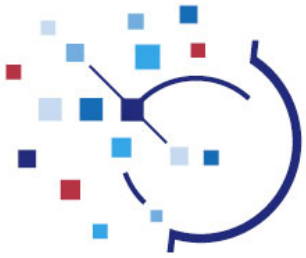
INTERNATIONAL HEALTH TERMINOLOGY
STANDARDS DEVELOPMENT ORGANISATION



SNOMED Clinical Terms® User Guide

January 2010 International Release

(US English)

Contents

Copyright Notice

Preface

Purpose

This document describes the content, structure and terminology of SNOMED CT. It is intended to provide new as well as experienced users with an overview and illustrations of SNOMED CT's capabilities and uses from a content perspective. As such, it explains the content and the principles used to model the terminology.

Who should read this guide?

The intended audience for the User Guide includes clinical personnel, business directors, software product managers, and project leaders who are involved in the acquisition, implementation and use of SNOMED CT and SNOMED CT enabled applications in their organizations. While an information technology background may be helpful, it is not required to benefit from this User Guide.

Technical professionals who support the implementation of SNOMED CT or who develop systems that will use SNOMED CT may find this guide helpful in providing a high-level overview of the terminology structure and content. However, for detailed technical guidance, technical professionals should consult the *SNOMED CT Technical Reference Guide* (TRG) and *SNOMED CT Technical Implementation Guide* (TIG), as well as other applicable technical documentation described in the Inventory of Documentation.

Notation used in this document

The following notation is used in this User Guide to represent key types of SNOMED CT information:

SNOMED CT Concept names are generally represented using the Fully Specified Name in mixed case formatted as in the following example:

Example: *Peribronchial pneumonia (disorder)*

SNOMED CT Attribute names are represented in all capital letters formatted as in the following example:

Example: FINDING SITE

Additional information

Further information about SNOMED CT is available on the Internet at:
www.ihtsdo.org

Please send feedback by email to:
support@ihtsdo.org

or contact:

IHTSDO
Rued Langgaards Vej 7, 5te
DK-2300 Copenhagen S
Denmark

Tel: +45 3644 8736
Fax: +45 4444 8736

Inventory of Documentation

The following essential SNOMED CT documentation is currently available in both English and Spanish versions as part of the International Release of SNOMED CT from the International Health Terminology Standards Development Organisation (IHTSDO):

SNOMED CT Technical Reference Guide (TRG)

The TRG is intended for SNOMED CT implementers, such as software developers. The TRG assumes an information technology background. Clinical knowledge is not a prerequisite.

The TRG contains reference material related to the current release of SNOMED CT and includes file layouts, field sizes, required values and their meanings, and high-level data diagrams. It can be used to install and use SNOMED.

SNOMED CT Technical Implementation Guide (TIG)

The TIG is intended for SNOMED CT implementers, such as software designers. The TIG assumes information technology and software development experience. Clinical knowledge is not required, although some background is helpful to understand the application context and needs.

The TIG contains guidelines and advice about the design of applications using SNOMED CT, and covers topics such as terminology services, entering and storing information, and migration of legacy information.

SNOMED CT User Guide

The User Guide is intended for clinical personnel, business directors, software product managers, and project leaders; information technology experience, though not necessary, can be helpful.

The User Guide is intended to explain SNOMED CT's capabilities and uses from a content perspective. It explains the content and the principles used to model the terminology.

Additional Documentation

The following supplementary documentation is also included, in English only, as part of the International Release of SNOMED CT:

- *SNOMED CT Canonical Table Guide*
- *SNOMED CT Developer Toolkit Guide*
- *SNOMED CT Namespace Identifier Guide*
- *SNOMED CT Namespace Registry*
- *SNOMED CT Stated Relationships Guide: Tabular Format and OWL Transformations*

Document History

Version	Notes
January 2006	• Modified guide organization and structure • Updated descriptions and examples for SNOMED CT attributes and hierarchies • Added overview of SNOMED CT structure and technology considerations • Revised glossary

Version	Notes
July 2006	• Added section on the use of attributes for *Event* hierarchy • Updated Attributes used to define Clinical findings: modifications were made to use of SEVERITY, EPISODICITY and PATHOLOGICAL PROCESS. • Renamed *Context-dependent category (context-dependent category)* hierarchy to *Situation with explicit context (situation)* • Updated Attributes used to define Procedure concepts: added ROUTE OF ADMINISTRATION as an attribute

January 2007	• Update to Attributes used to define Clinical findings: COURSE and ONSET were retired; CLINICAL COURSE was introduced
	• Update to Attributes used to define Procedure concepts
	  • Retired USING and ACCESS INSTRUMENT and replaced with USING DEVICE and USING ACCESS DEVICE
	  • Changes to ACCESS attribute
	  • New attributes USING SUBSTANCE and USING ENERGY
	• New range for LATERALITY attribute
	• Changes to range for PROCEDURE SITE and FINDING SITE and SPECIMEN SOURCE TOPOGRAPHY
	• Added section on use of attribute for *Physical object* hierarchy
	• Updates to Examples

July 2007	• Updates to reflect transfer of IP to the International Health Terminology Standards Development Organisation
	• Removal of references to College of American Pathologists (CAP) derivative products
	• Information provided on anticipated changes to Attributes used to define Procedure concepts:
	  • ACCESS
	  • APPROACH
	• Changes to value for HAS DOSE FORM for Pharmaceutical / biologic products

January 2008	• Changes to Attributes used to define Procedure concepts
	  • New attribute SURGICAL APPROACH
	  • Retired APPROACH
	  • Changes to description for attribute RECIPIENT CATEGORY
	• Changes to the range for ASSOCIATED FINDING and additional guidance on the use of ASSOCIATED FINDING and ASSOCIATED PROCEDURE in post-coordinated expressions

July 2008	• Changes to domain for Attribute ROUTE OF ADMINISTRATION • Discussion on the References Table • Update on [D], [M], [X], [V], [SO], [Q], and [EDTA] concepts in an appendix • Discussion of Negation was added to an appendix

Version	Notes
January 2009	• Changes to the range for attributes in the ASSOCIATED WITH role hierarchy for precoordinated content • Changes to the range for DIRECT SUBSTANCE for precoordinated content • Clarification of the range for attributes in the PROCEDURE DEVICE role hierarchy • Change to the range for SPECIMEN SOURCE IDENTITY

July 2009	• Changes to the range of attributes that take an anatomical value:
	  • Changes to the range for FINDING-SITE
	  • Changes to the range for PROCEDURE SITE attributes
	  • Changes to the range for SPECIMEN SOURCE TOPOGRAPHY
	• Changes to the range for INTERPRETS and HAS INTERPRETATION
	• Changes to the range for PATHOLOGICAL PROCESS
	• Changes to the domain for the six attributes previously identified for use with Measurement procedures
	• Changes to the range for LATERALITY

October 2009 - guide update	• Updated presentation of attribute ranges (allowable values) to reflect machine-readable concept model work • Changed method of generating document from MS Word to DITA • Overall appearance change and revised order of front matter • Revised figures and diagrams so they can be shared SVG images • Added appendix "Changes and historical notes" • Changed "Role hierarchies" to "Attribute hierarchies" • Updated and clarified wording in several sections
January 2010	• Added information about the metadata hierarchy and related changes, which are part of the January 2010 Technology Previews and will be incorporated into a future International Release • Added paragraph on allowable domains in post-coordinated expressions • Revised several glossary entries and aligned them to be identical with *Technical Reference Guide* glossary entries • Expanded scope of User Guide to include new editorial policies that are currently being implemented in the International Release, but with which the terminology may not yet be fully compliant • Improved formatting and layout of the DITA-generated document

Chapter 1

Overview

Topics:

What is SNOMED CT?

SNOMED Clinical Terms (SNOMED CT) is a comprehensive clinical terminology that provides clinical content and expressivity for clinical documentation and reporting. It can be used to code, retrieve, and analyze clinical data. SNOMED CT resulted from the merger of SNOMED Reference Terminology (SNOMED RT) developed by the College of American Pathologists (CAP) and Clinical Terms Version 3 (CTV3) developed by the National Health Service (NHS) of the United Kingdom. The terminology is comprised of concepts, terms and relationships with the objective of precisely representing clinical information across the scope of health care. Content coverage is divided into hierarchies, which include:

- *Clinical finding*
- *Procedure*
- *Observable entity*
- *Body structure*
- *Organism*
- *Substance*
- *Pharmaceutical/biologic product*
- *Specimen*
- *Special concept*
- *Linkage concept*
- *Physical force*
- *Event*
- *Environment or geographical location*
- *Social context*
- *Situation with explicit context*
- *Staging and scales*
- *Physical object*
- *Qualifier value*
- *Record artifact*

SNOMED CT uses

Health care software applications focus on collection of clinical data, linking to clinical knowledge bases, information retrieval, as well as data aggregation and exchange. Information may be recorded in different ways at different times and sites of care.

Standardized information improves analysis. SNOMED CT provides a standard for clinical information. Software applications can use the concepts, hierarchies, and relationships as a common reference point for data analysis. SNOMED CT serves as a foundation upon which health care organizations can develop effective analysis applications to conduct outcomes research, evaluate the quality and cost of care, and design effective treatment guidelines.

