://snomed.info/id/363675004)
363710007 | Indirect device (attribute) | (http://snomed.info/id/363710007)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)
363709002 | Indirect morphology (attribute) | (http://snomed.info/id/363709002)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)
260686004 | Method (attribute) | (http://snomed.info/id/260686004)	1	0..*	0..1	<< 129264002 | Action (qualifier value) | (http://snomed.info/id/129264002)
260870009 | Priority (attribute) | (http://snomed.info/id/260870009)	1	0..*	0..1	<< 272125009 | Priorities (qualifier value) | (http://snomed.info/id/272125009)
405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)
405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)	1	0..*	0..*	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)
363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007)	1	0..*	0..*	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)
405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)
405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)

370131001 | Recipient category (attribute) | (http://snomed.info/id/370131001)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002) OR << 35359004 | Family (social concept) | (http://snomed.info/id/35359004) OR << 133928008 | Community (social concept) | (http://snomed.info/id/133928008) OR << 389109008 | Group (social concept) | (http://snomed.info/id/389109008)	
246513007 | Revision status (attribute) | (http://snomed.info/id/246513007)	1	0..*	0..1	<< 261424001 | Primary operation (qualifier value) | (http://snomed.info/id/261424001) OR << 255231005 | Revision - value (qualifier value) | (http://snomed.info/id/255231005) OR << 257958009 | Part of multistage procedure (qualifier value) | (http://snomed.info/id/257958009)	
424876005 | Surgical approach (attribute) | (http://snomed.info/id/424876005)	1	0..*	0..1	<< 103379005 | Procedural approach (qualifier value) | (http://snomed.info/id/103379005)	
425391005 | Using access device (attribute) | (http://snomed.info/id/425391005)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424226004 | Using device (attribute) | (http://snomed.info/id/424226004)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424244007 | Using energy (attribute) | (http://snomed.info/id/424244007)	1	0..*	0..1	<< 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
424361007 | Using substance (attribute) | (http://snomed.info/id/424361007)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

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Domain Information for 433590000 | Administration of substance via specific route (procedure) | (http://snomed.info/id/433590000)	
Domain Constraint	<< 433590000 | Administration of substance via specific route (procedure) | (http://snomed.info/id/433590000)
Parent Domain	71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)
Proximal Primitive Constraint	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)

Proximal Primitive Refinement	[[1..*]] 260686004 | Method | (http://snomed.info/id/260686004) = [[+id(<< 129445006 | Administration - action (qualifier value) | (http://snomed.info/id/129445006))]], [[1..*]] 410675002 | Route of administration (attribute) | (http://snomed.info/id/410675002) = [[+id (<< 284009009 | Route of administration value (qualifier value) | (http://snomed.info/id /284009009))]], [[1..*]] 363701004 | Direct substance (attribute) | (http://snomed.info/id /363701004) = [[+id(<< 105590001 | Substance (substance) | (http://snomed.info/id /105590001))]]

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Author View of Attributes and Ranges for 433590000 \| Administration of substance via specific route (procedure) \| (http://snomed.info/id/433590000)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
260507000 | Access (attribute) | (http://snomed.info/id/260507000)	1	0..*	0..1	<< 309795001 | Surgical access values (qualifier value) | (http://snomed.info/id /309795001)	
363699004 | Direct device (attribute) | (http://snomed.info/id /363699004)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363700003 | Direct morphology (attribute) | (http://snomed.info/id /363700003)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id /49755003)	
363701004 | Direct substance (attribute) | (http://snomed.info/id /363701004)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id /105590001) OR << 373873005 | Pharmaceutical / biologic product (product) | (http://snomed.info/id/373873005)	
363702006 | Has focus (attribute) | (http://snomed.info/id /363702006)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id /404684003) OR << 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
363703001 | Has intent (attribute) | (http://snomed.info/id /363703001)	1	0..*	0..1	<< 363675004 | Intents (nature of procedure values) (qualifier value) | (http://snomed.info/id/363675004)	
363710007 | Indirect device (attribute) | (http://snomed.info/id /363710007)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
363709002 | Indirect morphology (attribute) | (http://snomed.info/id/363709002)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id /49755003)	

260686004 | Method (attribute) | (http://snomed.info/id/260686004)	1	0..*	0..1	<< 129264002 | Action (qualifier value) | (http://snomed.info/id/129264002)	
260870009 | Priority (attribute) | (http://snomed.info/id/260870009)	1	0..*	0..1	<< 272125009 | Priorities (qualifier value) | (http://snomed.info/id/272125009)	
405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)	1	0..*	0..*	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007)	1	0..*	0..*	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
370131001 | Recipient category (attribute) | (http://snomed.info/id/370131001)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002) OR << 35359004 | Family (social concept) | (http://snomed.info/id/35359004) OR << 133928008 | Community (social concept) | (http://snomed.info/id/133928008) OR << 389109008 | Group (social concept) | (http://snomed.info/id/389109008)	
246513007 | Revision status (attribute) | (http://snomed.info/id/246513007)	1	0..*	0..1	<< 261424001 | Primary operation (qualifier value) | (http://snomed.info/id/261424001) OR << 255231005 | Revision - value (qualifier value) | (http://snomed.info/id/255231005) OR << 257958009 | Part of multistage procedure (qualifier value) | (http://snomed.info/id/257958009)	
410675002 | Route of administration (attribute) | (http://snomed.info/id/410675002)	1	0..*	0..1	<< 284009009 | Route of administration value (qualifier value) | (http://snomed.info/id/284009009)	

425391005 | Using access device (attribute) | (http://snomed.info/id/425391005)	1	0..*	0..1	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424226004 | Using device (attribute) | (http://snomed.info/id/424226004)	1	0..*	0..*	<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)	
424244007 | Using energy (attribute) | (http://snomed.info/id/424244007)	1	0..*	0..1	<< 78621006 | Physical force (physical force) | (http://snomed.info/id/78621006)	
424361007 | Using substance (attribute) | (http://snomed.info/id/424361007)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

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

The following defining attributes correspond to the *Procedure Attributes Summary* table from the HRCM.

Access

Access describes the route used to access the site of a procedure. It distinguishes open, closed, and percutaneous procedures.

For example,

- 174572001 | Open removal of bile duct stent (procedure) | (http://snomed.info/id/174572001), has Open approach - access (qualifier value)

Direct device

Direct Device represents the device on which the method directly acts.

For example,

- 431698006 | Adjustment of gastric banding using fluoroscopic guidance (procedure) | (http://snomed.info/id/431698006) has Direct device, Surgical band (physical object)

Direct morphology

Direct Morphology describes the morphologically abnormal structure that is the direct object of the Method action.

For example,

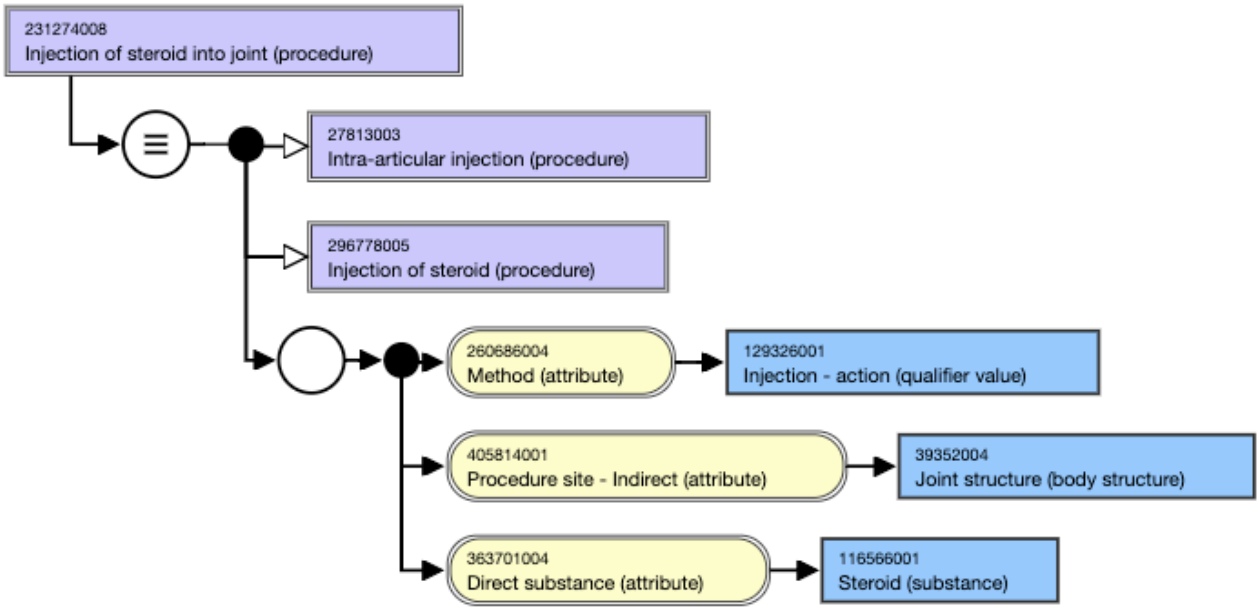
- 31512000 | Shaving of benign lesion with chemical cauterization (procedure) | (http://snomed.info/id/31512000) has the Direct morphology, Lesion (morphologic abnormality)

Direct substance

Direct Substance describes the Substance or Pharmaceutical/biologic product on which the procedure's method directly acts.

For example,

- 231274008 | Injection of steroid into joint (procedure) | (http://snomed.info/id/231274008) has Direct substance, Bone cement (substance)



⚠ Pharmaceutical / biologic product

Pharmaceutical / biologic product (product) and its descendants are not used as values for Direct Substance in the International Release.

Has focus

Has Focus specifies the Clinical finding or Procedure which is the focus of a procedure.

For example,

- 385941006 | Wound care assessment (procedure) | (http://snomed.info/id/385941006) Has focus, Wound care (regime/therapy)

Has intent

Has intent is generally used only to define procedures whose FSNs explicitly specify an intent, such as 240959006 | Therapeutic barium enema (procedure) | (http://snomed.info/id/240959006) or 274389009 | Diagnostic aspiration of ovary (procedure) | (http://snomed.info/id/274389009). Typically it is used when a procedure may be done for either a diagnostic or a therapeutic reason. It is not normally used to define procedures that are always inherently diagnostic, such as biopsies, or always inherently therapeutic, such as fixation of a fracture.

For example,

- 108249004 | Audiologic AND/OR audiometric test including vestibular function (procedure) | (http://snomed.info/id/108249004) has Intent, Diagnostic intent (qualifier value)

Indirect device

Indirect Device 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) | (http://snomed.info/id/232762008) has Indirect device, Mitral valve prosthesis device (physical object).

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 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) | (http://snomed.info/id/404205006) has Indirect morphology, Wound (morphologic abnormality)

Method

Method represents the action being performed to accomplish the procedure. It does not include: the surgical approach, e.g. translumbar; e quipment, e.g. sutures; or physical force, e.g. laser energy (see *Surgical Procedures Defining Attribute* page).

> *No relationship group can contain more than one Method relationship. If a procedure has more than one Method, each 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.*

For example,

- 10255001 | Incision of ureter (procedure) | (http://snomed.info/id/10255001) has Method, 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 a:

- Anatomical structure: Procedure site - Direct
- Morphologic abnormality: Direct Morphology
- Device: Direct Device
- Substance: Direct Substance

If the body 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 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) | (http://snomed.info/id/43748006) has Method, Removal - action (qualifier value) and Procedure site - Indirect, Bladder and outflow structure (body structure)

⚠ Method attribute

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 (see below). 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.

Priority

Priority is used when a procedure concept specifies a priority.

For example,

- 708932005 | Emergency hemodialysis (procedure) | (http://snomed.info/id/708932005) has Priority, Emergency (qualifier value)
- 177141003 | Elective cesarean section (procedure) | (http://snomed.info/id/177141003) has Priority, Elective (qualifier value)

260870009 | Priority (attribute) | (http://snomed.info/id/260870009)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 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) | (http://snomed.info/id/276272002)has Procedure device, Catheter, device (physical object)

⚠ Procedure device

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 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 describes the body site acted on or affected by a procedure.

Relatively few concepts are modeled using Procedure Site. It is used to model the site for high-level grouping-type procedure concepts. It is most likely used for concepts that do not require a 260686004 | Method (attribute) | (http://snomed.info/id/260686004) and 129264002 | Action (qualifier value) | (http://snomed.info/id/129264002) pair. It is not required in order for the classifier to work properly.

363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007) subsumes the more specific attributes, 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007), which is the site *directly* acted upon, and 405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001), which is the site *indirectly* acted upon. The more specific attributes should be used if possible (see *Procedure Site - Direct* and *Procedure Site - Indirect* explained below).

For example,

- 118839001 | Procedure on colon (procedure) | (http://snomed.info/id/118839001) has Procedure site of Colon structure (body structure)

Procedure site

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) | (http://snomed.info/id/23968004) has 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007) of 71854001 | Colon structure (body structure) | (http://snomed.info/id/71854001)
- 26390003 | Total colectomy (procedure) | (http://snomed.info/id/26390003)has 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007) of 302508007 | Entire colon (body structure) | (http://snomed.info/id/302508007)

Procedure site - direct

Procedure Site - Direct is used when the action of the procedure is directly aimed a t anatomical or acquired body structure or site, rather than something else located there (e.g. a device), i.e. when the 260686004 | Method (attribute) | (http://snomed.info/id/260686004) is 129303008 | Removal - action (qualifier value) | (http://snomed.info/id/129303008) or one of its subtypes (Excision, Surgical biopsy, or etc.). Removal of tissue lesions (cysts, tumors, or etc.) are considered to be removal of the site and should also use 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007).