Standardized terminology can provide benefits to clinicians, patients, administrators, software developers and payers. A clinical terminology can aid in providing health care providers with more easily accessible and complete information pertaining to the health care process (medical history, illnesses, treatments, laboratory results, etc.) and thereby result in improved patient outcomes. A clinical terminology can allow a health care provider to identify patients based on certain coded information in their records, and thereby facilitate follow-up and treatment.

Chapter 2

Basic Components of SNOMED CT

Topics:

Concepts

In the context of this document, a “concept” is a clinical meaning identified by a unique numeric identifier (ConceptID) that never changes. Concepts are represented by a unique human-readable Fully Specified Name (FSN). The concepts are formally defined in terms of their relationships with other concepts. These logical definitions give explicit meaning which a computer can process and query on. Every concept also has a set of terms that name the concept in a human-readable way.

Concept granularity

“Granular” means specific or particular. Concepts represent various levels of clinical detail. Concepts can be very general or they can represent increasingly specific levels of detail, also referred to as increasing granularity. Multiple levels of granularity improve the capability to code clinical data at the appropriate level of detail.

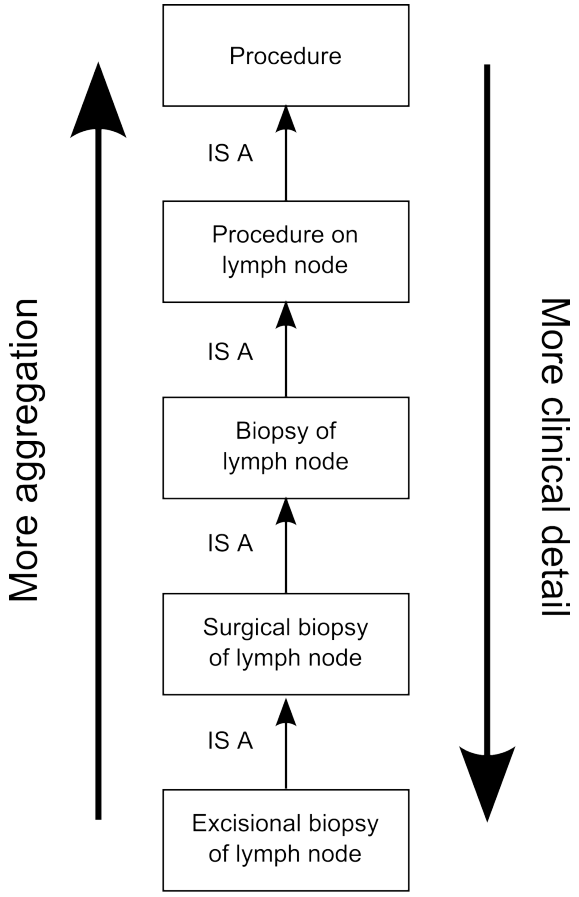


Figure 1: Multiple levels of granularity

Concepts and identifiers

SNOMED CT concepts have unique numeric identifiers called ConceptIDs. ConceptIDs do not contain hierarchical or implicit meaning. The numeric identifier does not reveal any information about the nature of the concept.

Example:

55679008 is the ConceptID for the concept *Peribronchial pneumonia (disorder)*.

Descriptions

Concept descriptions are the terms or names assigned to a SNOMED CT concept. “Term” in this context means a phrase used to name a concept. A unique DescriptionID identifies a description. Multiple descriptions might be associated with a concept identified by a ConceptID.

Example:

Some of the descriptions associated with ConceptID 22298006:

- Fully Specified Name: *Myocardial infarction (disorder)* DescriptionID 751689013
- Preferred term: Myocardial infarction DescriptionID 37436014
- Synonym: Cardiac infarction DescriptionID 37442013
- Synonym: Heart attack DescriptionID 37443015
- Synonym: Infarction of heart DescriptionID 37441018

Each of the above descriptions has a unique DescriptionID, and all of these descriptions are associated with a single Concept (and the single ConceptID 22298006).

Types of descriptions

Fully Specified Name (FSN)

Each concept has one unique FSN intended to provide an unambiguous way to name a concept. The purpose of the FSN is to uniquely identify a concept and clarify its meaning, not necessarily to present the most commonly used or natural phrase for that concept. Each FSN ends with a semantic tag in parentheses at the end of the concept. The semantic tag indicates the semantic category to which the concept belongs (e.g. Disorder, Organism, Person, etc.). For example, *Hematoma (morphologic abnormality)* is a FSN that represents the description of what the pathologist sees at the tissue level, whereas *Hematoma (disorder)* is a FSN which indicates the concept that would be used to code the clinical diagnosis of a hematoma by a general practitioner.

Preferred Term

Each concept has one Preferred Term meant to capture the common word or phrase used by clinicians to name that concept. For example, the concept 54987000 *Repair of common bile duct (procedure)* has the Preferred Term “Choledochoplasty” to represent a common name clinicians use to describe the procedure.

Unlike FSNs, Preferred Terms are not necessarily unique. Occasionally, the Preferred Term for one concept may also be a Synonym or the Preferred Term for a different concept.

Example:

- *Cold sensation quality (qualifier value)* has a preferred term of “Cold”.
- *Common cold (disorder)* also has a synonym of “Cold”.

In both cases, “cold” represents a common clinical phrase used to capture the meaning of the FSN.

Synonym

Synonyms represent any additional terms that represent the same concept as the FSN. Synonyms, like Preferred Terms, are not required to be unique across concepts.

Example:

Some of the Synonyms associated with ConceptID 22298006 which has the Fully Specified Name: *Myocardial infarction (disorder)* are:

- Synonym: Cardiac infarction DescriptionID: 37442013
- Synonym: Heart attack DescriptionID: 37443015
- Synonym: Infarction of heart DescriptionID: 37441018

Relationships

Relationships link concepts in SNOMED CT. There are four types of relationships that can be assigned to concepts in SNOMED CT:

- Defining
- Qualifying
- Historical
- Additional

The relationships addressed in this section are known as “defining” relationships which are used to model concepts and create their logical definitions.

Relationships and concept definitions

Each concept in SNOMED CT is logically defined through its relationships to other concepts.

Every active SNOMED CT concept (except the SNOMED CT Concept Root concept) has at least one IS A relationship to a supertype concept.

IS A relationships and defining attribute relationships are known as the defining characteristics of SNOMED CT concepts. They are considered defining because they are used to logically represent a concept by establishing its relationships with other concepts. This is accomplished by establishing IS A relationships with one or more defining concepts (called supertypes) and modeling the difference with those supertypes through defining attributes.

Example:

Fracture of tarsal bone (disorder)

- IS A *Fracture of foot (disorder)*
- FINDING SITE *Bone structure of tarsus (body structure)*
- ASSOCIATED MORPHOLOGY *Fracture (morphologic abnormality)*

A relationship is assigned only when that relationship is always known to be true. For example, Group A Streptococcus causes most cases of Streptococcal pharyngitis. However, a small percentage of these cases are caused by other species of Streptococcus. Consequently, when defining the concept *Streptococcal sore throat (disorder)*, Streptococcus Group A was not chosen as a value for the CAUSATIVE AGENT attribute. A more general concept, *Streptococcus (organism)*, was selected.

IS A relationships

IS A relationships are also known as “Supertype-Subtype relationships” or “Parent-Child relationships”. IS A relationships are the basis of SNOMED CT's hierarchies, as illustrated below.

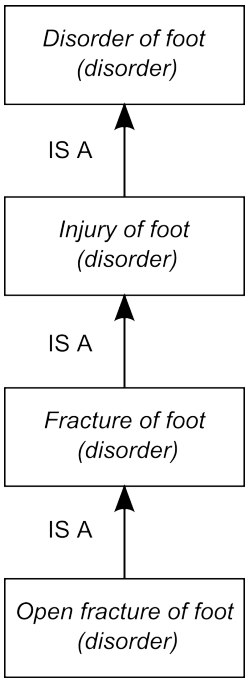


Figure 2: Example IS A hierarchy

A concept can have more than one IS A relationship to other concepts. In that case, the concept will have parent concepts in more than one sub-hierarchy of a top-level hierarchy. Subtype relationships can be multi-hierarchical.

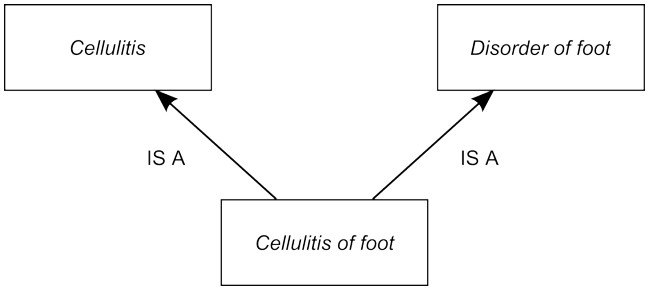


Figure 3: Example IS A relationships

Attribute relationships

Attributes relate two concepts and establish the type of relationship between them. Together with IS A relationships they are considered defining characteristics, since they allow the logical representation of the meaning of a concept by establishing its relationships with other concepts. A logical concept definition includes one or more supertypes (modeled with IS A relationships), and a set of defining attributes that capture the semantics of a concept and help to differentiate it from the other concept definitions, including its supertypes.

In the example below, *Lumbar discitis (disorder)* (a concept in the *Clinical finding* hierarchy) is related to concepts in the *Body structure* hierarchy through two attributes: FINDING SITE and ASSOCIATED MORPHOLOGY.

Example:

Lumbar discitis (disorder)

- FINDING SITE *Structure of lumbar intervertebral disc (body structure)*
- ASSOCIATED MORPHOLOGY *Inflammation (morphologic abnormality)*

The two attributes FINDING SITE and ASSOCIATED MORPHOLOGY and their assigned values provide definition for the concept *Lumbar discitis (disorder)*.

Example:

Part of the logical definition (a list of a concept's relationships to other concepts) of the concept *Pneumonia (disorder)* in SNOMED CT is:

- *Pneumonia (disorder)*
- FINDING SITE *Lung structure (body structure)*

In this example, the concept *Pneumonia (disorder)* is characterized with the attribute FINDING SITE. Since pneumonia is a disorder of the lung, FINDING SITE has the value *Lung structure (body structure)*.

Chapter 3

Attributes Used in SNOMED CT

Topics:

Introduction

SNOMED CT currently uses over 50 defining attributes to model concept definitions.

Each SNOMED CT attribute can usually be applied to one hierarchy and for a few attributes to more than one hierarchy. The hierarchy or hierarchies to which an attribute can be applied are referred to as the “domain” of the attribute. Each attribute can be given a limited set of values; this set of values is called the “range” of the attribute.

Domain

The Domain is the hierarchy to which a specific attribute can be applied.

The Domain of the attribute ASSOCIATED MORPHOLOGY is the *Clinical finding* hierarchy.

A *Procedure* cannot have an ASSOCIATED MORPHOLOGY.

A *Procedure* has a PROCEDURE MORPHOLOGY.

Allowable domains in post-coordinated expressions

The concept model provides constraints for attributes that are used as defining relationships, both in distributed SNOMED CT content (so-called pre-coordinated definitions) and in post-coordinated expressions, as described in the document *Abstract Logical Models and Representational Forms* (available at *www.ihtsdo.org/our-standards/technical-documents/*). The domain (or starting concept) to which qualifying relationships are applied in post-coordinated expressions may be more general than the domain of defining relationships defined in the concept model, as long as the resulting post-coordinated concept expression as a whole satisfies the concept model constraints.

For example, the concept model constraint for SURGICAL APPROACH requires that its domain be *Surgical procedure (procedure)* 387713003. When SURGICAL APPROACH is used in a qualifying relationship in post-coordinated expressions, the starting domain may be a general procedure, if the resulting expression satisfies the concept model constraint. In other words, when SURGICAL APPROACH is added to a general procedure as a qualifying relationship, the post-coordinated expression should also have a METHOD with a value of *Surgical action (qualifier value)* or one of its subtypes, so that the resulting concept becomes a subtype of *Surgical procedure (procedure)*.

Range

The Range is the set of values allowed for each attribute.

For example, the Range for ASSOCIATED MORPHOLOGY is *Morphologically abnormal structure (morphologic abnormality)* and its descendants, and the range for FINDING SITE is *Anatomical or acquired body structure (body structure)* and its descendants in the *Body structure* hierarchy.

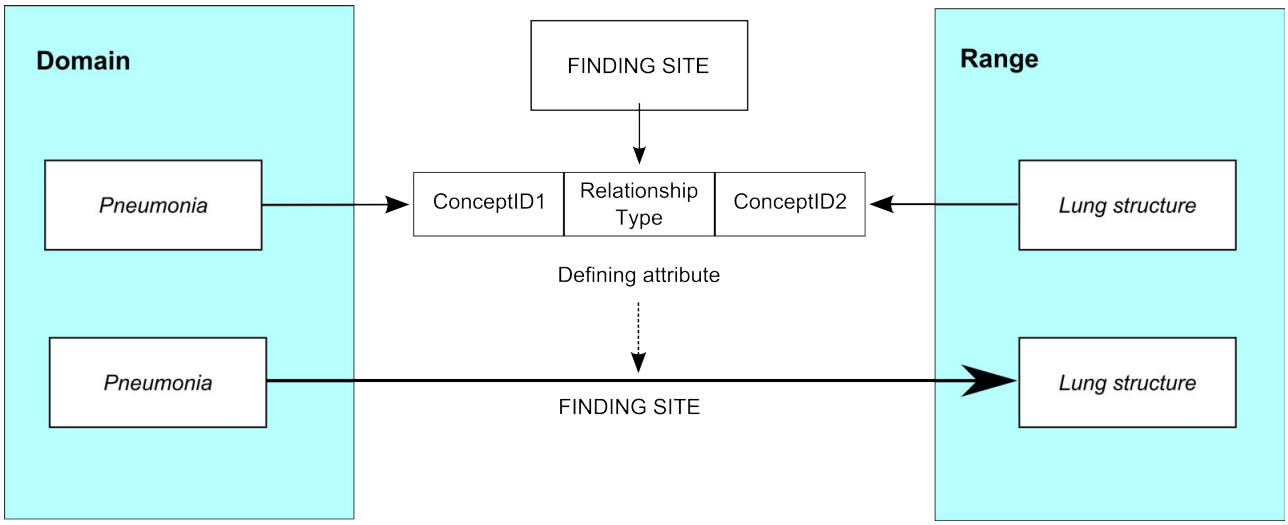


Figure 4: Example Pneumonia FINDING SITE Lung structure

The domain for the FINDING SITE attribute is the *Clinical finding* hierarchy. In the above example, the attribute FINDING SITE has the value *Lung structure (body structure)*. *Lung structure (body structure)* is found in the *Anatomical structure (body structure)* subhierarchy which is in the allowed range for FINDING SITE.

Defining attributes in SNOMED CT are assigned to the hierarchies where retrieval of clinical data is most useful and relevant (e.g. *Procedure*, *Clinical finding*, *Pharmaceutical/Biologic product*, *Situation with explicit context*, *Event*, *Specimen* and *Physical object*). In addition, LATERALITY is a defining attribute applied to *Body structure* concepts. Other hierarchies, such as *Social context*, *Substance*, *Organism*, and *Observable entity*, are not assigned attributes and instead are considered supporting hierarchies. Concepts from the supporting hierarchies can serve as the attribute values for the concept definitions of the main hierarchies.

This section of the SNOMED CT User Guide describes the approved attributes used in SNOMED CT. There are many other attributes in SNOMED, subtypes of *Unapproved attribute (attribute)*, which have not yet been evaluated thoroughly and approved for use.

Attribute Hierarchies in SNOMED CT

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.

Attribute hierarchies used in modeling Procedures

Three groups of attributes are organized as a simple two-level hierarchy. The three top level attributes are PROCEDURE SITE, PROCEDURE DEVICE, and PROCEDURE MORPHOLOGY. Each has a sub-attribute to represent the direct object, and another to represent the indirect object. In addition, PROCEDURE DEVICE can be specialized by the attributes USING DEVICE and USING ACCESS DEVICE.

PROCEDURE DEVICE attribute hierarchy:

- PROCEDURE DEVICE
  - DIRECT DEVICE
  - INDIRECT DEVICE
  - USING DEVICE
  - USING ACCESS DEVICE

PROCEDURE MORPHOLOGY attribute hierarchy:

- PROCEDURE MORPHOLOGY
  - DIRECT MORPHOLOGY
  - INDIRECT MORPHOLOGY

PROCEDURE SITE attribute hierarchy:

- PROCEDURE SITE
  - PROCEDURE SITE DIRECT
  - PROCEDURE SITE INDIRECT

Attribute hierarchy used in modeling Clinical Findings

ASSOCIATED WITH attribute hierarchy:

- ASSOCIATED WITH
  - AFTER
  - DUE TO
  - CAUSATIVE AGENT

Attributes used to define Clinical Finding concepts

Summary table

Table 1: Approved Clinical Finding attributes summary

DEFINING ATTRIBUTE	Subsumed Attribute	Allowable Values
FINDING SITE		*Anatomical or acquired body structure* 442083009 (<<)
ASSOCIATED MORPHOLOGY		*Morphologically abnormal structure* 49755003 (<<)