For example,

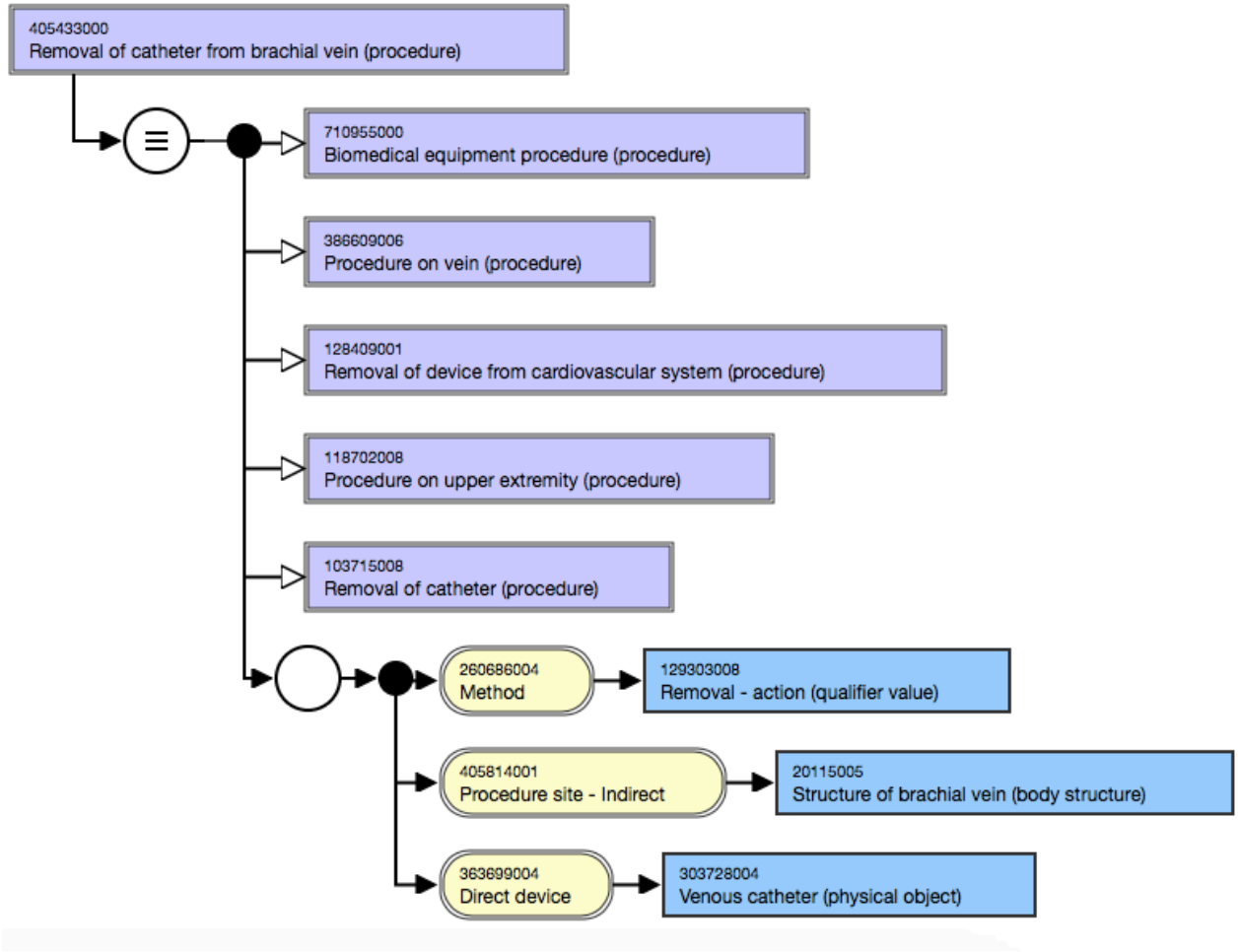
- 54321008 | Cardiac flow imaging (procedure) | (http://snomed.info/id/54321008) has 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007) of Coronary artery structure (body structure)

Procedure site - indirect

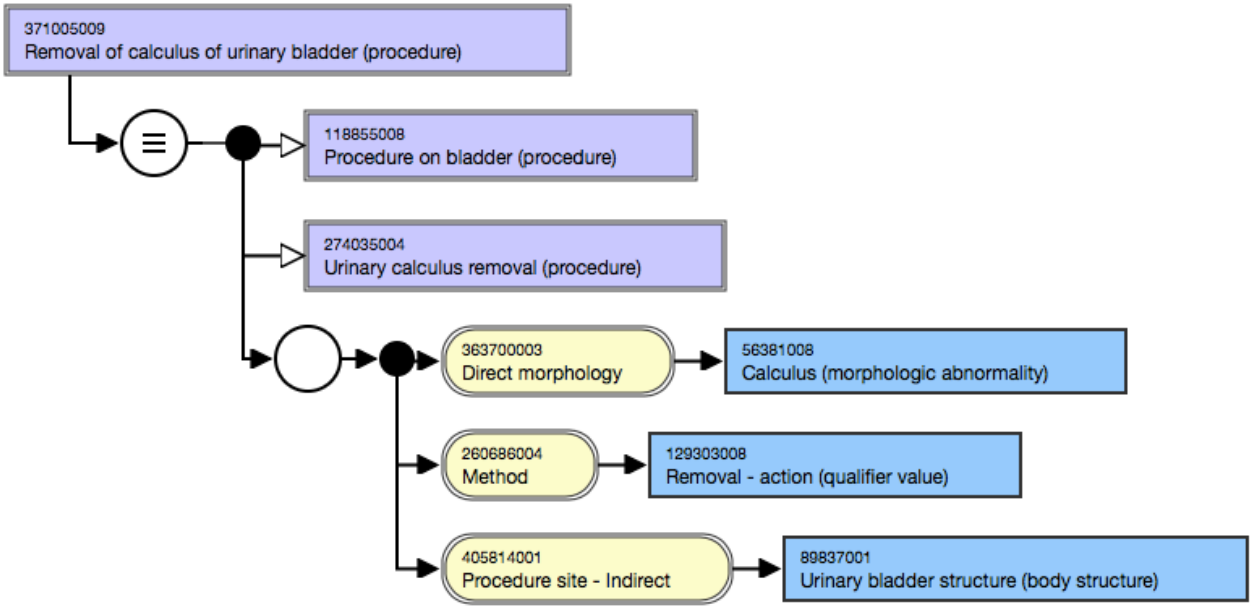
Procedure site - Indirect is used to specify an anatomical site in which a procedure takes place when that anatomical site is not the direct object of the procedure action. The direct object of the action may be a device, a substance, or a morphologic abnormality that is not a part of the tissue structure of the anatomical site in which it is located, such as a calculus, thrombus, or foreign body. Thus, 405814001 | Procedure site - Indirect (attribute) | (http://snomed.info/id/405814001) 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) | (http://snomed.info/id/405433000) has:
  - Method, Removal - action (qualifier value)
  - Procedure site - Indirect, Structure of brachial vein (body structure)
  - Direct device, Venous catheter (physical object)



- 371005009 | Removal of calculus of urinary bladder (procedure) | (http://snomed.info/id/371005009) has:
  - Direct morphology, Calculus (morphologic abnormality)
  - Method, Removal - action (qualifier value)
  - Procedure site - Indirect, Urinary bladder structure (body structure)



Recipient category

Recipient Category 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) | (http://snomed.info/id/105455006) has Recipient Category, 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 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) | (http://snomed.info/id/128323000) has Revision status, revision - value (qualifier value)

Using access device

Using Access Device specifies the instrument or equipment used to access the site of a procedure.

For example,

- 301761003 | Arthroscopic synovial biopsy (procedure) | (http://snomed.info/id/301761003) has Using access device, Arthroscope, device (physical object)

Using device

Using Device 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,

- 51064005 | Core needle biopsy of larynx (procedure) | (http://snomed.info/id/51064005) has Using device, Core biopsy needle, device (physical object)

Using energy

Using Energy refers to the energy used to execute an action.

For example,

- 65952009 | Gamma ray therapy (procedure) | (http://snomed.info/id/65952009) has Using energy, Gamma radiation (physical force)

Using substance

Using Substance 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) | (http://snomed.info/id/285754008) has Using substance, Contrast media (substance)

Evaluation Procedure

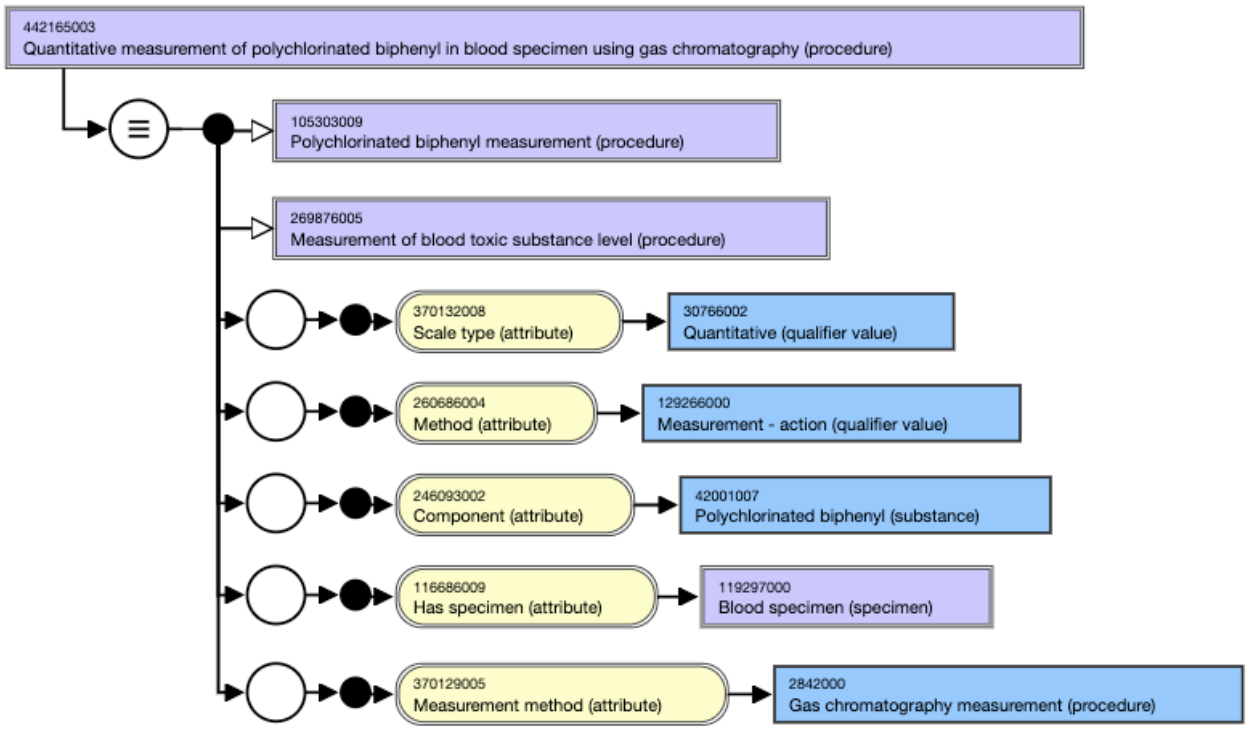
The following defining attributes are unique in the context of the 386053000 |Evaluation procedure (procedure)| subhierarchy. Many of these attributes (e.g., Component, Scale type) are used to define Observable entity concepts. Evaluation procedures may use the attributes below in addition to those attributes allotted to the 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002) hierarchy (see *Procedure Attributes Summary* page). All of the attributes for Evaluation procedure concepts are grouped. Also see 'Observable Entity vs. Evaluation Procedure' at Observable Entity.

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) | (http://snomed.info/id/442165003) has 246093002 | Component (attribute) | (http://snomed.info/id/246093002) of 42001007 | Polychlorinated biphenyl (substance) | (http://snomed.info/id/42001007)



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) | (http://snomed.info/id/442165003) uses 116686009 | Has specimen (attribute) | (http://snomed.info/id/116686009) of 119297000 | Blood specimen (specimen) | (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) | (http://snomed.info/id/260686004) is given the value 129266000 | Measurement - action (qualifier value) | (http://snomed.info/id/129266000). No concept can be defined with a 370129005 | Measurement method (attribute) | (http://snomed.info/id/370129005) unless it is being used to refine a *260686004 | Method (attribute) | (http://snomed.info/id/260686004)* that has a value of *129266000 | Measurement - action (qualifier value) | (http://snomed.info/id/129266000)* or one of its subtypes that is also specified in the concept definition. That is, use of *370129005 | Measurement method (attribute) | (http://snomed.info/id/370129005)* must be **in addition** to a *260686004 | Method (attribute) | (http://snomed.info/id/260686004)* of *129266000 | Measurement - action (qualifier value) | (http://snomed.info/id/129266000)* or one of its subtypes. Also, the 370129005 | Measurement method (attribute) | (http://snomed.info/id/370129005) and its value must be grouped with the 260686004 | Method (attribute) | (http://snomed.info/id/260686004) and its value of the concept or subtype of 129266000 | Measurement - action (qualifier value) | (http://snomed.info/id/129266000).

For example,

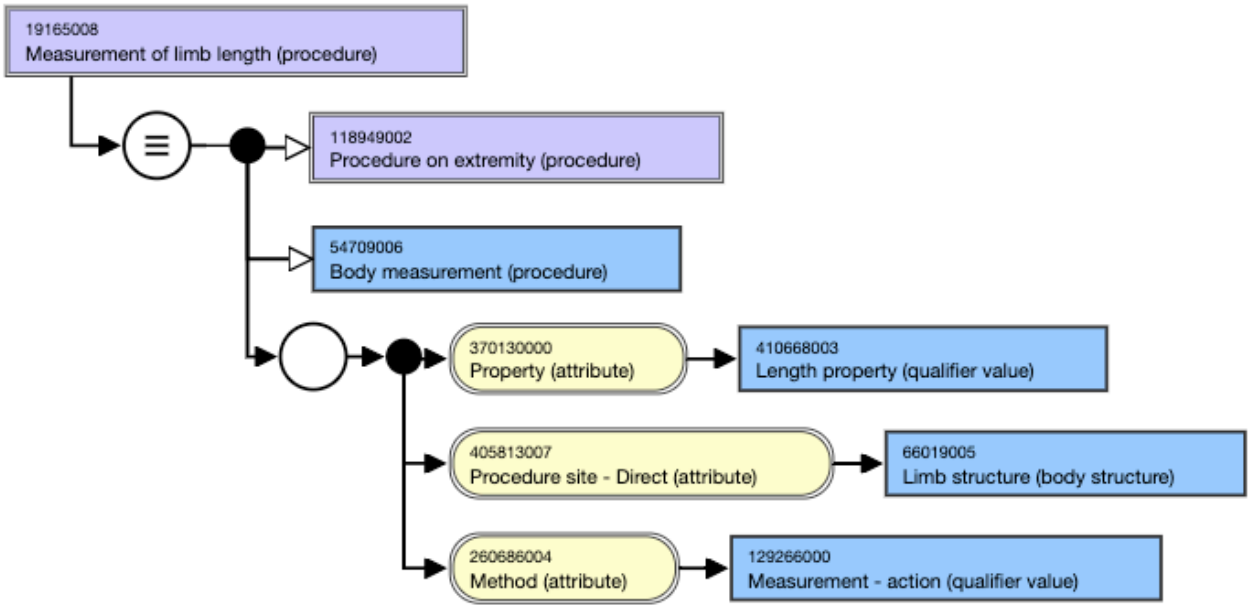
- 442165003 | Quantitative measurement of polychlorinated biphenyl in blood specimen using gas chromatography (procedure) | (http://snomed.info/id/442165003) has a 370129005 | Measurement method (attribute) | (http://snomed.info/id/370129005) of 2842000 | Gas chromatography measurement (procedure) | (http://snomed.info/id/2842000)

Property

Property specifies the kind of property (quality or characteristic) being measured.