DEFINING ATTRIBUTE	**Subsumed Attribute**	**Allowable Values**
ASSOCIATED WITH		*Clinical Finding* 404684003 (<<) *Procedure* 71388002 (<<) *Event* 272379006 (<<) *Organism* 410607006 (<<) *Substance* 105590001 (<<) *Physical object* 260787004 (<<) *Physical force* 78621006 (<<) *Pharmaceutical/biologic product* 373873005 (<< Q only) *SNOMED CT Concept* 138875005 (==)
	CAUSATIVE AGENT	*Organism* 410607006 (<<) *Substance* 105590001 (<<) *Physical object* 260787004 (<<) *Physical force* 78621006 (<<) *Pharmaceutical/biologic product* 373873005 (<< Q only) *SNOMED CT Concept* 138875005 (==)
	DUE TO	*Clinical Finding* 404684003 (<=) *Event* 272379006 (<=)
	AFTER	*Clinical Finding* 404684003 (<<) *Procedure* 71388002 (<<)
SEVERITY		*Severities* 272141005 (<=)(< Q)
CLINICAL COURSE		*Courses* 288524001 (<=)(< Q)
EPISODICITY		*Episodicities* 288526004 (<=)(< Q)
INTERPRETS		*Observable entity* 363787002 (<<) *Laboratory procedure* 108252007 (<<) *Evaluation procedure* 386053000 (<<)
HAS INTERPRETATION		*Findings values* 260245000 (<<)
PATHOLOGICAL PROCESS		*Autoimmune* 263680009 (==) *Infectious process* 441862004 (<<)
HAS DEFINITIONAL MANIFESTATION		*Clinical finding* 404684003 (<<)

DEFINING ATTRIBUTE	Subsumed Attribute	Allowable Values
OCCURRENCE		*Periods of life* 282032007 (<)
FINDING METHOD		*Procedure* 71388002 (<=)
FINDING INFORMER		*Performer of method* 420158005 (<<) *Subject of record or other provider of history* 419358007 (<<)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

FINDING SITE

This attribute specifies the body site affected by a condition.

Table 2: Permissible values for FINDING SITE

Attribute Values	Examples
Anatomical or acquired body structure 442083009 (<<)	*Kidney disease (disorder)* • FINDING SITE *Kidney structure (body structure)*
	Appendicitis (disorder) • FINDING SITE *Appendix structure (body structure)*

ASSOCIATED MORPHOLOGY

This attribute specifies the morphologic changes seen at the tissue or cellular level that are characteristic features of a disease.

Table 3: Permissible values for ASSOCIATED MORPHOLOGY

Attribute Values	Examples
Morphologically abnormal structure 49755003 (<<)	*Bone marrow hyperplasia (disorder)* • ASSOCIATED MORPHOLOGY *Hyperplasia (morphologic abnormality)*
	Pancreatitis (disorder) • ASSOCIATED MORPHOLOGY *Inflammation (morphologic abnormality)*

ASSOCIATED WITH

This attribute asserts an interaction between two concepts beyond simple co-occurrence in the patient. ASSOCIATED WITH represents a clinically relevant association between concepts without either asserting or excluding a causal or sequential relationship between the two.

Table 4: Permissible values for ASSOCIATED WITH

Attribute Values	Examples
Clinical Finding 404684003 (<<)	
Procedure 71388002 (<<)	
Event 272379006 (<<)	
Organism 410607006 (<<)	
Substance 105590001 (<<)	
Physical object 260787004 (<<)	
Physical force 78621006 (<<)	
Pharmaceutical/biologic product 373873005 (<< Q only)	
SNOMED CT Concept 138875005 (==)	

ASSOCIATED WITH subsumes the following, more specific, attributes in what is called an attribute hierarchy (explained in *Attribute Hierarchies in SNOMED CT* on page 21):

- AFTER
- DUE TO
- CAUSATIVE AGENT

AFTER

This attribute is used to model concepts in which a clinical finding occurs after another clinical finding or procedure. Neither asserting nor excluding a causal relationship, it instead emphasizes a sequence of events.

Table 5: Permissible values for AFTER

Attribute Values	Examples
Clinical Finding 404684003 (<<) *Procedure* 71388002 (<<)	*Post-viral disorder (disorder)* • AFTER *Viral disease (disorder)*

This example can be paraphrased as: “every post-viral disorder occurs after some viral disease”.

DUE TO

This attribute is used to relate a *Clinical finding* directly to its cause. If a clinical finding merely predisposes to or worsens another disorder, rather than causing it directly, then the more general attribute ASSOCIATED WITH is used instead.

Table 6: Permissible values for DUE TO

Attribute Values	Examples
Clinical Finding 404684003 (<=) *Event* 272379006 (<=)	*Cheilitis due to atopic dermatitis (disorder)* • IS A *Cheilitis (disorder)* • DUE TO *Atopic dermatitis (disorder)*

CAUSATIVE AGENT

This attribute identifies the direct causative agent of a disease. It does not include vectors, e.g. a mosquito that transmits malaria.

Table 7: Permissible values for CAUSATIVE AGENT

Attribute Values	Examples
Organism 410607006 (<<) *Substance* 105590001 (<<) *Physical object* 260787004 (<<) *Physical force* 78621006 (<<) *Pharmaceutical/biologic product* 373873005 (<< Q only) *SNOMED CT Concept* 138875005 (==)	*Bacterial endocarditis (disorder)* • CAUSATIVE AGENT *Superkingdom Bacteria (organism)* *Fentanyl allergy (disorder)* • CAUSATIVE AGENT *Fentanyl (substance)* *Electrical burn of skin (disorder)* • CAUSATIVE AGENT *Electricity (physical force)*

SEVERITY

This attribute is used to subclass a *Clinical finding* concept according to its severity; however, caution is encouraged because this use is said to be *relative*. By relative, it is meant that it is incorrect to assume that the same degree of disease intensity or hazard is implied for all *Clinical findings* to which this attribute is applied. There are three reasons.

First, “severe” could be interpreted differently depending on what other values are available to choose for severity. Thus severity is relative to the other values in the value set presented to users. Consider the different meaning of severity in each of the following three sets of values:

- mild / moderate / severe
- minimal / mild / moderate / severe / very severe
- mild / mild to moderate / moderate / moderate to severe / severe / life threatening / fatal

Second, the severity is defined relative to the expected degree of intensity or hazard of the *Clinical finding* that is being qualified. A common cold has a baseline intensity or hazard much less that that of a more serious disease like lupus erythematosus or pneumonia; thus a severe cold might be considered less intense or hazardous than a mild pneumonia.

Third, some disorders that are life-threatening do not ordinarily have a severity assigned to them. Cancer, for example, is generally not subclassed according to mild, moderate and severe types, but rather is subclassed according to stage or grade.

For these reasons, the SEVERITY attribute cannot be relied on to retrieve all *Clinical findings* with serious or life-threatening import. Nevertheless, it is still useful for subclassing certain concepts and differentiating between different severities of a single disorder. SEVERITY is not used to model any concepts pre-coordinated in the International Release but it can still be used in post-coordination as a qualifier.

Table 8: Permissible values for SEVERITY

Attribute Values	Examples
Severities 272141005 (<=)(< Q)	

CLINICAL COURSE

This attribute is used to represent both the course and onset of a disease. Many conditions with an acute (sudden) onset also have an acute (short duration) course. Few diseases with a chronic (long-term) course would need to have their onset sub-divided into rapid or gradual subtypes, and thus there is no clear need for separating the rapidity of onset from the duration of a disease; based on testing by implementers and modelers, a single attribute with values that combine these meanings has clearly been more reproducible and useful than two attributes that attempt to separate the meanings.

Table 9: Permissible values for CLINICAL COURSE

Attribute Values	Examples
Courses 288524001 (<=)(< Q)	*Acute amebic dysentery (disorder)* • CLINICAL COURSE *Sudden onset AND/OR short duration (qualifier value)*
	Chronic fibrosing pancreatitis (disorder) • CLINICAL COURSE *Chronic (qualifier value)*

The word acute has more than one meaning, and the meanings are often overlapping or unclear. The word acute may imply rapid onset, short duration, or high severity; in some circumstances it might be used to mean all of these. For morphological terms it may also imply the kind of morphology associated with the speed of onset. *Acute inflammation (morphologic abnormality)* does not necessarily have CLINICAL COURSE *Sudden onset AND/OR short duration*, but rather implies polymorphonuclear infiltration; likewise *Chronic inflammation (morphologic abnormality)* implies mononuclear cell infiltration, not necessarily a chronic course, although inflammation with a chronic course is highly correlated with a lymphocytic infiltration.

EPISODICITY

EPISODICITY is used to represent episodes of care provided by a physician or other care provider, typically a general practitioner, *not* episodes of disease experienced by the patient. See *EPISODICITY no longer modeled in active content* on page 79, regarding the origin of the attribute. For example, asthma with EPISODICITY = *first episode* represents the first time the patient presents to their health care provider with asthma. EPISODICITY is not used to model any concepts pre-coordinated in the International Release but it can still be used in post-coordination as a qualifier.

Table 10: Permissible values for EPISODICITY

Attribute Values	Examples
Episodicities 288526004 (<=)(< Q)	

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. This attribute is usually grouped with the HAS INTERPRETATION attribute.

Table 11: Permissible values for INTERPRETS

Attribute Values	Examples
Observable entity 363787002 (<<) *Laboratory procedure* 108252007 (<<) *Evaluation procedure* 386053000 (<<)	*Decreased muscle tone (finding)* • INTERPRETS *muscle tone (observable entity)* • HAS INTERPRETATION *Decreased (qualifier value)*
	Abnormal glucose level (finding) • INTERPRETS *Glucose measurement (procedure)* • HAS INTERPRETATION *Outside reference range (qualifier value)*

Note: For concepts in the Measurement finding subhierarchy, the value for INTERPRETS should be an Evaluation procedure or a Laboratory procedure rather than an Observable entity.

HAS INTERPRETATION

This attribute is grouped with the attribute INTERPRETS , and designates the judgment aspect being evaluated or interpreted for a concept (e.g., presence, absence, degree, normality, abnormality, etc.).

Table 12: Permissible values for HAS INTERPRETATION

Attribute Values	Examples
Findings values 260245000 (<<)	*Decreased muscle tone (finding)* • INTERPRETS *Muscle tone (observable entity)* • HAS INTERPRETATION *Decreased (qualifier value)*
	Abnormal glucose level (finding) • INTERPRETS *Glucose measurement (procedure)* • HAS INTERPRETATION *Outside reference range (qualifier value)*

PATHOLOGICAL PROCESS

This attribute provides information about the underlying pathological process for a disorder, but only when the results of that process are not structural and cannot be represented by the ASSOCIATED MORPHOLOGY attribute.

For the July 2009 release, two new values *Infectious process (qualifier value)* and *Parasitic process (qualifier value)* have been added to the range for PATHOLOGICAL PROCESS. These were added to accommodate the change in the modeling of concepts in the *Infectious disease (disorder)* subhierarchy where the infectious aspect of the disease is now represented using PATHOLOGICAL PROCESS.

Table 13: Permissible values for PATHOLOGICAL PROCESS

Attribute Values	Examples
Autoimmune 263680009 (==) *Infectious process* 441862004 (<<)	*Autoimmune parathyroiditis (disorder)* • PATHOLOGICAL PROCESS *Autoimmune (qualifier value)*
	Disease caused by parasite (disorder) • PATHOLOGICAL PROCESS *Parasitic process (qualifier value)*

Pathological process must not be used for values that could overlap with ASSOCIATED MORPHOLOGY. Inflammatory processes result in inflammation (by definition), but these disorders should be defined using their morphology.

HAS DEFINITIONAL MANIFESTATION

This attribute links disorders to the manifestations (observations) that define them. It can only be applied to disorders.

Table 14: Permissible values for HAS DEFINITIONAL MANIFESTATION

Attribute Values	Examples
Clinical finding 404684003 (<<)	*Seizure disorder (disorder)* • HAS DEFINITIONAL MANIFESTATION *Seizure (finding)* *Hypertensive disorder, systemic arterial (disorder)* • HAS DEFINITIONAL MANIFESTATION *Finding of increased blood pressure (finding)*

OCCURRENCE

This attribute refers to the specific period of life during which a condition first presents. Multiple values of OCCURRENCE for a single concept are not desirable, and these will be addressed in a future release. This does not mean the condition cannot persist beyond the period of life in which it first presents.

Table 15: Permissible values for OCCURRENCE

Attribute Values	Examples
Periods of life 282032007 (<)	*Childhood phobic anxiety disorder (disorder)* • OCCURRENCE *Childhood (qualifier value)*

FINDING METHOD

This attribute specifies the means by which a clinical finding was determined. This attribute is frequently used in conjunction with FINDING INFORMER. Findings that specify that they were determined by examination of the patient (e.g. *On examination - ankle clonus (finding)*) should have a value for both FINDING METHOD and FINDING INFORMER.

Table 16: Permissible values for FINDING METHOD

Attribute Values	Examples
Procedure 71388002 (<=)	*Finding by palpation (finding)* • FINDING METHOD *Palpation (procedure)*

FINDING INFORMER

This attribute specifies the person or other entity from which the clinical finding information was obtained. This attribute is frequently used in conjunction with FINDING METHOD.

Table 17: Permissible values for FINDING INFORMER

Attribute Values	Examples
Performer of method 420158005 (<<) *Subject of record or other provider of history* 419358007 (<<)	*Complaining of a headache (finding)* • FINDING INFORMER *Subject of record or other provider of history (person)*
	On examination - ankle clonus (finding) • FINDING INFORMER *Performer of method (person)*

It is accepted that an information model should permit identification of a particular individual who provides information; FINDING INFORMER is not about the particular individual. It is about the *category or type* of informer, which is used to differentiate self-reported symptoms from provider-observed signs. Granted, this permits inclusion of epistemology-loaded terms (cf. Bodenreider el al., FOIS 2004), but health care is full of such terms, and they are (or at least can be) understandable, reproducible and useful.

Attributes used to define Procedure concepts

Summary table

Table 18: Approved Procedure attributes summary table

DEFINING ATTRIBUTE	Subsumed Attribute	Allowable Values
PROCEDURE SITE		*Anatomical or acquired body structure* 442083009 (<<)
	PROCEDURE SITE DIRECT	*Anatomical or acquired body structure* 442083009 (<<)
	PROCEDURE SITE INDIRECT	*Anatomical or acquired body structure* 442083009 (<<)
PROCEDURE MORPHOLOGY		*Morphologically abnormal structure* 49755003 (<<)
	PROCEDURE MORPHOLOGY DIRECT	*Morphologically abnormal structure* 49755003 (<<)
	PROCEDURE MORPHOLOGY INDIRECT	*Morphologically abnormal structure* 49755003 (<<)
METHOD		*Action* 129264002 (<<)

DEFINING ATTRIBUTE	Subsumed Attribute	Allowable Values
PROCEDURE DEVICE		*Device* 49062001 (<<)
	DIRECT DEVICE	*Device* 49062001 (<<)
	INDIRECT DEVICE	*Device* 49062001 (<<)
	USING DEVICE	*Device* 49062001 (<<)
	USING ACCESS DEVICE	*Device* 49062001 (<<)
ACCESS		*Surgical access values* 309795001 (<=)(< Q)
DIRECT SUBSTANCE		*Substance* 105590001 (<<) *Pharmaceutical/biologic product* 373873005 (<<)
PRIORITY		*Priorities* 272125009 (<=)(< Q)
HAS FOCUS		*Clinical finding* 404684003 (<<) *Procedure* 71388002 (<<)
HAS INTENT		*Intents (nature of procedure values)* 363675004 (<=)
RECIPIENT CATEGORY		*Person* 125676002 (<<) *Family* 35359004 (<<) *Community* 133928008 (<<) *Donor for medical or surgical procedure* 105455006 (<<) *Group* 389109008 (<<)
REVISION STATUS		*Primary operation* 261424001 (<<) *Revision-value* 255231005 (<<) *Part of multistage procedure* 257958009 (<<)
ROUTE OF ADMINISTRATION		*Route of administration value* 284009009 (<<)
SURGICAL APPROACH		*Procedural approach* 103379005 (<=)(< Q)
USING ENERGY		*Physical force* 78621006 (<<)
USING SUBSTANCE		*Substance* 105590001 (<<)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

Note:

Attributes should be grouped with the METHOD attribute to which they apply; in the absence of a METHOD attribute, attributes that are related to each other should be grouped. The one exception is RECIPIENT CATEGORY, because a single procedure code should not be pre-coordinated in situations where more than one recipient category is involved. Such complex statements should utilize two or more procedure codes that are placed into an appropriately structured information model.

PROCEDURE SITE

The PROCEDURE SITE attribute describes the body site acted on or affected by a procedure. This attribute subsumes, in an attribute hierarchy (see *Attribute Hierarchies in SNOMED CT* on page 21), the more specific attributes (PROCEDURE SITE DIRECT and PROCEDURE SITE INDIRECT) that should be used if possible. The anatomical site may be directly acted on (PROCEDURE SITE DIRECT) or indirectly acted upon (PROCEDURE SITE INDIRECT).

When modeling procedures where the METHOD is *Removal action* or one of its subtypes (e.g. *Excision*, *Surgical biopsy*, etc.), removals **of** the structure itself should use PROCEDURE SITE DIRECT. Removals of tissue lesions (cysts, tumors, etc.) are considered to be removals of the site, and should also use PROCEDURE SITE DIRECT. Removals of devices, calculi, thrombi, foreign bodies and other non-tissue entities **from** the structure should use PROCEDURE SITE INDIRECT.

Table 19: Permissible values for PROCEDURE SITE

Attribute Values	Examples
Anatomical or acquired body structure 442083009 (<<)	*Procedure on colon (procedure)* • PROCEDURE SITE *colon structure (body structure)*

Procedures need not necessarily be categorized by site. "Human body structure" should *not* be assigned as a default value of this attribute because many procedures can be performed on non-human subjects, and because this attribute does *not* necessarily need to be present in a procedure concept definition in order for classifier algorithms to work properly.

The general PROCEDURE SITE attribute is used to model the site for high-level grouper type procedure concepts. It is most likely to be used for concepts that do not require a METHOD (action) attribute. Relatively few concepts will be modeled using PROCEDURE SITE, rather than the more specific direct and indirect site attributes (see below).

PROCEDURE SITE DIRECT

This attribute is used when the action of the procedure is directly aimed at an anatomical or acquired body structure or site rather than at something else (such as a device) located there.