For example,

- 19165008 | Measurement of limb length (procedure) | (http://snomed.info/id/19165008) has a 370130000 | Property (attribute) | (http://snomed.info/id/370130000) of 410668003 | Length property (qualifier value) | (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) | (http://snomed.info/id/442165003) has 370132008 | Scale type (attribute) | (http://snomed.info/id/370132008) of 30766002 | Quantitative (qualifier value) | (http://snomed.info/id/30766002)

Time aspect

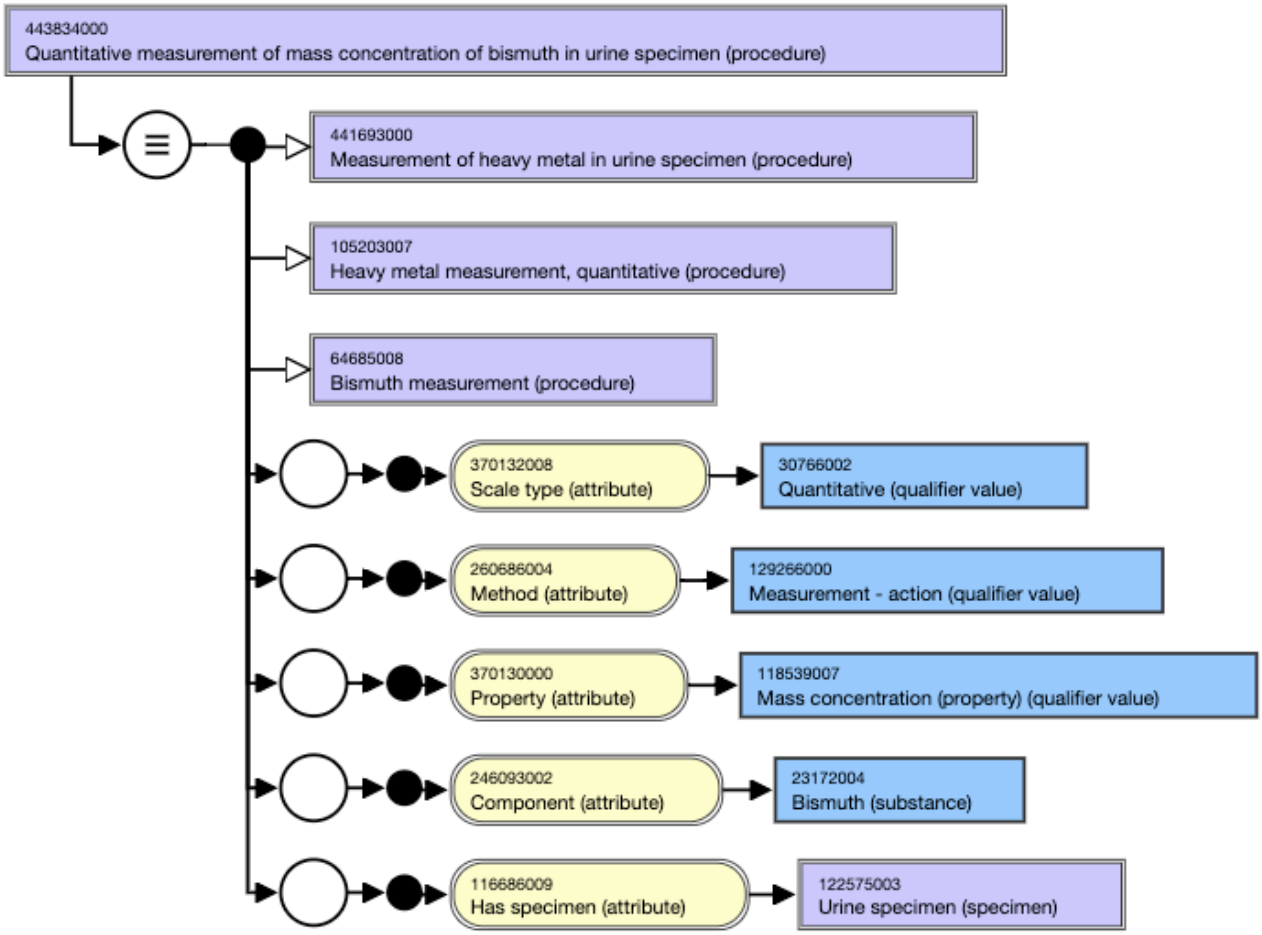
Time Aspect specifies temporal relationships for a measurement procedure. While this attribute has been approved, guidelines for its implementation await development.

Further clarification

An evaluation procedure may evaluate a property of a component , or a property may be the sole focus of the method.

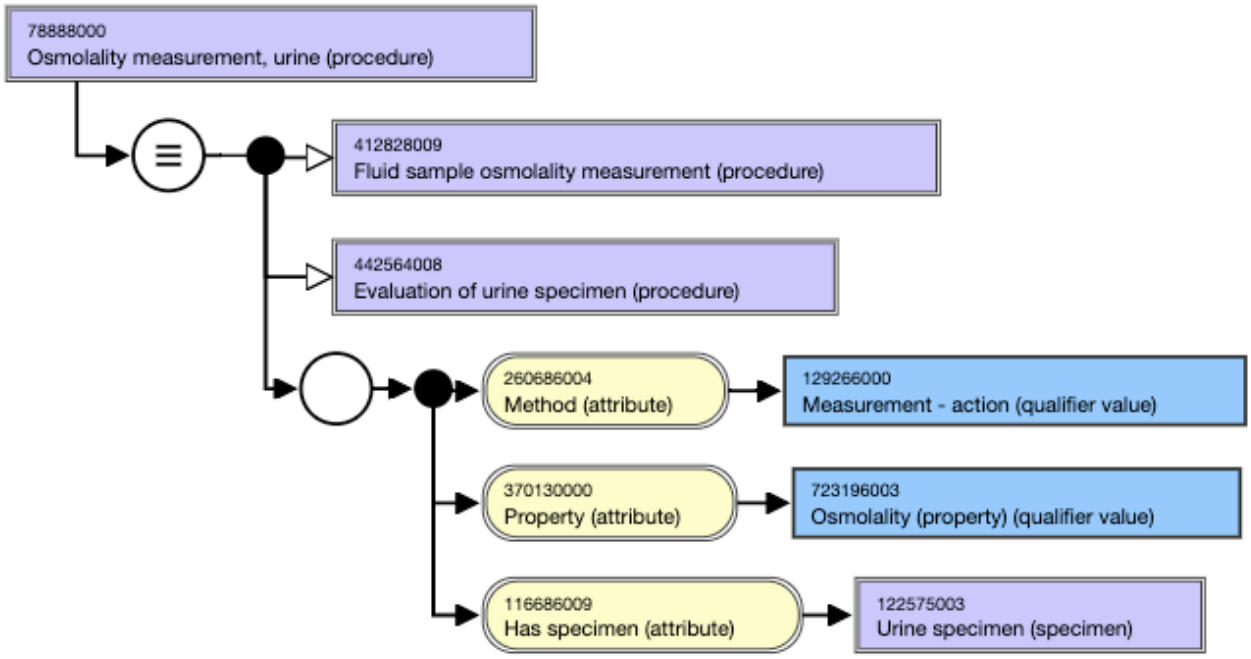
For example of an evaluation procedure evaluating a property of a component,

- 443834000 | Quantitative measurement of mass concentration of bismuth in urine specimen (procedure) | (http://snomed.info/id/443834000) has 370130000 | Property (attribute) | (http://snomed.info/id/370130000) of 118539007 | Mass concentration (property) (qualifier value) | (http://snomed.info/id/118539007) and 246093002 | Component (attribute) | (http://snomed.info/id/246093002) of 23172004 | Bismuth (substance) | (http://snomed.info/id/23172004)



For example where property may be the sole focus of the method,

- 78888000 | Osmolality measurement, urine (procedure) | (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) | (http://snomed.info/id/103379005)

- 172883004 | Intranasal ethmoidectomy (procedure) | (http://snomed.info/id/172883004) has Surgical approach, Intranasal approach (qualifier value)

Administration of Substance via Specific Route Procedure

In addition to attributes applicable to general procedures, the subhierarchy of |Administration of substance 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 433590000 | Administration of substance via specific route (procedure) | (http://snomed.info/id/433590000). 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)|. While the values for these two attributes may be similar and seem redundant, their presence is necessary for consistent inheritance.

For example,

- 410572008 | Intravitreal steroid injection (procedure) | (http://snomed.info/id/410572008) has the | Route of administration (attribute) | (http://snomed.org/fictid#) of Intravitreal route (qualifier value)

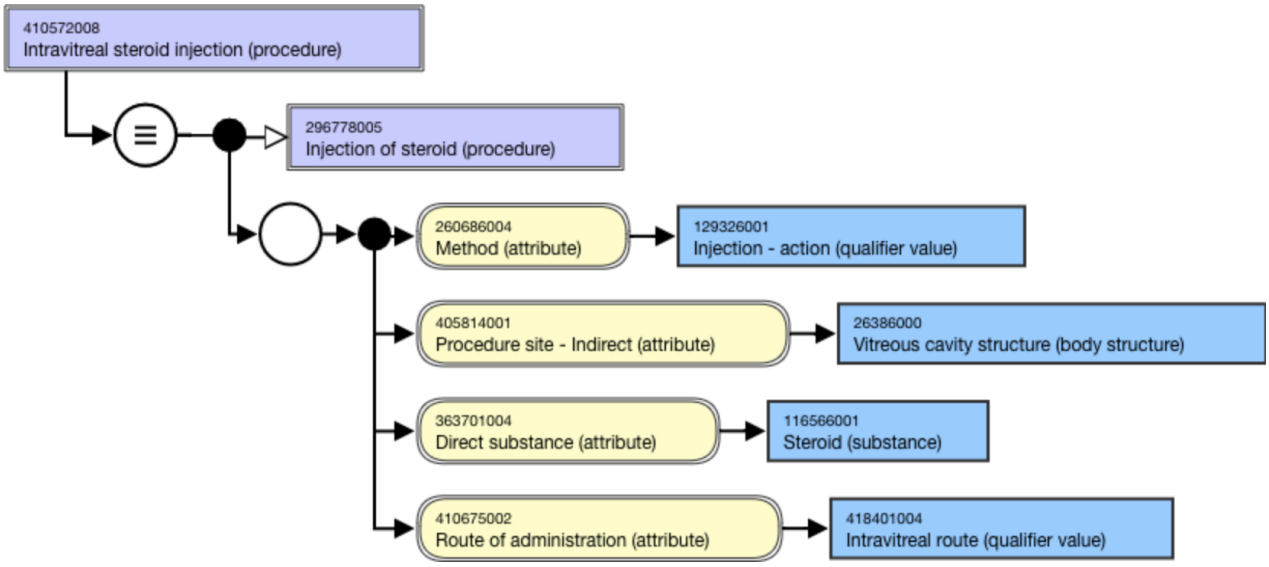


Figure 1: Stated view of 410572008 |Intravitreal steroid injection (procedure)|

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.

Route of administration (qualifier value)	Body structure value of Procedure site - Indirect
Intravenous route	Venous structure

Route of administration (qualifier value)	Body structure value of Procedure site - Indirect
Oral route	Mouth region structure

Table 1: Examples of complementary values of Route of administration and Procedure site - Indirect

Procedure Naming Conventions

When possible, the FSN for a procedure should name the action of the procedure (the method) first, and then the object that the action acts directly upon. However, the structure of FSNs can vary.

For example,

- Transurethral prostatectomy (procedure)
- Colpopexy by abdominal approach (procedure)
- Total hysterectomy via vaginal approach (procedure)
- Anterior decompression of fracture of spine (procedure)

Including the approach is not relevant in some cases, though where more than one option exists, it is valid to do so. Often the approach is indicated at the beginning of the FSN. Again, the naming is determined on a case-by-case basis but often follows one of the two following patterns:

FSN: <Y> approach <X> procedure e.g. Transurethral prostatectomy (procedure)

OR

FSN: <X> procedure via <Y> approach e.g.173822004 |Diagnostic gastroscopy via stoma (procedure)|

Surgical procedures

Surgical procedures: Use "via" for route/approach and "using" for device.

Anatomical site

An *anatomical site* is the direct object of the action. The word/s naming the site should follow the word(s) naming the action.

For example,

- 175253007 | Repair of pulmonary artery (procedure) | (http://snomed.info/id/175253007). The action is *repair* and the site is *pulmonary artery*.

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) | (http://snomed.info/id/392247006). 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) | (http://snomed.info/id/427258004). *Injection* is the action, *hormone* is the direct object, and *subcutaneous tissue* is the indirect site.

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) | (http://snomed.info/id/41180005). *Excision* is the action, the direct object is the morphologic abnormality *cyst*, and *breast* is the site.
- 175376008 | Operation on aneurysm of carotid artery (procedure) | (http://snomed.info/id/175376008). 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.

- 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) | (http://snomed.info/id/11227005). 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.

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) | (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, i.e. all lower case, and should represent the International Non-proprietary Name (INN) of the substance.

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) | (http://snomed.info/id/79516005) has the synonym renal angiography
- 726077005 | Computed tomography arteriography of bronchial artery (procedure) | (http://snomed.info/id/726077005) has the synonym CT *angiography* of bronchial artery
- 709552006 | Computed tomography angiography of iliac artery (procedure) | (http://snomed.info/id/709552006) has the synonym CT *angiogram* of iliac artery

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) | (http://snomed.info/id/49345004)

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) | (http://snomed.info/id/426581005)

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) | (http://snomed.info/id/66596009)

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*.

Modeling: New content requests

An X-ray concept may have the action, 312254007 | Plain X-ray imaging - action (qualifier value) | (http://snomed.info/id/312254007) or the broader supertype action, 278110001 | Radiographic imaging - action (qualifier value) | (http://snomed.info/id/278110001). A s ubmitter should clearly identify which of the actions is appropriate.

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) | (http://snomed.info/id/709590000)
  - 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
- SYN: Doppler ultrasound of X

For example,

- 710306004 | Doppler ultrasonography of venous structure (procedure) | (http://snomed.info/id/710306004)
  - FSN: Doppler ultrasonography of venous structure (procedure)
  - PT: Doppler ultrasonography of vein
  - SYN: Doppler ultrasound scan of vein
  - SYN: Doppler ultrasound 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) | (http://snomed.info/id/169670003)

- FSN: Antenatal ultrasound scan at 17-22 weeks (procedure)
- PT: Antenatal ultrasound scan at 17-22 weeks

Computed Tomography (CT)

Exception

CT is an exception to the rule that all abbreviations should have their expanded form in parentheses in descriptions.

Axial

Legacy issues: Existing computerized tomography concepts, will be renamed consistently when the Quality Initiative tackles the cleanup of procedures.

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

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) | (http://snomed.info/id/241566009)
  - FSN: Computed tomography of elbow (procedure)
  - PT: CT of elbow
  - SYN: Computed tomography of elbow

Computed tomography angiography

- FSN: Computed tomography angiography of X (procedure)
- PT: CT angiography of X
- SYN: CT angiogram of X
- SYN: Computed tomography angiography of X

For example,

- 419559003 | Computed tomography angiography of renal artery (procedure) | (http://snomed.info/id/419559003)
  - FSN: Computed tomography angiography of renal artery (procedure)
  - PT: CT angiography of renal artery
  - SYN: Computed tomography angiography of renal artery

Computed tomography venography

- FSN: Computed tomography venography of X (procedure)

- PT: CT venography of X
- SYN: CT venogram of X
- SYN: Computed tomography venography of X

For example,

- 432842007 | Computed tomography venography of intracranial vein (procedure) | (http://snomed.info/id/432842007)
    - FSN: Computed tomography venography of intracranial vein (procedure)
    - PT: CT venography of intracranial vein
    - SYN: Computed tomography venography of intracranial vein

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) | (http://snomed.info/id/418940000)
    - FSN: Computed tomography arthrography of intratarsal joint (procedure)
    - PT: CT arthrogram of intratarsal joint
    - SYN: CT arthrography of intratarsal joint

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) | (http://snomed.info/id/6007000)
    - 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) | (http://snomed.info/id/432103005)
    - 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,

- 21101000087100 | Magnetic resonance venography of limb (procedure) | (http://snomed.info/id/21101000087100)
    - 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) | (http://snomed.info/id/19741000087109)
    - FSN: Magnetic resonance arthrography of right knee (procedure)
    - PT: Magnetic resonance arthrography of right knee
    - SYN: MR arthrography of right knee

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) | (http://snomed.info/id/702501008)
    - FSN: Computed tomography of knee with contrast (procedure)
    - PT: CT of knee with contrast

- SYN: Computed tomography of knee with contrast

Exception

Fluoroscopic angiography and fluoroscopic-guided angiography procedures do not require *with contrast*.

For example,

- 418867007 | Fluoroscopic angiography of abdominal vascular structure (procedure) | (http://snomed.info/id/418867007)

Although vascular contrast and other contrast are regularly used in imaging procedures, it is agreed that there is no need to specify *vascular* contrast for procedures involving the vasculature.

For example,

- 431326009 | Computed tomography of neck with contrast (procedure) | (http://snomed.info/id/431326009)

Unacceptable example,

- CT of neck with *vascular* contrast

It is agreed that it is unnecessary to add the word *media* to contrast.

It is agreed that the link 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) | (http://snomed.info/id/566341000119106)
  - FSN: Computed tomography of ankle without contrast (procedure)
  - PT: CT 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*.

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.

Imaging Guided Procedures

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 (DI Modality guidance) (procedure)
- PT: (DI Modality) guided Y (procedure)
- SYN: Y (procedure) using (DI Modality guidance)

For example,

- 407971000119109 | Percutaneous needle biopsy of liver using computed tomography guidance (procedure) | (http://snomed.info/id/407971000119109)
    - 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

For example,

- 431864000 | Injection using computed tomography guidance (procedure) | (http://snomed.info/id/431864000)
    - 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,

- 430278000 | Biopsy using fluoroscopic guidance (procedure) | (http://snomed.info/id/430278000)
    - FSN: Biopsy using fluoroscopic guidance (procedure)
    - PT: Biopsy using fluoroscopic guidance
    - SYN: Fluoroscopic guidance for biopsy

> ⚠ **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) | (http://snomed.info/id/432540009) 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) | (http://snomed.info/id/433008009)
    - 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

For example,

- 710790002 | Puncture and aspiration using ultrasonographic guidance (procedure) | (http://snomed.info/id/710790002)
  - FSN: Puncture and aspiration using ultrasonographic guidance (procedure)
  - PT: Ultrasonography guided puncture and aspiration
  - SYN: Puncture and aspiration using ultrasonographic guidance

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) | (http://snomed.info/id/718674009)
  - FSN: Injection of steroid using X-ray guidance (procedure)
  - PT: X-ray guided steroid injection
  - SYN: Injection of steroid using X-ray guidance

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 use of contrast or 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. *SNOMED CT* uses the adjectival form, i.e. fluoroscopic arteriography in the FSN; the noun, i.e. fluoroscopic arteriogram, is acceptable as a synonym.

- FSN: Fluoroscopy of X (procedure)
- PT: Fluoroscopy of X
- SYN: Fluoroscopy - X

For example,

- 169005008 | Fluoroscopy of esophagus (procedure) | (http://snomed.info/id/169005008)
  - FSN: Fluoroscopy of esophagus (procedure)
  - PT: Fluoroscopy of esophagus
  - SYN: Fluoroscopy - esophagus

Fluoroscopic guidance

- FSN: Y using fluoroscopic guidance (procedure)
- PT: Fluoroscopy guided Y
- SYN: Y using fluoroscopic guidance

For example,

- 710293001 | Colonoscopy using fluoroscopic guidance (procedure) | (http://snomed.info/id/710293001)
  - FSN: Colonoscopy using fluoroscopic guidance (procedure)
  - PT: Fluoroscopy guided colonoscopy
  - SYN: Colonoscopy using fluoroscopic guidance

⚠ Fluoroscopic guidance

Fluoroscopic Y is interpreted as *Y using fluoroscopic guidance (procedure)*. Such procedures are subtypes of fluoroscopy (procedure).

For example,

- 432540009 | Biopsy of wrist using fluoroscopic guidance (procedure) | (http://snomed.info/id/432540009)

Fluoroscopic arteriography

- FSN: Fluoroscopic arteriography of X (procedure)
- PT: Fluoroscopic arteriography of X
- SYN: Fluoroscopic arteriogram of X
- SYN: Fluoroscopic angiography of X
- SYN: Fluoroscopic angiogram of X

For example,

- 16051000087102 | Fluoroscopic arteriography of right cervical vertebral artery (procedure) | (http://snomed.info/id/16051000087102)
  - FSN: Fluoroscopic arteriography of right cervical vertebral artery (procedure)
  - PT: Fluoroscopic arteriography of right cervical vertebral artery
  - SYN: Fluoroscopic arteriogram of right cervical vertebral artery
  - SYN: Fluoroscopic angiography of right cervical vertebral artery
  - SYN: Fluoroscopic angiogram of right cervical vertebral artery

Fluoroscopic venography

- FSN: Fluoroscopic venography of X
- PT: Fluoroscopic venography of X
- SYN: Fluoroscopic venogram of X

For example,

- 392491000119105 | Fluoroscopic venography of right extremity (procedure) | (http://snomed.info/id/392491000119105)
  - FSN: Fluoroscopic venography of right extremity (procedure)
  - PT: Fluoroscopic venography of right extremity
  - SYN: Fluoroscopic venogram of right extremity

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) | (http://snomed.info/id/723775001)
  - 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) | (http://snomed.info/id/723193006)
  - 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

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) | (http://snomed.info/id/702767007)
  - FSN: Positron emission tomography of whole body (procedure)
  - PT: PET of whole body
  - SYN: Positron emission tomography of whole body

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) | (http://snomed.info/id/709549003)
  - FSN: Single photon emission computed tomography of heart (procedure)
  - PT: Single photon emission computed tomography of heart
  - SYN: SPECT of heart

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) | (http://snomed.info/id/16554361000119106)
  - 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) | (http://snomed.info/id/16534151000119105)
  - 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

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,

- 710313004 | Radionuclide scan of peritoneal cavity (procedure) | (http://snomed.info/id/710313004)
  - 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) | (http://snomed.info/id/710312009)
  - 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

Adjacent structures

Concepts which describe adjacent structures, imaged in one procedure, are acceptable.

For example,

- 432672003 | Magnetic resonance imaging of pelvis and hip (procedure) | (http://snomed.info/id/432672003)

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

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.

Measurement Procedure Naming Conventions

In *SNOMED CT, measurement procedure* is the preferred way of expressing a laboratory test. *Measurement* and *assay* are synonymous in SNOMED CT. Naming conventions for measurement procedures are as follows:

General naming pattern: Action, Analyte, Specimen

Action

This is consistent with the general rule for the FSN for new procedure concepts.

- *Action* (the Method) is named first, when possible
- Modifier of the first component: *Scale Method*
  - Scale Method refines, and precedes the action in the naming order (Scale Method, Action)
  - Naming pattern: (Scale Method, Action), Analyte, Specimen

Analyte

This is also consistent with the general rule for FSNs for new procedure concepts.

- *Action* (the Method) is named first followed by the object acted directly upon, when possible
- Applying this convention to measurement procedures, the object being acted directly upon (measured) is the *analyte*

Specimen

- Modifier of third component: *Timing*

- *Timing* provides information and precedes *specimen* in the naming order (Timing, Specimen)

Word order for additional properties

Additional properties such as ratio, concentration, percentage, and count follow the *action*.

Screening

Measurements done by screening should be specified with *by screening method*, added at the end of the description.

For example,

- Measurement of substance X in Y specimen by *screening method*

The FSN should have *measurement of X antibody by screening method*, not *X antibody assay by screening method*.

Serologic and antibody

"Serology" and "serologic test" are ambiguous terms and should not be included in FSNs. These terms can be included in the descriptions for antibody procedure concepts but cannot be included in the preferred term. The existing content will be corrected in a future release.

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 2020-01-31

Author View of Ranges for 363704007 | Procedure site (attribute) | (http://snomed.info/id/363704007)
Range Constraint
<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)

HRCM 2020-01-31

Author View of Ranges for 405815000 | Procedure device (attribute) | (http://snomed.info/id/405815000)
Range Constraint
<< 49062001 | Device (physical object) | (http://snomed.info/id/49062001)

HRCM 2020-01-31

Author View of Ranges for 405816004 | Procedure morphology (attribute) | (http://snomed.info/id/405816004)
Range Constraint
<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)

Observable Entity vs. Evaluation Procedure

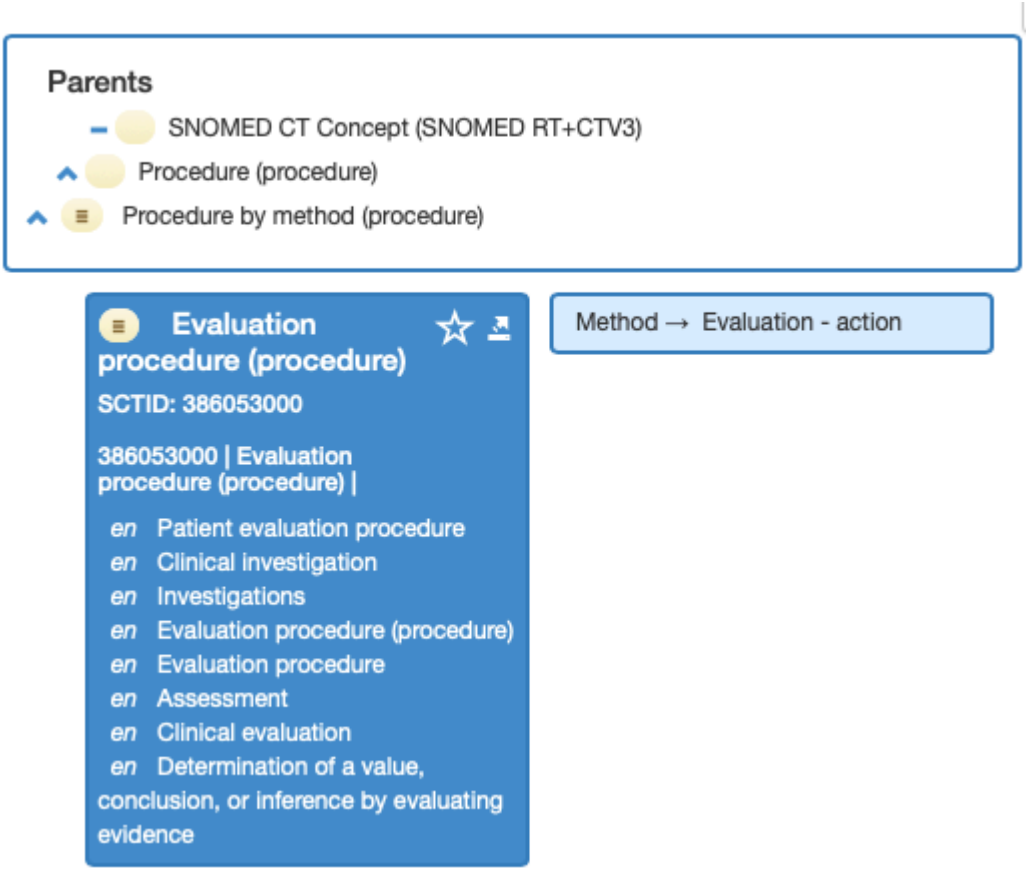
The observable entity and evaluation procedure hierarchies have some of the same attributes. There is not and should not be a one-to-one correspondence between the two hierarchies.

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:

- 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 Method = 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 a procedure is ordered should not be precoordinated with the procedure, 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 not 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) | (http://snomed.info/id/66596009)

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)

Specific Procedure Modeling

Topic links

Surgical procedure (see page)

Surgical procedure (operation) vs. non-surgical action (see page)

Surgical repair (see page)

Surgical procedure

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 procedure (operation) vs. non-surgical action

As mentioned above, 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 procedures

- 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) | (http://snomed.info/id/48635004) 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.

Surgical repair

The definition of *surgical repair* is restoring, to the extent possible, the 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 auto-classified as kinds of repair procedures.

For example,

- 79433000 | Closure of colon fistula (procedure) | (http://snomed.info/id/79433000) 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 use 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

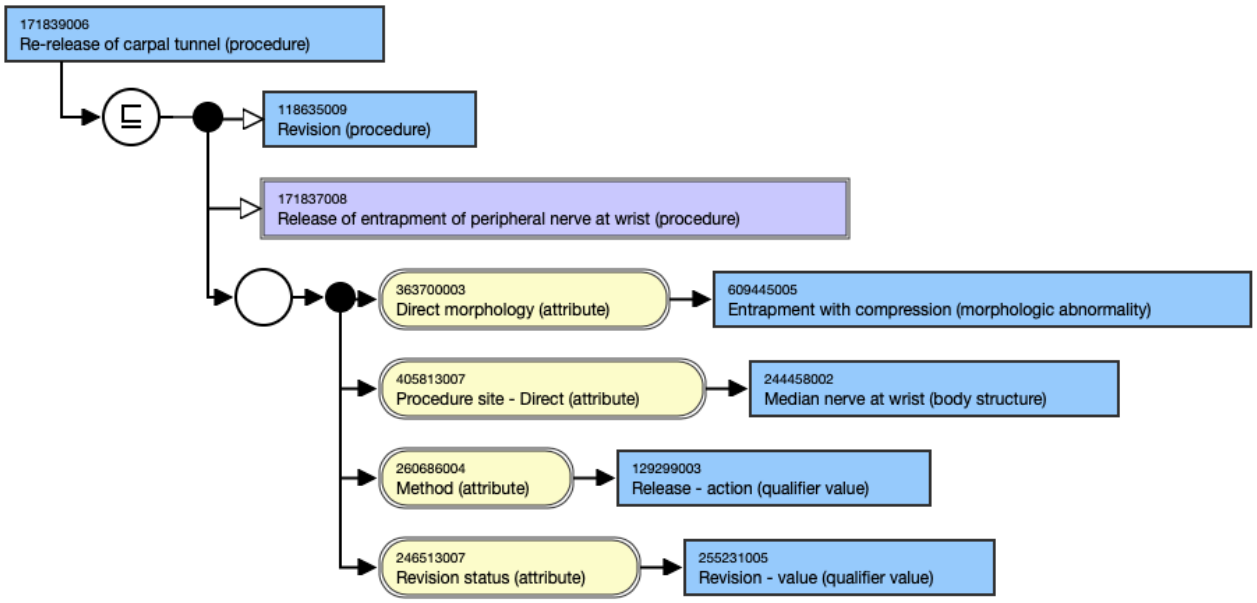
> ⚠ **-plasty**
>
> The suffix *-plasty* is widely used in concepts that apply to prosthetic repairs (e.g. total hip arthroplasty). So *-plasty* may refer to any general repair (prosthetic, plastic, or other), and not just plastic repairs.

Revision

A *revision procedure* is not a subtype of the original procedure.

Revision procedure concepts should be in the 118635009 | Revision (procedure) | (http://snomed.info/id/118635009) sub-hierarchy.