Table 20: Permissible values for PROCEDURE SITE DIRECT

Attribute Values	Examples
Anatomical or acquired body structure 442083009 (<<)	*Amputation of the foot (procedure)* • METHOD *Amputation - action (qualifier value)* • PROCEDURE SITE DIRECT *Foot structure (body structure)*
	Biopsy of femur (procedure) • METHOD *Biopsy - action (qualifier value)* • PROCEDURE SITE DIRECT *Bone structure of femur (body structure)*

Multiple values for PROCEDURE SITE DIRECT

When the METHOD (action) acts directly on a morphological abnormality (more simply, a lesion) arising from, or existing in, the cells of the tissue in which it occurs [e.g. a tumor (including metastatic tumors), granuloma, polyp, or cyst] the attribute DIRECT MORPHOLOGY is used to model the morphological abnormality. Most concept definitions where DIRECT MORPHOLOGY is used, which also require a site in the definition, will use PROCEDURE SITE DIRECT. Thus, there can be more than one direct object of the METHOD for a concept. For example, the DIRECT MORPHOLOGY and the PROCEDURE SITE DIRECT can both be direct objects of the METHOD. An example of an exception to this rule would be removal of a calculus from the ureter. In this case, the calculus is the direct object, but there is no procedure site that is that direct object, since the ureter is an indirect object.

The most common concepts that have more than one direct object of the METHOD are Subtypes of *Removal (procedure)* where the object of the removal (e.g. a neoplasm) can be considered to be a part of the tissue at the anatomical site in which it occurs. When a part of an anatomical structure (however abnormal) has been removed, both the morphological abnormality and the anatomical structure in which it is located are to be modeled as direct objects for the METHOD *Removal - action (qualifier value)*. Grafts that become attached via in-growth of capillaries, fibroblasts, and/or other cells or tissues would also be regarded as biologically connected, and therefore modeling their removal would include the anatomical structure as a direct object of the action. The anatomical structure is not to be modeled as a direct object of a removal only when the procedure does not necessarily involve removal also of part of the anatomy; examples include removals of things such as a foreign body, a catheter, a renal calculus, or a mechanical implant like a pacemaker.

PROCEDURE SITE INDIRECT

This attribute describes the anatomical site, which is acted upon, but is not the direct object of the procedure. (The site is indirectly acted on by the procedure.) Usually in these procedures there is another value that is the direct object of the action. Exceptions (concepts that do not specify a direct object, but only an indirect object) are usually general groupers such as *Arm implantation (procedure)* (meaning implantation of something into the arm), since the thing implanted could be either a device or a substance (material).

Table 21: Permissible values for PROCEDURE SITE INDIRECT

Attribute Values	Examples
Anatomical or acquired body structure 442083009 (<<)	*Removal of catheter from brachial vein (procedure)* • METHOD *Removal-action (qualifier value)* • DIRECT DEVICE *Catheter, device (physical object)* • PROCEDURE SITE INDIRECT *Structure of brachial vein (body structure)*
	Removal of calculus of urinary bladder (procedure) • METHOD *Removal-action (qualifier value)* • DIRECT MORPHOLOGY *Calculus (morphologic abnormality)* • PROCEDURE SITE INDIRECT *Urinary bladder structure (body structure)*

PROCEDURE MORPHOLOGY

PROCEDURE MORPHOLOGY is the attribute used to specify the morphology or abnormal structure involved in a procedure. This attribute subsumes the more specific attributes DIRECT MORPHOLOGY and INDIRECT MORPHOLOGY that should be used if possible (see below). DIRECT MORPHOLOGY is used when the procedure method acts directly on the morphologic abnormality. INDIRECT MORPHOLOGY is used when the procedure method acts directly on something else (e.g. a device, substance or anatomical structure) that is associated with the morphologic abnormality. The more general attribute PROCEDURE MORPHOLOGY is used when defining general concepts that subsume both kinds of sub-concepts.

Table 22: Permissible values for PROCEDURE MORPHOLOGY

Attribute Values	Examples
Morphologically abnormal structure 49755003 (<<)	

Hematoma, calculus, foreign body, blood clot, embolus, and some other entities are not strictly body structures, but are in the body structure hierarchy under morphologically abnormal structure, and are valid values for the PROCEDURE MORPHOLOGY attributes.

DIRECT MORPHOLOGY

This attribute describes the morphologically abnormal structure that is the direct object of the METHOD action.

Table 23: Permissible values for DIRECT MORPHOLOGY

Attribute Values	Examples
Morphologically abnormal structure 49755003 (<<)	*Excision of benign neoplasm (procedure)* • METHOD *Excision - action (qualifier value)* • DIRECT MORPHOLOGY *Neoplasm, benign (morphologic abnormality)*

INDIRECT MORPHOLOGY

This attribute represents a morphology that is acted upon, but is not the direct target of the action being performed (i.e. the procedure's method acts directly on something else, such as a device, substance, or anatomical structure).

Table 24: Permissible values for INDIRECT MORPHOLOGY

Attribute Values	Examples
Morphologically abnormal structure 49755003 (<<)	*Removal of mesh from wound (procedure)* • METHOD *Removal - action (qualifier value)* • DIRECT DEVICE *Mesh (physical object)* • INDIRECT MORPHOLOGY *Wound (morphologic abnormality)*

METHOD

This attribute represents the action being performed to accomplish the procedure. It does not include the surgical approach (e.g. translumbar), equipment (e.g. sutures), or physical forces (e.g. laser energy).

Table 25: Permissible values for METHOD

Attribute Values	Examples
Action 129264002 (<<)	*Incision of ureter (procedure)* • METHOD *Incision-action (qualifier value)* • PROCEDURE SITE DIRECT *Ureteric structure (body structure)*

The METHOD can be considered the anchor of each relationship group that defines a procedure; if there are two methods, there should be two different relationship groups. It is correct to regard each relationship group as a kind of sub-procedure that defines the overall procedure. Each method can be regarded as the verb of a sentence, and the verbs direct and indirect objects are specified by the site, morphology, device, substance or energy attributes (below) that are grouped with it.

PROCEDURE DEVICE

PROCEDURE DEVICE is a general attribute used to model devices associated with a procedure. It subsumes the more specific attributes DIRECT DEVICE, INDIRECT DEVICE, USING DEVICE, and USING ACCESS DEVICE, which should be used instead of PROCEDURE DEVICE if possible. The general attribute PROCEDURE DEVICE is mainly useful for defining high-level, general concepts that aggregate procedures according to the device involved.

Table 26: Permissible values for PROCEDURE DEVICE

Attribute Values	Examples
Device 49062001 (<<)	*Catheter procedure (procedure)* • PROCEDURE DEVICE *Catheter, device (physical object)*

When the device is the direct object of the action (METHOD), the attribute DIRECT DEVICE is used. If the action is done indirectly to the device, that is, the action is done to something that is located in or on a device, but is not done directly to the device itself, then the attribute INDIRECT DEVICE is used. If the device is used to carry out the action, then the attribute USING DEVICE is used. If the device is used to access the site of the action, then the attribute USING ACCESS DEVICE is used.

Note: The permissible values for attributes in the PROCEDURE DEVICE role hierarchy include *Device (physical object)* and its descendants. However, there are a limited number of products in SNOMED CT which are devices that also deliver drugs. These concepts descend from *Drug-device combination product (product)* which is a descendent of both *Device (physical object)* and *Pharmaceutical/biologic product (product)*. Therefore, although they carry the hierarchy tag of (product), they are valid values for attributes in the PROCEDURE DEVICE role hierarchy.

Example:

Removal of drug coated stent (procedure)

- METHOD *Catheter, device (physical object)*
- DIRECT DEVICE *Drug coated stent (product)*

DIRECT DEVICE

This attribute represents the device on which the method directly acts.

Table 27: Permissible values for DIRECT DEVICE

Attribute Values	Examples
Device 49062001 (<<)	*Removal of arterial stent (procedure)* • METHOD *Removal - action (qualifier value)* • DIRECT DEVICE *Arterial stent (physical object)*

INDIRECT DEVICE

This attribute models action done on something that is located in or on a device, but is not done directly on the device itself.

Table 28: Permissible values for INDIRECT DEVICE

Attribute Values	Examples
Device 49062001 (<<)	*Excision of vegetations from implanted mitral valve (procedure)* • METHOD *Excision - action (qualifier value)* • DIRECT MORPHOLOGY *Vegetation (morphologic abnormality)* • INDIRECT DEVICE *Mitral valve prosthesis, device (physical object)* • PROCEDURE SITE INDIRECT *Mitral valve structure (body structure)*

Note:

In the above example, the vegetation is being excised. The mitral valve prosthesis is where the excised vegetation is located but the mitral valve prosthesis itself is not excised. Thus, mitral valve prosthesis is the INDIRECT DEVICE.

Note:

The attribute INDIRECT DEVICE is infrequently needed. When using this attribute, a second look is advisable to be sure it is needed.

USING DEVICE

This attribute refers to the instrument or equipment utilized to execute an action. USING DEVICE 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 used instead of USING DEVICE.