For example, 171839006 | Re-release of carpal tunnel (procedure) | (http://snomed.info/id/171839006)is modeled as follows:



Bilateral procedures

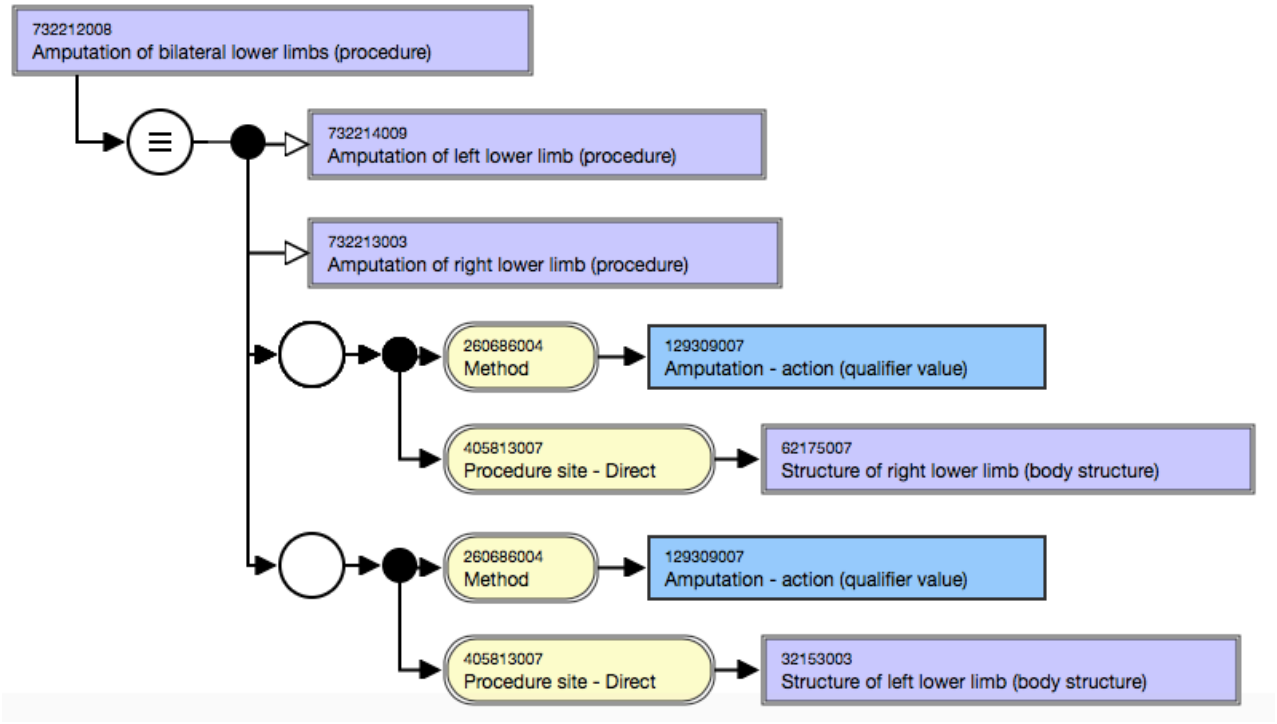
The naming pattern is as follows:

- FSN: X procedure of bilateral X (procedure)
- PT: Bilateral X procedure
- SYN: X p rocedure of both Xs
- Other synonyms may be added if requested, e.g. *left and right* X

For example, 732212008 | Amputation of bilateral lower limbs (procedure) | (http://snomed.info/id/732212008)

- FSN: Amputation of bilateral lower limbs (procedure)
- PT: Bilateral lower limb amputation
- SYN: Amputation of bilateral lower limbs
- SYN: Amputation of both lower limbs

The concept is modeled as follows:



Regime/therapy

A regime/therapy is a is a set, sequence, or group of procedures, a *subtype* of procedure. As a subtype of procedure, they have the same attributes and use the same model as procedures in general. Regime/therapies are either:

- Repeated multiple times, over an extended period of time

For example,

- 716872004 | Antineoplastic chemotherapy regimen (regime/therapy) | (http://snomed.info/id/716872004), This regime/therapy might include individual instances of administration of chemotherapy agents; the instances are at separate times, over a predetermined or planned period of time.
- 229586001 | Rest, ice, compression and elevation treatment program (regime/therapy) | (http://snomed.info/id/229586001), This regime/therapy refers to repeated rest, ice, compression and elevation (RICE) for an indefinite period of time.
- Focused on a single purpose, but do not have any single sub-procedure as a necessary part.

For example,

- 385695003 | Cast care (regime/therapy) | (http://snomed.info/id/385695003), 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, or 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) | (http://snomed.info/id/385978009) with Has focus, cardiac rehabilitation (regime/therapy)

Endoscopy vs. endoscopic procedure

Endoscopic procedures are distinguished from *endoscopy* procedures. The distinction depends on the Action (qualifier value) of the Method (attribute).

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) | (http://snomed.info/id/427595003) has the Relationship group
  - Using device, Endoscope, device (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) | (http://snomed.info/id/53767003) has the Relationship group
  - Using access device, Endoscope, device (physical object)
  - Method, Biopsy, action (qualifier value)

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, puncture action and a Procedure site - Direct, the structure being punctured.

For example,

- 91602002 | Thoracentesis (procedure) | (http://snomed.info/id/91602002) has Procedure site - Direct, Pleural membrane structure (body structure)

The second group has a Method, aspiration action and a Procedure site - Indirect, space being aspirated.

For example,

- 91602002 | Thoracentesis (procedure) | (http://snomed.info/id/91602002) has Procedure site - Indirect, Pleural cavity structure (body structure)

Inactivation

The value *centesis - action* was inactivated, since it had two actions with different direct and indirect objects.

Transplantation and grafting

Transplantation includes procedures that are not grafting

Transplantation

Content in this area is under review and subject to change.

The term *transplantation* should, in general, be reserved for the transplantation of whole organs or body parts (e.g., liver transplant, finger transplant, hair transplant, or etc.).

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 fixed or attached to a recipient site. The recipient site provides the vascularity.

Fixation or attachment, for example, is of tissue involves skin, bone, cartilage, or fat, rather than whole organs. The term can also be used for fixation or attachment of some synthetic materials (e.g., a bioengineered skin graft is a manufactured skin graft grown in the laboratory from the patient's own cells, or from other allogeneic or xenogeneic sources, and/or synthetic materials, for example, silicone graft, or combined sources).

For example,

- Graft of skin
  - A skin graft is a section of skin, of variable size, thickness and origin.
  - A skin graft is completely detached from its original site and moved to cover the area to be repaired without the benefit of any blood supply.

For example,

- 783285007 | Full thickness graft of skin to skin of neck (procedure) | (http://snomed.info/id/783285007)
  - Proximal primitive *Is a* attribute value of 71388002 Procedure (procedure).
  - One relationship group:
    - 260686004 | Method (attribute) | (http://snomed.info/id/260686004) = 129407005 | Grafting - action (qualifier value) | (http://snomed.info/id/129407005)
    - 405813007 | Procedure site - Direct (attribute) | (http://snomed.info/id/405813007) = 43081002 | Skin structure of neck (body structure) | (http://snomed.info/id/43081002)
    - 363701004 | Direct substance (attribute) | (http://snomed.info/id/363701004) = 782792007 | Full thickness graft of skin (substance) | (http://snomed.info/id/782792007)
      - Values for direct substance should be from the 420934007 | Graft of skin (substance) | (http://snomed.info/id/420934007) hierarchy that includes the origin of the material in the description and a text definition.

⚠ Skin flaps are under review and not included here.

Imaging guidance (see also Clinical imaging procedure naming conventions)

Imaging guidance can be modeled using the attribute *Has Intent*. The concept 429892002 | Guidance intent (qualifier value) | (http://snomed.info/id/429892002), a child of 363675004 | Intents (nature of procedure values) (qualifier value) | (http://snomed.info/id/363675004), is the value for Has Intent for imaging guided procedures.

For example,

- 432666003 | Biopsy of brain using computed tomography guidance (procedure) | (http://snomed.info/id/432666003) has two relationship groups, the second one below with *Has Intent*,
  - Method: Biopsy - action (qualifier value)
  - Procedure Site - Direct: Brain structure (body structure)
- Procedure Site - Direct: Brain structure (body structure)
- Method: Computed tomography imaging - action (qualifier value)
- Has Intent: Guidance intent (qualifier value)

⚠ **Biopsy of brain using computed tomography guidance**

432666003 | Biopsy of brain using computed tomography guidance (procedure) | (http://snomed.info/id/432666003) is subsumed by 702707005 | Biopsy of head (procedure) | (http://snomed.info/id/702707005) and by 34227000 | Computerized axial tomography of brain (procedure) | (http://snomed.info/id/34227000).

Fluoroscopic guidance

Y using fluoroscopic guidance (procedure) is a subtype of fluoroscopy (procedure).

For example,

- 710291004 | Endoscopy using fluoroscopic guidance (procedure) | (http://snomed.info/id/710291004) with the following relationship groups,
  - Using device: Endoscopic device (physical object)
  - Method: Inspection - action (qualifier value)
- Method: Fluoroscopic imaging - action (qualifier value)
- Has intent: Guidance intent (qualifier value)

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) | (http://snomed.info/id/23968004) 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) | (http://snomed.info/id/63016009) with the synonyms Complete cystectomy, Total excision of bladder, and etc

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) | (http://snomed.info/id/708929007) 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) | (http://snomed.info/id/72106008)
- 69031006 | Excision of breast tissue (procedure) | (http://snomed.info/id/69031006)

Lesion modeling

The word *lesion* can be used to refer to both structural and functional abnormalities. If a procedure (or disorder) refers to a lesion in a way that makes it clear that it is a generic term for a structural abnormality, then the correct modeling approach is to use Procedure morphology (attribute) for procedures or [Associated morphology (attribute), Morphologically abnormal structure (morphologic abnormality) for disorders].

Excision(al) biopsy

Excisional biopsy of entire organ (organ structure)

For example,

- 447412005 | Excisional biopsy of lymph node of neck (procedure) | (http://snomed.info/id/447412005)

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) | (http://snomed.info/id/116237003)

Incision

Organ incision. Any incisional act involving the organ; usually *(organ)-otomy,* or similar, is a synonym

For example,

- 45558009 | Incision of lung (procedure) | (http://snomed.info/id/45558009) or the synonym, pneumonotomy

Incision

Any *incision* procedure that does not necessarily involve division (as opposed to ordinarily does not involve division) remains primitive without an available negation operator.

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) | (http://snomed.info/id/237378001)

Biopsy

A *biopsy* may not be an excision.

For example,

- 445713002 | Brush biopsy of endocervix (procedure) | (http://snomed.info/id/445713002)
- 48426002 | Fine needle biopsy of kidney (procedure) | (http://snomed.info/id/48426002)

Modeling biopsy

Biopsies, like other removal procedures, may have two direct objects, the *morphology* and the *site*. It is permissable to use Procedure site - Direct for biopsies, even if subtypes might have a direct object that is a morphology.

Division, lysis, transection, bisection

Division and lysis

Division action 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, 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) | (http://snomed.info/id/173269002), should be modeled the same as *lysis of adhesion* concepts, like 45602008 | Lysis of adhesions of peritoneum (procedure) | (http://snomed.info/id/45602008)

Both use *dissection - action*. 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,

- 53176004 | Transection of muscle of eye (procedure) | (http://snomed.info/id/53176004)
- 60158005 | Bilateral bisection of ovary (procedure) | (http://snomed.info/id/60158005)

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) | (http://snomed.info/id/77825002) 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*:

- 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) | (http://snomed.info/id/118483001)
- 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) | (http://snomed.info/id/447867002)

- 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*.

Inactivated

- Osteotomy - action (qualifier value)
- Incision of bone without division as a synonym for *Incision of bone*

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) | (http://snomed.info/id/74011006)

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) | (http://snomed.info/id/38598009) has *vaccination* in all descriptions
- 86198006 | Influenza vaccination (procedure) | (http://snomed.info/id/86198006) has the synonym, influenza *immunization*

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. An encounter is a kind of procedure.

For example,

- 185349003 | Encounter for check up (procedure) | (http://snomed.info/id/185349003)

An *indirect encounter* is not actually an encounter, since there is no face-to-face meeting. Therefore encounter and indirect encounter are siblings in the procedure hierarchy.

For example,

- 11797002 | Telephone call by physician to patient or for consultation (procedure) | (http://snomed.info/id/11797002)
-

Qualifier Value*

Changes cannot be made to the Qualifier Value hierarchy without permission from the Head of Terminology.

Definition	Examples
One of several possible values for an attribute used to define concepts	• 7771000 | Left (qualifier value) | (http://snomed.info/id/7771000) • 260389003 | No reaction (qualifier value) | (http://snomed.info/id/260389003)

The 362981000 | Qualifier value (qualifier value) | (http://snomed.info/id/362981000) hierarchy contains concepts used as the target value of an attribute in a d efining relationship.

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, please refer to the MRCM Project

- 18639004 | Left kidney structure (body structure) | (http://snomed.info/id/18639004) has Left (qualifier value) for the attribute Laterality

Number (qualifier value) hierarchy

Concepts that describe numeric values have been added as descendants of 260299005 | Number (qualifier value) | (http://snomed.info/id/260299005). While the FSN and PT for these concepts use numeric characters, the concepts represent descriptions of a number and are not actually numeric values. To reinforce this, a synonym with the textual description of the number is created for each concept.

For example,

- |Zero point two| is the synonym for 732349004 | 0.2 (qualifier value) | (http://snomed.info/id/732349004)

⚠ True numeric values

Textual descriptions of numbers provide a path to representing true numeric values, should that become an option.

Concepts representing numbers	
FSN	X (qualifier value) *Trailing zeros are not allowe*d (e.g. 10, not 10.0) Preceding zeros are required (e.g. 0.5, not .5) For example, • 25 (qualifier value) • 37.5 (qualifier value) • 125 (qualifier value)
PT	X Trailing zeros are not allowed (e.g. 10, not 10.0) Preceding zeros are required (e.g. 0.5, not .5) For example, • 25 • 37.5 • 125

Concepts representing numbers	
SYN	A synonym representing the concept as a textual description is required Synonyms are not case sensitive. No commas or other punctuation is allowed. An exception is the hyphen For example, • Twenty-five • Thirty-seven point five • One hundred and twenty-five

Unit of presentation (unit of presentation) hierarchy

The 732935002 | Unit of presentation (unit of presentation) | (http://snomed.info/id/732935002) hierarchy is used to support harmonization between SNOMED CT's *Drug Concept Model* and the International Organization for Standardization's *Identification of Medicinal Products (IDMP)* standards for product strength.

⚠ Unit dose

The Unit dose (qualifier value) is unacceptable for representing unit of presentation.

Concepts 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

Disposition (disposition) hierarchy

The 726711005 | Disposition (disposition) | (http://snomed.info/id/726711005) hierarchy is required to support the remodeling of the 105590001 | Substance (substance) | (http://snomed.info/id/105590001) hierarchy. These concepts are used as the attribute values for the 726542003 | Has disposition (attribute) | (http://snomed.info/id/726542003). 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.

For example,

- 702658000 | Microbial culture technique (qualifier value) | (http://snomed.info/id/702658000)

International System of Units - unit of mass (qualifier value) hierarchy

The *258681007 | International System of Units unit of mass (qualifier value) | (http://snomed.info/id/258681007)* hierarchy contains concepts representing metric units of mass.

Concepts representing Unit of Mass	
FSN	**X** metric unit of mass Lower case with case sensitivity, *ci*
PT	**X** metric unit of mass Lower case with case sensitivity, *CS* *SNOMED CT* exception: abbreviated without the expanded form
SYN	**X** metric unit of mass Lower case with case sensitivity, *ci*

International System of Units - derived unit of volume (qualifier value) hierarchy

The *282115005 | International System of Units-derived unit of volume (qualifier value) | (http://snomed.info/id/282115005)* hierarchy contains concepts representing metric units of volume.

Concepts representing Derived Unit of Volume	
FSN	**X** metric unit of volume Lower case with case sensitivity, *ci*

Concepts representing Derived Unit of Volume	
PT	X metric unit of mass Lower case with case sensitivity *CS* *SNOMED CT* exception: abbreviated without the expanded form For example, • dL • mL • L
SYN	Lower case with case sensitivity *ci* For example, • deciliter • milliliter • liter

Pharmaceutical dose form (dose form) hierarchy

The 736542009 | Pharmaceutical dose form (dose form) | (http://snomed.info/id/736542009)* hierarchy contains concepts support the drug model. Please see the Drugs Project Confluence page, Pharmaceutical dose form Hierarchy - Editorial Guidelines.

Other Qualifier Value Subhierarchies that Support the Drug Model

See the separate guidelines for the following qualifier value subhierarchies that support the drug model at the Drugs Project Confluence page, Supporting hierarchies.

- 736478001 | Basic dose form (basic dose form) | (http://snomed.info/id/736478001)*
- 736665006 | Dose form administration method (administration method) | (http://snomed.info/id/736665006)
- 736479009 | Dose form intended site (intended site) | (http://snomed.info/id/736479009)
- 736480007 | Dose form release characteristic (release characteristic) | (http://snomed.info/id/736480007)
- 736477006 | Dose form transformation (transformation) | (http://snomed.info/id/736477006)
- 736471007 | State of matter (state of matter) | (http://snomed.info/id/736471007)
- 105904009 | Type of drug preparation (qualifier value) | (http://snomed.info/id/105904009)

*For these concept model domains that support the drug model, see the attribute and range tables at the Pharmaceutical/Biologic Product Attributes Summary page.

Record Artifact*

Definition	Examples
Clinical documents, or parts thereof	• 422813005 | Document section (record artifact) | (http://snomed.info/id/422813005) • 416575001 | Perioperative record (record artifact) | (http://snomed.info/id/416575001)

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) | (http://snomed.info/id/184225006) 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) | (http://snomed.info/id/726738003). These may, in turn, contain more finely granular Record artifacts, such as sections, and even section headers e.g. 422813005 | Document section (record artifact) | (http://snomed.info/id/422813005).

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	• 407565004 | Angiotensin II receptor antagonist not tolerated (situation) | (http://snomed.info/id/407565004) • 417886001 | Treatment adjusted per protocol (situation) | (http://snomed.info/id/417886001)

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
- D iagnosis, 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
- 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

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 2020-01-31

Domain Information for 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009)	
Domain Constraint	<< 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009)
Parent Domain	-
Proximal Primitive Constraint	<< 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 243796009 | Situation with explicit context (situation) | (http://snomed.info/id/243796009)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002)	
	1	0..*	0..1		

408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000)				<< 410510008 | Temporal context value (qualifier value) | (http://snomed.info/id/410510008)	

HRCM 2020-01-31

Author View of Attributes and Ranges for 413350009 \| Finding with explicit context (situation) \| (http://snomed.info/id/413350009)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
246090004 | Associated finding (attribute) | (http://snomed.info/id/246090004)	1	0..*	0..1	<< 404684003 | Clinical finding (finding) | (http://snomed.info/id/404684003) OR << 272379006 | Event (event) | (http://snomed.info/id/272379006)	
408729009 | Finding context (attribute) | (http://snomed.info/id/408729009)	1	0..*	0..1	<< 410514004 | Finding context value (qualifier value) | (http://snomed.info/id/410514004)	
408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002)	
408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000)	1	0..*	0..1	<< 410510008 | Temporal context value (qualifier value) | (http://snomed.info/id/410510008)	

HRCM 2020-01-31

Author View of Attributes and Ranges for 129125009 \| Procedure with explicit context (situation) \| (http://snomed.info/id/129125009)

Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
363589002 | Associated procedure (attribute) | (http://snomed.info/id/363589002)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
408730004 | Procedure context (attribute) | (http://snomed.info/id/408730004)	1	0..*	0..1	<< 288532009 | Context values for actions (qualifier value) | (http://snomed.info/id/288532009)	
408732007 | Subject relationship context (attribute) | (http://snomed.info/id/408732007)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002)	
408731000 | Temporal context (attribute) | (http://snomed.info/id/408731000)	1	0..*	0..1	<< 410510008 | Temporal context value (qualifier value) | (http://snomed.info/id/410510008)	

Situation with Explicit Context Defining Attributes

⚠ Context values for Actions

Context values for Actions are under Review.

- See the proposed qualifier values for the International Release @ EDITPANEL-15 (https://jira.ihtsdotools.org/browse/EDITPANEL-15).
- Specifically link to document @ Context values for actions (qualifier value); Proposed allowed qualifier values within the International Release (https://docs.google.com/document/d/1Rc9c0QyVK6aXHSEui8I5-Ea6HFYavZOiC3DNq1nTd2s/edit?usp=sharing).

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) | (http://snomed.info/id/443999008) 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) | (http://snomed.info/id/161922009) with Associated finding, Cough (finding) and Finding context, Known absent (qualifier value)

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) | (http://snomed.info/id/161077003) with Associated finding, Smoker (finding) and Subject relationship context, Father of subject (person)

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) | (http://snomed.info/id/161550001) 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) | (http://snomed.info/id/183976008) 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) | (http://snomed.info/id/183976008) with Procedure context, Planned (qualifier value)

Situation with Explicit Context Modeling

SNOMED CT contains concepts that include *context* information and some 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) | (http://snomed.info/id/22298006) 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, or etc.
- The concept for *breast cancer*, 254837009 | Malignant neoplasm of breast (disorder) | (http://snomed.info/id/254837009), might be used to indicate a a current diagnosis of breast cancer, 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.

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*. When a concept is entered into an EHR, the information in the health record structure or its information model, can override the default context.

The 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).

The 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 represent Clinical findings and Procedures that:

Have not yet occurred

For example,

- 165137000 | Endoscopy arranged (situation) | (http://snomed.info/id/165137000)

Refer to someone other than the patient

For example,

- 160303001 | Family history: Diabetes mellitus (situation) | (http://snomed.info/id/160303001)
- 395083002 | Discussed with next of kin (situation) | (http://snomed.info/id/395083002)

Have occurred at some time prior to the time of the current entry in the record

For example,

- 161514008 | History of aortic aneurysm (situation) | (http://snomed.info/id/161514008)

Attributes

These attributes are used to represent *Clinical finding* and *Procedure* in the Situation hierarchy.

	Clinical Finding	Procedure
Attributes	Associated finding	Associated procedure
	Finding context	Procedure context
	Subject relationship context	Subject relationship context
	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) | (http://snomed.info/id/266897007) 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) | (http://snomed.info/id/54355006) 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) | (http://snomed.info/id/281666001), combined with 246090004 | Associated finding (attribute) | (http://snomed.info/id/246090004) = 22298006 | Myocardial infarction (disorder) | (http://snomed.info/id/22298006). 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) | (http://snomed.info/id/397956004) within a section of a patient's EHR 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) | (http://snomed.info/id/2004005) 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 EHR, 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) | (http://snomed.info/id/192644005) is entered in a patient's EHR, it usually indicates that the patient has had an instance of this disease. Similarly the entry of 38102005 | Cholecystectomy (procedure) | (http://snomed.info/id/38102005) 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) | (http://snomed.info/id/194828000) 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) | (http://snomed.info/id/49049000) in a *Family history* field or 41339005 | Coronary angioplasty (procedure) | (http://snomed.info/id/41339005) 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

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*.

A subtype qualification refines the meaning of a concept.

For example,

- 71620000 | Fracture of femur (disorder) | (http://snomed.info/id/71620000) may be elaborated by indicating whether the fracture is open or closed or whether it is the left or right femur that is fractured. A patient with an *open fracture of the neck of the left femur* has a type of fracture of the femur. Refining the morphology, site, and laterality act as subtype qualifications.
- 708038006 | Acute exacerbation of asthma (disorder) | (http://snomed.info/id/708038006) may be elaborated by adding *severity*. A patient with a severe exacerbation of asthma has a type of asthma exacerbation . *Severity* acts as a subtype qualification.
- 236886002 | Hysterectomy (procedure) | (http://snomed.info/id/236886002) may be elaborated by specifying a priority and a surgical approach. A patient who had a *routine vaginal hysterectomy* had a type of *hysterectomy;* priority, i.e. routine, and approach, i.e. vaginal, *Priority* and *approach* are subtype qualifications.

⚠ Subtype qualification

Subtype qualification has also been considered a *qualifier* (e.g. ENV136060, GEHR, CTV3) or a *secondary status term* (e.g. NHS Context of Care). In *SNOMED CT, 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 some International Organization of Standardization (ISO) authorities.

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) | (http://snomed.info/id/22298006) 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) | (http://snomed.info/id/52734007) 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) | (http://snomed.info/id/167272007) 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) | (http://snomed.info/id/167271000), 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 JIRA Project.

> ⚠ **Axis modification**
>
> *Axis modification* i s 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*.

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) | (http://snomed.info/id/430679000) is *IS A* situation-with-explicit-context with,
  - Subject relationship context, Person in family of subject (person)
  - Associated finding, Diabetes mellitus type 2 (disorder)
  - Finding context, Known present (qualifier value)
  - Temporal context, 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, Known Present (qualifier value), Finding Context becomes Known Absent (qualifier value).

For example,

- The concept 160273004 | No family history: Hypertension (situation) | (http://snomed.info/id/160273004) negates 160357008 | Family history: Hypertension (situation) | (http://snomed.info/id/160357008) by changing the value of Finding Context to Known Absent with Temporal Context, All times past (qualifier value). It is *IS A* Situation-with-explicit-context,
  - Temporal context, All times past (qualifier value)
  - Associated finding, Hypertensive disorder, systemic arterial (disorder)
  - Finding context, Known absent (qualifier value)
  - Subject Relationship Context, Person in family of subject (person)

Context attributes

When a Situation with explicit context concept is used in a electronic health application, 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.

Modeling procedure context

Acceptable precoordination naming pattern

- *Procedure refused*

For example,

FSN and PT: <procedure> refused (situation)
Synonym: <procedure> declined (situation) (optional)

- 413123006 | Blood pressure procedure refused (situation) | (http://snomed.info/id/413123006)

There is legacy content that does not follow this modeling.

Unacceptable precoordination naming patterns

The following precoordination naming patterns are no longer accepted for addition to the International Edition, although some legacy content with these patterns is still present:

- Procedure offered
- Procedure not offered
- Procedure done
- Procedure not done

Note that the 385658003 | Done (qualifier value) | (http://snomed.info/id/385658003) (a descendent of 410523001 | Post-starting action status (qualifier value) | (http://snomed.info/id/410523001)) remains in use as the target value of the 408730004 | Procedure context (attribute) | (http://snomed.info/id/408730004) in *History of <procedure>* concepts.

Modeling: No known allergy

The pattern is:

716186003 | No known allergy (situation) | (http://snomed.info/id/716186003)

FSN: No known allergy (situation)

PT: No known allergy

SYN: NKA - No known allergy

No known X allergy (situation)

For example, 428197003 | No known insect allergy (situation) | (http://snomed.info/id/428197003)

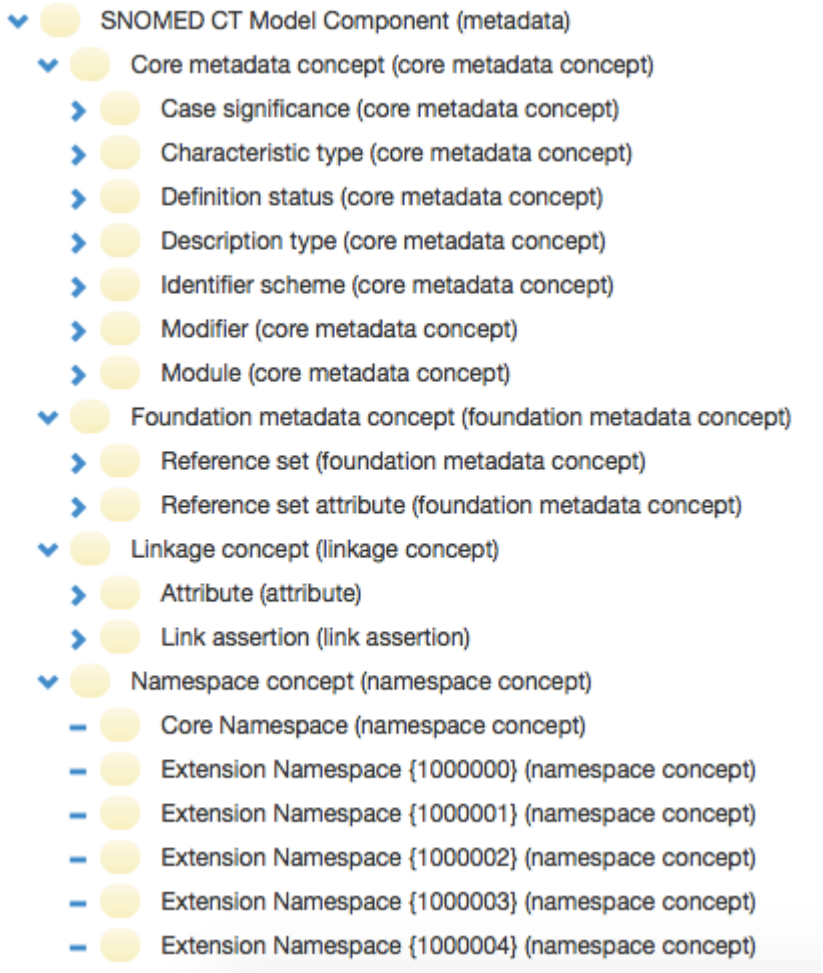
FSN: No known insect allergy (situation)

PT: No known insect allergy

SNOMED Model Component*

Definition	Types
Concepts and attributes necessary to organize and structure SNOMED terminology and its derivatives	1. 900000000000442005 | Core metadata concept (core metadata concept) | (http://snomed.info/id/900000000000442005) 2. 900000000000454005 | Foundation metadata concept (foundation metadata concept) | (http://snomed.info/id/900000000000454005) 3. 106237007 | Linkage concept (linkage concept) | (http://snomed.info/id/106237007) 4. 370136006 | Namespace concept (namespace concept) | (http://snomed.info/id/370136006)

SNOMED Model component module (metadata)



Core metadata concept

Subtypes of 900000000000442005 | Core metadata concept (core metadata concept) | (http://snomed.info/id/900000000000442005) 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.

Foundation metadata concept

Subtypes of the 900000000000454005 | Foundation metadata concept (foundation metadata concept) | (http://snomed.info/id/900000000000454005) provide supporting metadata and structural information for derivative release structures including Reference Sets.

Linkage concept

A 106237007 | Linkage concept (linkage concept) | (http://snomed.info/id/106237007) 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. The Concept Model attributes are approved for use.