Table 29: Permissible values for USING DEVICE

Attribute Values	Examples
Device 49062001 (<<)	*Core needle biopsy of larynx (procedure)* • METHOD *Biopsy - action (qualifier value)* • USING DEVICE *Core biopsy needle, device (physical object)* • PROCEDURE SITE DIRECT *Laryngeal structure (body structure)*

USING ACCESS DEVICE

This attribute specifies the instrument or equipment used to access the site of a procedure.

Table 30: Permissible values for USING ACCESS DEVICE

Attribute Values	Examples
Device 49062001 (<<)	*Arthroscopic synovial biopsy (procedure)* • METHOD *Biopsy - action (qualifier value)* • USING ACCESS DEVICE *Arthroscope, device (physical object)* • PROCEDURE SITE DIRECT *Structure of synovial tissue of joint (body structure)*

ACCESS

This attribute describes the route used to access the site of a procedure. It is used to distinguish open, closed, and percutaneous procedures.

Table 31: Permissible values for ACCESS

Attribute Values	Examples
Surgical access values 309795001 (<=)(< Q)	*Open removal of bile duct stent (procedure)* • ACCESS *Open approach-access (qualifier value)*

DIRECT SUBSTANCE

This attribute describes the *Substance* or *Pharmaceutical/Biologic product* on which the procedure's method directly acts.

Table 32: Permissible values for DIRECT SUBSTANCE

Attribute Values	Examples
Substance 105590001 (<<) *Pharmaceutical/biologic product* 373873005 (<<)	*Injection of prostaglandin (procedure)* • METHOD *Injection - action (qualifier value)* • DIRECT SUBSTANCE *Prostaglandin (substance)*

Note:

NOTE: As an editorial policy, in the distribution form of the International Release, *Pharmaceutical/biologic product (product)* and its descendants are not used as values for DIRECT SUBSTANCE.

PRIORITY

This attribute refers to the priority assigned to a procedure.

Table 33: Permissible values for PRIORITY

Attribute Values	Examples
Priorities 272125009 (<=)(< Q)	*Emergency cesarean section (procedure)* • PRIORITY *Emergency (qualifier value)*

HAS FOCUS

This attribute specifies the *Clinical finding* or *Procedure* which is the focus of a procedure.

Table 34: Permissible values for HAS FOCUS

Attribute Values	Examples
Clinical finding 404684003 (<<) *Procedure* 71388002 (<<)	*Cardiac rehabilitation assessment (procedure)* • HAS FOCUS *Cardiac rehabilitation (regime/therapy)*

HAS INTENT

This attribute specifies the intent of a procedure.

Table 35: Permissible values for HAS INTENT

Attribute Values	Examples
Intents (nature of procedure values) 363675004 (<=)	*Diagnostic bronchoscopy (procedure)* • HAS INTENT *Diagnostic-procedure intent (qualifier value)*

RECIPIENT CATEGORY

This attribute specifies the type of individual or group upon which the action of the procedure is performed. For example, it can be used in blood banking procedures to differentiate whether the procedure was performed on the donor or the recipient of a blood product. In other words, RECIPIENT CATEGORY is *Donor for medical or surgical procedure (person)* if the subject of the record is the donor.

It is not used for a procedure where the subject of the procedure is someone other than the subject of record.

Table 36: Permissible values for RECIPIENT CATEGORY

Attribute Values	Examples
Person 125676002 (<<) *Family* 35359004 (<<) *Community* 133928008 (<<) *Donor for medical or surgical procedure* 105455006 (<<) *Group* 389109008 (<<)	*Social service interview of family (procedure)* • RECIPIENT CATEGORY *Family (social concept)*

REVISION STATUS

This attribute specifies whether a procedure is primary or a revision.

Table 37: Permissible values for REVISION STATUS

Attribute Values	Examples
Primary operation 261424001 (<<) *Revision-value* 255231005 (<<) *Part of multistage procedure* 257958009 (<<)	*Primary repair of inguinal hernia (procedure)* • REVISION STATUS *Primary operation (qualifier value)*
	Revision of knee arthroplasty (procedure) • REVISION STATUS *Revision-value (qualifier value)*

ROUTE OF ADMINISTRATION

This attribute allows representation of the route by which a procedure introduces a given substance into the body.

The domain for this attribute is the sub-hierarchy below *Administration of treatment via specific route (procedure)* 394898006.

Table 38: Permissible values for ROUTE OF ADMINISTRATION

Attribute Values	Examples
Route of administration value 284009009 (<<)	*Inhaled drug administration (procedure)* • ROUTE OF ADMINISTRATION *By inhalation (route) (qualifier value)*

SURGICAL APPROACH

This attribute specifies the directional, relational, or spatial access to the site of a surgical procedure. The domain for SURGICAL APPROACH is descendants of *Surgical procedure (procedure)* 387713003.

Table 39: Permissible values for SURGICAL APPROACH

Attribute Values	Examples
Procedural approach 103379005 (<=)(< Q)	*Intranasal ethmoidectomy (procedure)* • SURGICAL APPROACH *Intranasal approach (qualifier value)*
	Abdominal hysterectomy (procedure) • SURGICAL APPROACH *Abdominal approach (qualifier value)*

USING SUBSTANCE

This attribute describes the *Substance* used to execute the action of a procedure, but it is not the substance on which the procedure's method directly acts (the DIRECT SUBSTANCE).

Table 40: Permissible values for USING SUBSTANCE

Attribute Values	Examples
Substance 105590001 (<<)	*Contrast radiography of esophagus (procedure)* • METHOD *Radiographic imaging - action (qualifier value)* • PROCEDURE SITE DIRECT *Esophageal structure (body structure)* • USING SUBSTANCE *Contrast media (substance)*

USING ENERGY

This attribute describes the energy used to execute an action. USING ENERGY has been introduced because the new attribute USING DEVICE is now used only to represent the instrument or equipment used to execute the action. Unlike the attribute USING, which it replaces, USING DEVICE does not take values from the *physical force* hierarchy.

Table 41: Permissible values for USING ENERGY

Attribute Values	Examples
Physical force 78621006 (<<)	*Gamma ray therapy (procedure)* • USING ENERGY *Gamma radiation (physical force)*

Direct and indirect objects

Procedures that have 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 (at least) one of the four direct object attributes, depending on whether the direct object on which the method acts is a device (DIRECT DEVICE), anatomical structure (PROCEDURE SITE DIRECT), morphologic abnormality (DIRECT MORPHOLOGY) or substance (DIRECT SUBSTANCE).

When the type (body structure, device, or substance) of direct object is indeterminate, the direct-object attributes should not be used.

Attributes used to define Evaluation Procedure concepts

The evaluation procedure model

Approved Evaluation Procedure attributes summary table

Defining Attribute	Allowable Values
HAS SPECIMEN	*Specimen* 123038009 (<=)(< Q)
COMPONENT	*Substance* 105590001 (<=)(< Q) *Observable entity* 363787002 (<=)(< Q) *Cell structure* 4421005 (<=)(< Q) *Organism* 410607006 (<=)(< Q)
TIME ASPECT	*Time frame* 7389001 (<=)(< Q)
PROPERTY	*Property of measurement* 118598001 (<=)(< Q)

Defining Attribute	Allowable Values
SCALE TYPE	*Quantitative* 30766002 (<<) *Qualitative* 26716007 (<<) *Ordinal value* 117363000 (<<) *Ordinal or quantitative value* 117365007 (<<) *Nominal value* 117362005 (<<) *Narrative value* 117364006 (<<) *Text value* 117444000 (<<)
MEASUREMENT METHOD	*Laboratory procedure categorized by method* 127789004(<=)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

HAS SPECIMEN

This attribute specifies the type of specimen on which a measurement or observation is performed.

Table 42: Permissible values for HAS SPECIMEN

Attribute Values
Specimen 123038009 (<=)(< Q)

COMPONENT

This attribute refers to what is being observed or measured by a procedure.

Table 43: Permissible values for COMPONENT

Attribute Values	Example
Substance 105590001 (<=)(< Q) *Observable entity* 363787002 (<=)(< Q) *Cell structure* 4421005 (<=)(< Q) *Organism* 410607006 (<=)(< Q)	*Protein measurement (procedure)* • COMPONENT *Protein (substance)*

TIME ASPECT

This attribute specifies temporal relationships for a measurement procedure.

Table 44: Permissible values for TIME ASPECT

Attribute Values
Time frame 7389001 (<=)(< Q)

PROPERTY

This attribute specifies the kind of property being measured (e.g. concentration).

Table 45: Permissible values for PROPERTY

Attribute Values
Property of measurement 118598001 (<=)(< Q)

SCALE TYPE

This attribute refers to the scale of the result of an observation of a diagnostic test (i.e. quantitative, qualitative, semi-quantitative).

Table 46: Permissible values for SCALE TYPE

Attribute Values
Quantitative 30766002 (<<)
Qualitative 26716007 (<<)
Ordinal value 117363000 (<<)
Ordinal or quantitative value 117365007 (<<)
Nominal value 117362005 (<<)
Narrative value 117364006 (<<)
Text value 117444000 (<<)

MEASUREMENT METHOD

This attribute specifies the method by which a procedure is performed.