Linkage concept is a subclass of *SNOMED CT* model component. The Linkage concept hierarchy has the sub-hierarchies:

- Attribute (attribute)
- Link assertion (link assertion)

Linkage concept attributes

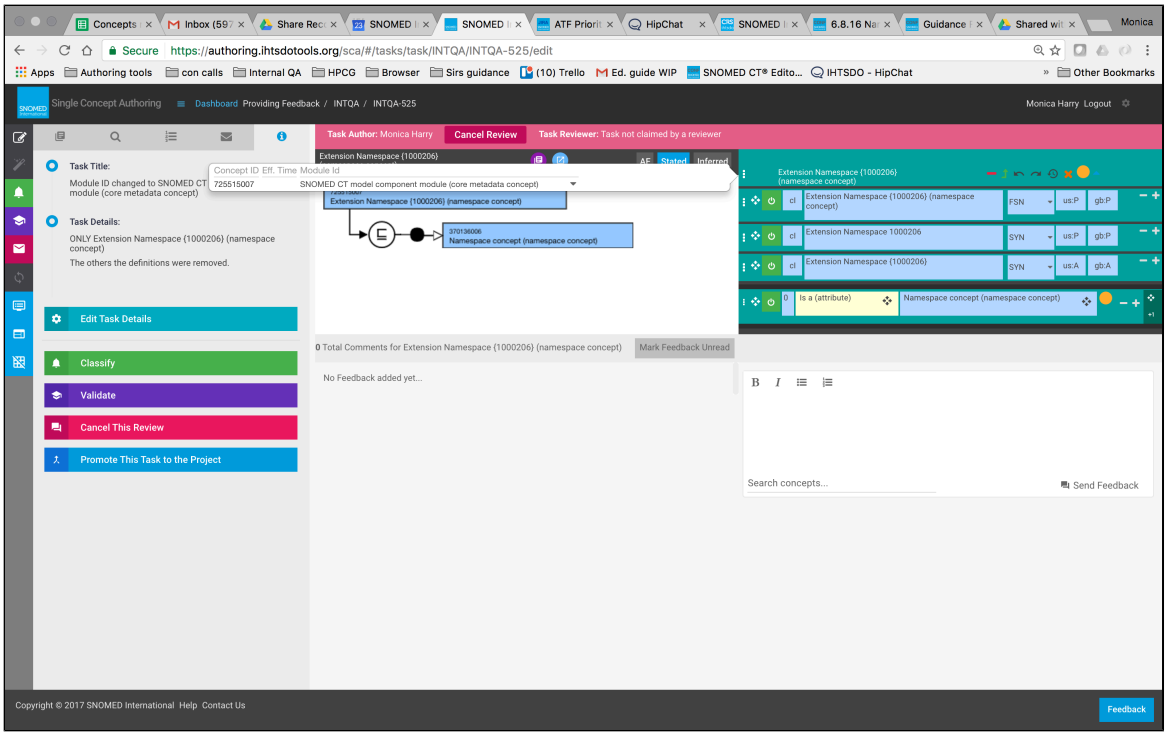
Concepts in the Linkage concept sub-hierarchy are used to construct relationships between two *SNOMED CT* concepts, i.e. they indicate the relationship type between those concepts. Some attributes (relationship types) can be used to logically define a concept (defining attributes).

Namespace concept

370136006 | Namespace concept (namespace concept) | (http://snomed.info/id/370136006) is a subtype of *SNOMED CT* model component. Each of its subtype concepts has an integer term which is an assigned Extension namespace identifier.

For more information

New namespace concepts are requested via *Freshdesk*. An internal author adds new IDs as received. It is also necessary to change the Module ID per the following:



For further details search for *Change or Add to SNOMED CT* on the IHTSDO website at: http://www.snomed.org/snomed-ct/learn-more.

Social Context*

Definition	Examples
Social conditions and circumstances related to healthcare Subtypes include: ethnic group, lifestyle, occupation, person, racial group, religion /philosophy, social concept	• 413465009 | Afro-Caribbean (ethnic group) | (http://snomed.info/id/413465009) • 116060000 | Eating habit (life style) | (http://snomed.info/id/116060000) • 24413000 | Carpenter, general (occupation) | (http://snomed.info/id/24413000)

Definition	Examples
	• 133932002 | Caregiver (person) | (http://snomed.info/id/133932002) • 415794004 | Unknown racial group (racial group) | (http://snomed.info/id/415794004) • 61154002 | Hinduism (religion/philosophy) | (http://snomed.info/id/61154002) • 22575004 | Middle class economic status (social concept) | (http://snomed.info/id/22575004)

Social Context

These concepts represent social aspects affecting patient health and treatment.

Special Concept*

Definition	Examples
Inactive and navigational (support locating concepts in hierarchies) concepts	• 363664003 | Erroneous concept (inactive concept) | (http://snomed.info/id/363664003) • 394899003 | Oral administration of treatment (navigational concept) | (http://snomed.info/id/394899003)

Inactive concepts

Inactive concepts are no longer active in the terminology. Subclass concepts indicate the reason a concept is inactive.

Navigational concepts

NO LONGER ACCEPTED IN SNOMED CT CORE

The concepts in navigational hierarchies are used for structured data entry. 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. They:

- Are not suitable for recording or aggregating information
- Are direct subtypes of the concept 363743006 \| Navigational concept (navigational concept) \| (http://snomed.info/id/363743006)
- 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 54).

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) | (http://snomed.info/id/384744003) • 122880004 | Urine specimen obtained by clean catch procedure (specimen) | (http://snomed.info/id/122880004)

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

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 2020-01-31

Domain Information for 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009)	
Domain Constraint	<< 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009)
Parent Domain	-
Proximal Primitive Constraint	<< 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 123038009 | Specimen (specimen) | (http://snomed.info/id/123038009)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
118171006 | Specimen procedure (attribute) | (http://snomed.info/id/118171006)	1	0..*	0..1	<< 71388002 | Procedure (procedure) | (http://snomed.info/id/71388002)	
118170007 | Specimen source identity (attribute) | (http://snomed.info/id/118170007)	1	0..*	0..1	<< 125676002 | Person (person) | (http://snomed.info/id/125676002) OR << 35359004 | Family (social concept) | (http://snomed.info/id/35359004) OR << 133928008 | Community (social concept) | (http://snomed.info/id	

				/133928008) OR << 276339004 | Environment (environment) | (http://snomed.info/id/276339004) OR << 260787004 | Physical object (physical object) | (http://snomed.info/id/260787004)	
118168003 | Specimen source morphology (attribute) | (http://snomed.info/id/118168003)	1	0..*	0..1	<< 49755003 | Morphologically abnormal structure (morphologic abnormality) | (http://snomed.info/id/49755003)	
118169006 | Specimen source topography (attribute) | (http://snomed.info/id/118169006)	1	0..*	0..1	<< 442083009 | Anatomical or acquired body structure (body structure) | (http://snomed.info/id/442083009)	
370133003 | Specimen substance (attribute) | (http://snomed.info/id/370133003)	1	0..*	0..1	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

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,

- 419695002 \| Environmental swab (specimen) \| (http://snomed.info/id/419695002) 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) \| (http://snomed.info/id/447407009) 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) \| (http://snomed.info/id/16209771000119101) 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) | (http://snomed.info/id/384744003) has the Specimen procedure, Dissection procedure (procedure)

Specimen substance

Specimen substance specifies the type of substance of which a specimen is comprised.

For example,

- 110897001 | Bone marrow cytological material (specimen) | (http://snomed.info/id/110897001) has the Specimen substance, Bone marrow fluid (substance)

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) | (http://snomed.info/id/273472005) Staging • 254294008 | Tumor-node-metastasis (TNM) head and neck tumor staging (tumor staging) | (http://snomed.info/id/254294008)

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.

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.

Modeling

Concepts of the type |*Assessment using X assessment scale*| are modeled with a proximal primitive parent of 445536008 | Assessment using assessment scale (procedure) | (http://snomed.info/id/445536008) or one of its subtypes, as appropriate.

For example,

- 445719003 | Assessment using visual analog pain scale (procedure) | (http://snomed.info/id/445719003) has a parent of 445536008 | Assessment using assessment scale (procedure) | (http://snomed.info/id/445536008)

(See also *Why is Content Rejected* page, *Proprietary Names* for information about use of Questionnaire and Scale names)

Substance

Definition	Examples
Active chemical constituents of allergens, agents, substances, chemicals, drugs, and materials (not Pharmaceutical/Biological Products)	• 116272000 | Dietary fiber (substance) | (http://snomed.info/id/116272000)

Definition	Examples
	• 52454007 | Albumin (substance) | (http://snomed.info/id/52454007)

Concepts from the Substance hierarchy are used to represent general substances and chemical constituents of Pharmaceutical / biologic products, which are in a separate hierarchy.

Editorial guidelines in development

Editorial guidelines are in development for the Substance hierarchy. There will be iterative documentation spanning multiple international release cycles. Comments will also be solicited from the Project Group. The guidelines will be relocated to the Editorial Guide after they are tested and stable. The current guideline draft is located on the Substance Project Confluence space @ Reference Documentation - Substances.

Substance concept and causative agent

When creating a new concept that includes a substance in the FSN, where no exact matching substance concept exists, then a new substance concept with an FSN, and a PT matching the FSN, should be created (the terms in the new concept should match the terms used in the FSN and PT of the substance concept selected as the causative agent).

For example,

- 418689008 \| Allergy to grass pollen (disorder) \| (http://snomed.info/id/418689008) modeled with causative agent, 256277009 \| Grass pollen (substance) \| (http://snomed.info/id/256277009)

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 2020-01-31

Domain Information for 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	
Domain Constraint	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)
Parent Domain	-
Proximal Primitive Constraint	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)
Proximal Primitive Refinement	-

HRCM 2020-01-31

Author View of Attributes and Ranges for 105590001 | Substance (substance) | (http://snomed.info/id/105590001)					
Attribute	Grouped	Cardinality	In Group Cardinality	Range Constraint	
	0	0..*	0..0		

726542003 | Has disposition (attribute) | (http://snomed.info/id/726542003)				<< 726711005 | Disposition (disposition) | (http://snomed.info/id/726711005)	
738774007 | Is modification of (attribute) | (http://snomed.info/id/738774007)	0	0..*	0..0	<< 105590001 | Substance (substance) | (http://snomed.info/id/105590001)	

Substance Defining Attributes

⚠ Editorial guidelines are in development for the Substance hierarchy. The current Substance editorial guidelines draft is located on the Substance Project Confluence space at: Substance Project.

Documentation will be developed in iterations that span multiple International Release cycles, with comments to be solicited from the Project Group intermittently. Editorial guidelines will be relocated to the Editorial Guide after they are tested and deemed to be stable.

The following defining attributes corresponds to the *Substance Attribute Summary* table.

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).

Is modification of

This attribute indicates that the concept is a structural modification of another concept.

Substance Naming Conventions

⚠ **Editorial guidelines are in development for the Substance hierarchy. The current Substance editorial guidelines draft is located on the Substance Project Confluence space at: Substance Project.**

Documentation will be developed in iterations that span multiple International Release cycles, with comments to be solicited from the Project Group intermittently. Editorial guidelines will be relocated to the Editorial Guide after they are tested and deemed to be stable.

Appendices

This section provides guidance for terms in fully specified names and synonyms.

Appendix A: 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, to enable extension to new user communities.

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.

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

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.

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.

Nonsemantic identifiers

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

Polyhierarchy

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

Formal definitions

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

Reject, 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.

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

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.

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.

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.

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.

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.

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.

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, and 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.

Implementation and Migration

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.

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.

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.

User Communities

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, 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.

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.

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

Factors affecting term use	
	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

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.

Summary

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
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

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	
	• 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
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
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

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:

Searches and Text Parsing	
	• 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
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:

Data Structure	
	• 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
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, and 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

Appendix B: Concept Models

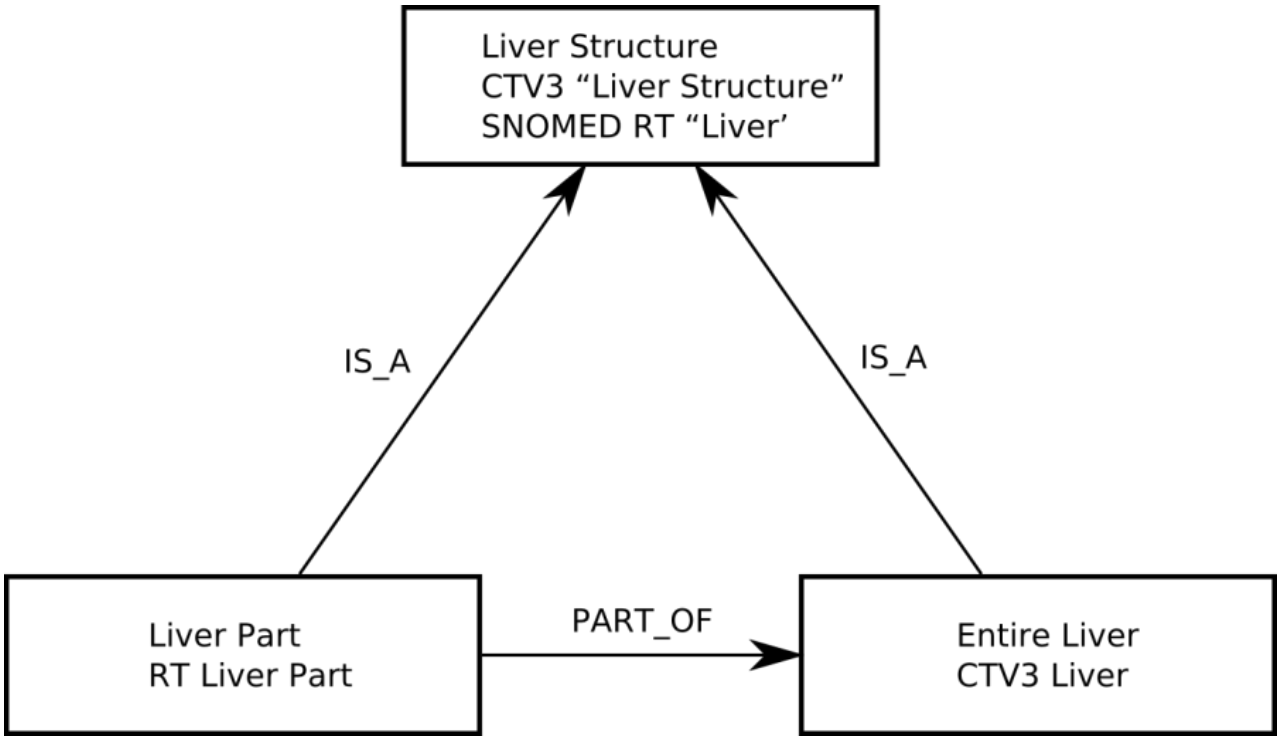
The *SNOMED CT* concept model specifies the way in which *SNOMED CT* concepts are defined using a combination of formal logic and editorial rules. Concept model rules specify the top level concepts under which concepts are arranged in the subtype hierarchy and the types of relationships that are permitted between concepts in particular branches of the hierarchy.

The information that follows is additional/background information about the two concept models. The information necessary for authoring for the two concept models is in *Anatomical Structure Modeling* and *Disorder Combination Modeling*.

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:



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 Part *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 Structure *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*.

Naming conventions

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 finger*s in the FSN would mean more than one finger, while *Skin of finger* would not imply more than one.

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 4. Part of relationships (under development).

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

Unilateral: with the addition of lateralized content in the International Release, the need for unspecified unilateral concepts is obviated, as well as potentially dangerous if used directly in a patient record. Unilateral concepts will not be accepted and a review of existing content for potential inactivation is underway.

Disorder Combinations

Combined disorders and clinical life phases (CLPs)

The model for combined disorders is based on the reimagining of clinical disorders as clinical life phases which represent a period of a person's life during which they are experiencing one or more pathological conditions (pathological structures, dispositions or processes). The subtype relationship in this case is analogous to the subset relation of set theory in which Y is a subtype of X if all members of Y are wholly included as members of X rather than Y being more specific than X. In this manner, a combined life phase consisting of CLP_a and CLP_b will inherit both CLP_a and CLP_b as parents as all individuals with the combined CLP of CLP_a and CLP_b are also individuals with CLP_a and are individuals with CLP_b.

Temporal relationships and the meaning of co-occurrence

Relations between two time intervals may be described using a formalism known as Allen's interval algebra[i] (see page). The basic relations (and their converses) between 2 time intervals are illustrated below where a and b are individual CLPs and relations are represented by small letters and their converses by capital letters. Note the relation "equals" is its own converse.

precedes	meets	overlaps	finished by	contains	starts	equals	started by	during	finishes	overlap-ped by	met by	preceded by
												
p	m	o	F	D	s	e	S	d	f	O	M	P

Figure 1: Allen's basic relations and converse relations (https://www.ics.uci.edu/~alspaugh/cls/shr/allen.html#Allen1983-mkti)

- *We define co-occurrence as the situation in which time interval a (e.g. a CLP) is wholly present during time interval b (or conversely time interval b is wholly present during time interval a).*

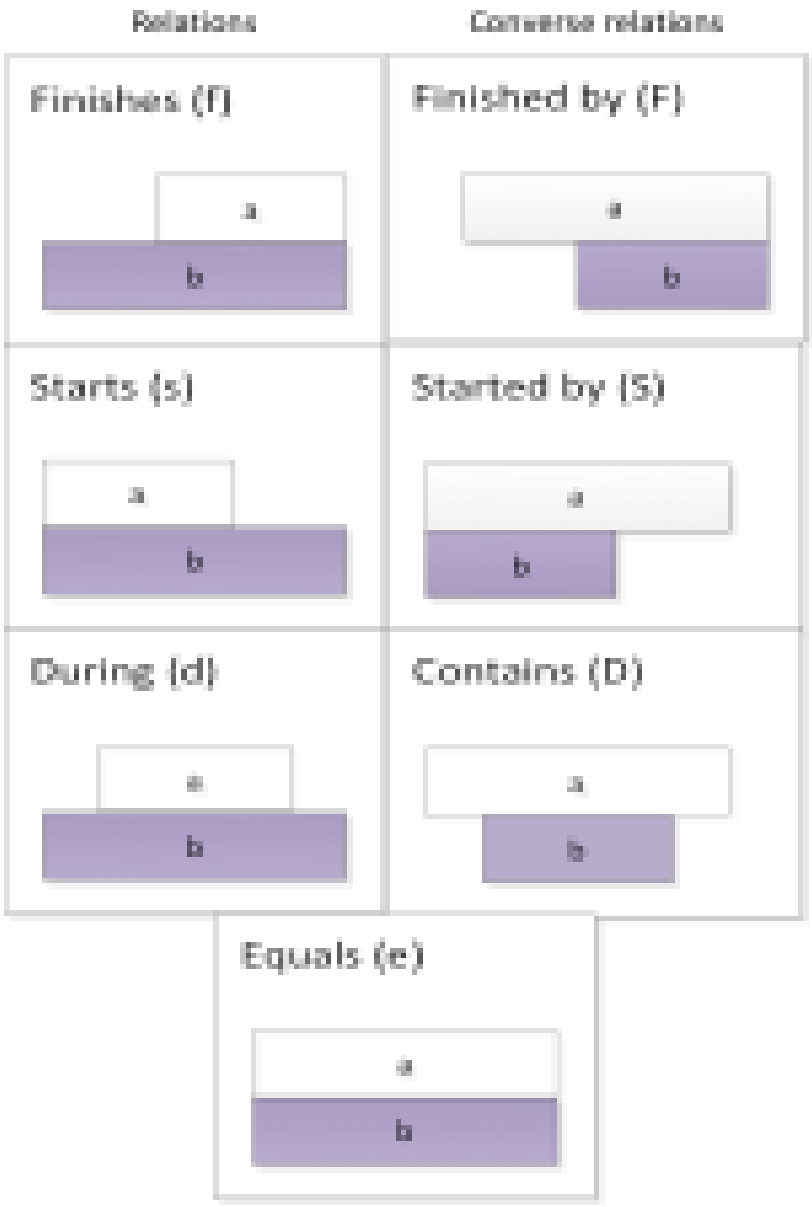


Figure 2: Allen's basic and converse relations compatible with co-occurrence

As it would undoubtedly be difficult to distinguish among these various temporal relations in a clinical setting, we can represent the relationship between a and b in Allen's syntax as *a(fsdeFSD)b* which indicates the disjunction of all the patterns depicted in figure 2 above.

Thus, in deciding whether CLPa and CLP_b are co-occurrent, the question becomes can either life phase persist after the other has resolved. If the answer is no, then CLP_a and CLP_b are co-occurrent. As an example, consider the conjunction of coronary artery embolus and myocardial infarction. Clearly the embolus may resolve after treatment but the infarcted myocardial tissue will not and thus coronary artery embolus and myocardial infarction are not considered to be necessarily co-occurrent. On the other hand, consider the conjunction of intestinal obstruction and volvulus. The intestinal obstruction would no longer exist once the volvulus is reduced and thus volvulus and intestinal obstruction are necessarily co-occurrent.

In terms of simple co-occurrence, two life phases may be necessarily co-occurrent but clinically related by an association in which neither condition causes the other. These types of clinical associations often are related by a common predisposition and therefore simple co-occurrence would be most appropriate for representing overlap syndromes (e.g. asthma with COPD) as well as to associate two CLPs (CLPa and CLPb) in which after reviewing the current literature one is still unsure of whether a causal chain exists between CLPa and CLPb. (especially relevant for genetic mutations and associated phenotypes).

[i] (see page)Allen, James F. "Maintaining knowledge about temporal intervals". Communications of the ACM 26 (11) pp.832-843, Nov. 1983.

Causality

We consider the notion of causality as a primitive predicate, which is essential for medical reasoning and decision-making. Whether y follows x incidentally or because it is caused by x is seen as fundamentally different. Causal relationships between disorders are represented using the due to role. A causal relationship should be considered as any point in a causal chain between X and Y and for which X is not merely a risk factor for Y and for which X is temporally separated by Y by an interval where it is reasonable to believe that the association between X and Y is not just coincidental.

Risk factors vs. cause*

- A cause is an event, condition, or characteristic without which the disease would not have occurred.
- A risk factor is a surrogate or marker for an underlying cause (e.g. education and income status are risk factors but not causes of ischemic heart disease

*http://sphweb.bumc.bu.edu/otlt/MPH-Modules/EP/EP713_Causality/EP713_Causality3.html

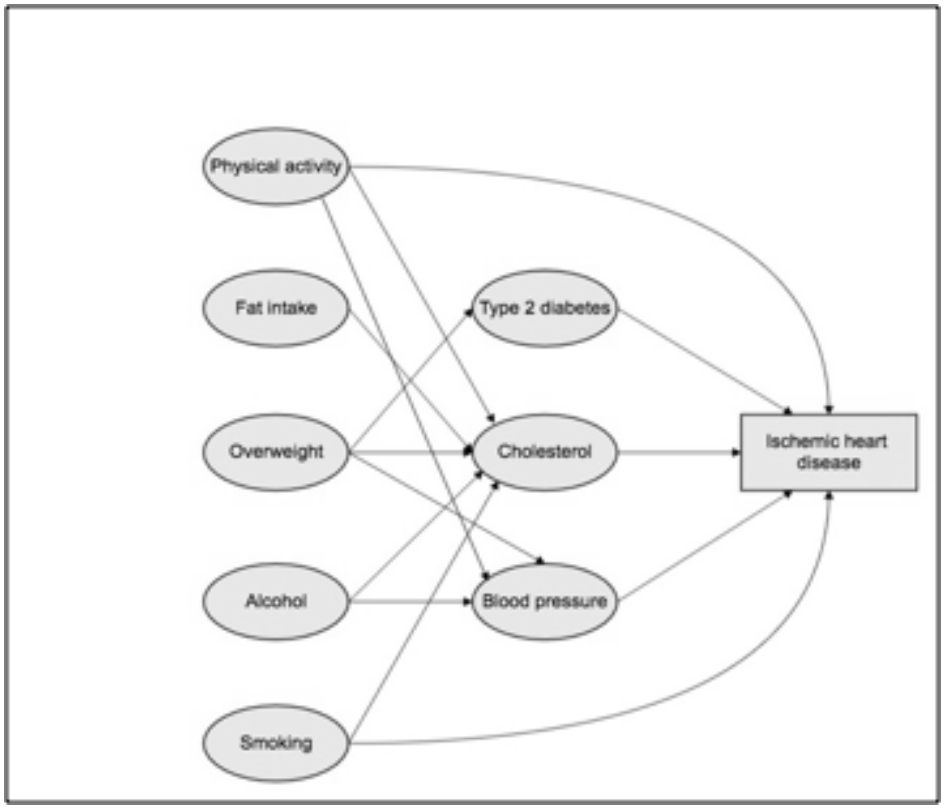


Figure 3: Example of causal chain for ischemic heart disease adapted from The Global Health Risks Report, WHO 2004

- ***Due to*** **may be thought of as a differentia to distinguish between simple co-occurrence and co-occurrent and due to. It may be used when co-occurrence or temporally following is uncertain in lieu of additional temporal patterns such as during and after currently not represented in SNOMED CT.**

Causality and co-occurrence

Disorders that are both co-occurrent and causally related are no longer modeled with "co-occurrent and due to." Only the use of "due to" is appropriate.

Use of the associated with attribute

In general, 47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) should be avoided due to the ambiguity which it conveys and the difficulty in applying this role consistently. There is only one situation when 47429007 | Associated with (attribute) | (http://snomed.info/id/47429007) could possibly be considered appropriate*.

General grouping concepts which aggregate more specific associations

For example, 6211002 | Polyarthritis associated with another disorder (disorder) | (http://snomed.info/id/6211002) subsumes two children

- 201972000 | Allergic arthritis of multiple sites (disorder) | (http://snomed.info/id/201972000) modeled with *42752001 | Due to (attribute) | (http://snomed.info/id/42752001)* of 419076005 | Allergic reaction (disorder) | (http://snomed.info/id/419076005)
- 422565003 | Post-infective polyarthritis (disorder) | (http://snomed.info/id/422565003) modeled with *255234002 | After (attribute) | (http://snomed.info/id/255234002)* of 40733004 | Infectious disease (disorder) | (http://snomed.info/id/40733004)

"Due to" is used when there is a strongly suspected or known causal relationship between the conditions; otherwise, the clinical conditions should be recorded separately.

For more information see *Disorder Combination Modeling*.

Appendix C: Principles for Accepting Content in the International Release

The statement of scope for the International Release is that it includes content necessary for international conformance and interoperability. 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. Affirmative answers to the following questions are criteria for inclusion in the International Release:

- Is it useful in more than one national healthcare system?
- 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?

Use of proprietary names and works

This section considers scope as it relates to the incorporation of proprietary names (e.g. names of clinical forms or tools, and drugs) into *SNOMED CT*. The section is divided into two sub-sections. The first one covers SNOMED International itself. The second one covers third parties (e.g. SNOMED International Affiliates) who implement *SNOMED CT* in electronic health applications (Note: there is some overlap between these sections).

Clinical form or tool

In this section, we refer to the *owner* of a clinical form or tool. This term 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.

SNOMED International

Names

Incorporating the name of a clinical form or tool (e.g. the *XYZ Test*), or the name of the score generated by a form or tool (e.g. the *XYZ Test Score*) into *SNOMED CT* does not require a license from the owner. 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.

This also applies to brand name drugs. 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*.

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. 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 text 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.

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* and so on, 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.

Implementation of SNOMED CT

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.

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.

Management of non-human content

Non-human content may be included in a request for new content via the SNOMED International Request System (SIRS) 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.** 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, with some exceptions. There are over 20,000 organism codes in the Veterinary Extension maintained by the Veterinary Terminology Services Laboratory (VTSL) at Virginia Tech University. Generally, these are 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.

Organisms that are not used in human medicine can be added to the Veterinary Extension. It is publicly available to SNOMED International member countries and to Affiliate Licensees. To access to the Veterinary Extension, see http://vtsl.vetmed.vet.edu (http://vtsl.vetmed.vet.edu/)|http://vtsl.vetmed.vet.edu/ or contact VTSL at vtsl.e (mailto:vtsl.extension@gmail.com)xtension@gmail.com (mailto:xtension@gmail.com)

Principles for determining National Extension content

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.

Criteria to determine if concepts should be included in a National Extension 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?

If so, then the concept may be eligible for the National Extension.

Appendix D: Historical Notes

This page is no longer updated. Please see summary of changes provided in the linked spreadsheet found on the Editorial Guide homepage, http://snomed.org/eg.

Added or changed

Domain change for measurement/evaluation attributes. Six attributes were approved for Measurement procedure only. The domain for these attributes was expanded to Evaluation procedure.

Dose form values. Type of drug preparation (product) and its subtypes were moved to the Qualifier value hierarchy. Type of drug preparation (qualifier value) better represents these concepts because they are not products.

Finding to Event. A number of concepts moved. The attributes used to define those concepts were retained in the Clinical finding hierarchy.

Route of Administration. Allows a procedure to be more fully modeled, so that its definition includes the route of administration of a given substance.

Situation with explicit context (situation). Previously named Context-dependent category.

Summary of historical domain relationships

Domain	Historical Relationship
Ambiguous component	Possibly equivalent to
Component moved elsewhere	Moved to
Duplicate component	Same as
Erroneous component	Replaced by Was a
Limited component	Was a
Outdated component	Replaced by

	Was a
Pending move	Moved to
Non-conformance to editorial policy	None required

No longer valid

Access for Endoscopic route of access. Information that was previously captured by Access, Endoscopic approach-access (qualifier value) is adequately captured with Using Access Device, Endoscope, device (physical object).

Has Definitional Manifestation. Not being used in an understandable, reproducable and useful way.

Inactivated

Approach. Use for non-surgical procedures not reproducible.

Episodicity no longer modeled in active content. Was used not to specify the first episode of a disorder for a patient but rather, the first time a patient presented to the healthcare provider for a disorder.

Onset and Course. Could not be used reproducibly. Onset easily confused with Course.

Using (replaced with Using Device). Allowed values that included descendants of Physical force (physical force) which are not actually devices. The Device attributes clarify the inconsistency that existed over when to use Using vs. Access Instrument vs Access, particularly for Endoscopic procedure.

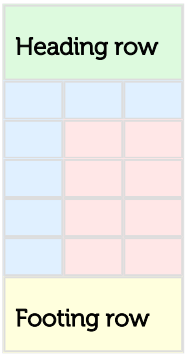
Other

Surgical and related procedure domains in *Clinical Terms Version 3*. Generated from the OPCS4-based Chapter 7 of Read Version 2 by the addition of new *concepts* during the Clinical Terms Project (CTP) and subsequent refinement.

Appendix E: Editorial Guide: Style and Terms

To provide consistency and clarity, there has been an effort to use certain styles and specific terms within the 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:

Style	
	For example, • • *text of example* • When possible, examples from the SNOMED CT browser are provided. When examples from the browser aren't available, i.e do not yet exist, they are obtained from other sources
Macros: Note, Tip, Warning • General • For example, *For more information, Modeling, Exception* • Specific • For example, *Concepts, URLs* • Optional Title - added to each	**General** **For more information** Contains general information or additional resource (may be link). **Modeling** Contains modeling information. **Exception or Inactivation or Under Revision** Contains information about content exceptions, inactivation, or under revision **Specific** **Concepts** Some concepts, for example, those in the Qualifier value hierarchy, support the definition of other concepts. **URLs** URLs that point to definition sources are unacceptable.
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
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
Modeler/Modeling	Author/Authoring, Editor/Editing
Parent	Supertype, Supertype parent
Precoordinated	Precoordinated expression
Postcoordinated	Postcoordinated expression

Terms	
Qualifier	Qualifying characteristic
Range	Concept model range, Allowable value
Relationship group	Role group
Root concept	Top-level concept
Semantic tag	Semantic type, Hierarchy tag
Situation with Explicit Context	Context-dependent Category
Sufficiently defined	~~Fully defined*~~
Supercategory	??
*Strikethrough = No longer used	

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