Table 47: Permissible values for MEASUREMENT METHOD

Attribute Values
Laboratory procedure categorized by method 127789004(<=)

For measurement procedures, the attribute METHOD is given the value *Measurement - action (qualifier value)*. The attribute MEASUREMENT METHOD can be used to provide additional specificity.

Attributes used to define Specimen concepts

Table 48: Approved Specimen attributes summary table

Defining Attribute	Allowable Values
SPECIMEN PROCEDURE	*Procedure* 71388002 (<)
SPECIMEN SOURCE TOPOGRAPHY	*Anatomical or acquired body structure* 442083009 (<<)
SPECIMEN SOURCE MORPHOLOGY	*Morphologically abnormal structure* 49755003 (<<)
SPECIMEN SUBSTANCE	*Substance* 105590001 (<<)
SPECIMEN SOURCE IDENTITY	*Person* 125676002 (<<) *Family* 35359004 (<<) *Community* 133928008 (<<) *Device* 49062001 (<<) *Environment* 276339004 (<<)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

SPECIMEN PROCEDURE

This attribute identifies the procedure by which a specimen is obtained.

Table 49: Permissible values for SPECIMEN PROCEDURE

Attribute Values	Examples
Procedure 71388002 (<)	*Urine specimen obtained by clean catch procedure (specimen)* • SPECIMEN PROCEDURE *Urine specimen collection, clean catch (procedure)*
	Specimen from stomach obtained by total gastrectomy (specimen) • SPECIMEN PROCEDURE *Total gastrectomy (procedure)*

SPECIMEN SOURCE TOPOGRAPHY

This attribute specifies the body site from which a specimen is obtained.

Table 50: Permissible values for SPECIMEN SOURCE TOPOGRAPHY

Attribute Values	Examples
Anatomical or acquired body structure 442083009 (<<)	*Cervix cytologic material (specimen)* • SPECIMEN SOURCE TOPOGRAPHY *Cervix uteri structure (body structure)*
	Omentum biopsy sample (specimen) • SPECIMEN SOURCE TOPOGRAPHY *Omentum structure (body structure)*

SPECIMEN SOURCE MORPHOLOGY

This attribute names the morphologic abnormality from which a specimen is obtained.

Table 51: Permissible values for SPECIMEN SOURCE MORPHOLOGY

Attribute Values	Examples
Morphologically abnormal structure 49755003 (<<)	*Specimen from cyst (specimen)* • SPECIMEN SOURCE MORPHOLOGY *Cyst (morphologic abnormality)*
	Specimen from wound abscess (specimen) • SPECIMEN SOURCE MORPHOLOGY *Abscess of wound (morphologic abnormality)*

SPECIMEN SUBSTANCE

This attribute names the type of substance of which a specimen is comprised.

Table 52: Permissible values for SPECIMEN SUBSTANCE

Attribute Values	Examples
Substance 105590001 (<<)	*Mid-stream urine sample (specimen)* • SPECIMEN SUBSTANCE *Urine (substance)*
	Pancreatic fluid specimen (specimen) • SPECIMEN SUBSTANCE *Pancreatic fluid (substance)*

SPECIMEN SOURCE IDENTITY

This attribute names the type of individual, group, or physical location from which a specimen is collected.

Table 53: Permissible values for SPECIMEN SOURCE IDENTITY

Attribute Values	Examples
Person 125676002 (<<) *Family* 35359004 (<<) *Community* 133928008 (<<) *Device* 49062001 (<<) *Environment* 276339004 (<<)	*Blood specimen from blood donor (specimen)* • SPECIMEN SOURCE IDENTITY *Blood donor (person)*
	Catheter tip specimen (specimen) • SPECIMEN SOURCE IDENTITY *Catheter tip, device (physical object)*

Attributes used to define Body structure concepts

Just one attribute is used in Anatomy, namely, Laterality. This attribute is detailed below.

Table 54: Attributes for Body structure concepts summary table

Defining Attribute	Permissible Values
LATERALITY	*Side* 182353008 (<=)

Note:

Permissible values for this attribute include the descendants of the concept listed, except for supercategory grouper concepts.

LATERALITY

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

Table 55: Permissible values for LATERALITY

Attribute Values	Examples
Side 182353008 (<=)	*Left kidney structure (body structure)* • LATERALITY *Left (qualifier value)*

Attributes used to define Pharmaceutical/Biologic Product concepts

DEFINING ATTRIBUTE	Allowable Values
HAS ACTIVE INGREDIENT	*Substance* 105590001 (<<)
HAS DOSE FORM	*Type of drug preparation* 105904009 (<<)

Note:

Permissible values for these attributes include the concepts listed and their descendants.

HAS ACTIVE INGREDIENT

This attribute indicates the active ingredient of a drug product, linking the *Pharmaceutical/Biologic product* hierarchy to the *Substance* hierarchy.

Table 56: Permissible values for HAS ACTIVE INGREDIENT

Attribute Values	Examples
Substance 105590001 (<<)	*Naproxen 500mg tablet (product)* • HAS ACTIVE INGREDIENT *Naproxen (substance)*

HAS DOSE FORM

This attribute specifies the dose form of a product.

Table 57: Permissible values for HAS DOSE FORM

Attribute Values	Examples
Type of drug preparation 105904009 (<<)	*Digoxin 0.1mg capsule (product)* • HAS DOSE FORM *Oral capsule (qualifier value)*

Attributes used to define Situation with Explicit Context concepts

Summary Table

Table 58: Approved Context attributes summary table

DEFINING ATTRIBUTE	Allowable Values
ASSOCIATED FINDING	*Clinical finding* 404684003 (<=)(< Q) *Event* 272379006 (<=)(< Q) *Observable entity* 363787002 (< Q only) *Link assertion* 416698001 (< Q only) *Procedure* 71388002 (< Q only)
FINDING CONTEXT	*Finding context value* 410514004 (<=)(< Q)
ASSOCIATED PROCEDURE	*Procedure* 71388002 (<=)(< Q) *Observable entity* 363787002 (< Q only)
PROCEDURE CONTEXT	*Context values for actions* 288532009 (<=)(< Q)
TEMPORAL CONTEXT	*Temporal context value* 410510008 (<=)(< Q)
SUBJECT RELATIONSHIP CONTEXT	*Person* 125676002 (<=)(< Q)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

Context

The meaning conveyed by a SNOMED CT code in a medical record is affected by the context in which it is recorded. For instance, the code for “breast cancer” might be used to indicate a family history of breast cancer, a past history of breast cancer, or a current diagnosis of breast cancer. Each of these three meanings differs in regard to the context in which breast cancer is being described. 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. Current diagnosis of breast cancer indicates that the breast cancer is present now, and in this patient. These differences are important for data retrieval, because it would be incorrect when searching for patients with breast cancer to retrieve those who merely have a family history of breast cancer.

Default Context

When a SNOMED CT code appears in a record without any explicitly stated context, that code is considered to have a default context. The default is "soft" in that it can be over-ridden by information carried in the structure of the record or its information model.

The default context for a clinical finding code implies that the finding has actually occurred (vs. being absent), that it applies to the subject of the record (the patient), and that it is occurring currently or occurred at a past time that is given by a date-time record linked to the code.

The default context for a procedure code 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 in the past at a time that is given by a date-time record linked to the code.

Axis Modifiers

The six attributes used to define situation codes permit explicit (rather than default) representation of various contexts. These attributes can change the meaning of a clinical finding or procedure code in a way that changes the hierarchy (or "axis") of the code from *Clinical finding* or *Procedure* to *Situation with explicit context*. The resulting modified meaning is not a subtype of the original meaning of the code, and therefore the axis-modifying attributes are not used to qualify the code, but instead are used to qualify a "situation" code.

For instance, if *Fine needle biopsy (procedure)* is given the non-context modifying attribute PROCEDURE SITE DIRECT and a value of *Urinary bladder structure (body structure)*, the resulting concept *Fine needle biopsy of urinary bladder (procedure)* is still a subtype of the original concept *Fine needle biopsy (procedure)*.

However, the concept *Urine protein test not done (situation)* uses the context-modifying attribute PROCEDURE CONTEXT and a value of *Not done (qualifier value)*, and the resulting concept is not a subtype of *Urine protein test (procedure)*. Its axis (hierarchy) has been modified.

Overview of context attributes

Of the six attributes applied to concepts in the *Situation with explicit context* hierarchy, two are used only in representing the context in which a *Clinical finding* is recorded, (ASSOCIATED FINDING and FINDING CONTEXT); two are used only in representing the context in which a *Procedure* is recorded (ASSOCIATED PROCEDURE and PROCEDURE CONTEXT); and two attributes are used in representing the context of both *Procedures* and *Clinical findings* (SUBJECT RELATIONSHIP CONTEXT and TEMPORAL CONTEXT).

ASSOCIATED FINDING

This attribute links concepts in the *Situation with explicit context* hierarchy to their related *Clinical finding*. It specifies the *Clinical finding* concept whose context is being modified.

Table 59: Permissible values for ASSOCIATED FINDING

Attribute Values	Examples
Clinical finding 404684003 (<=)(< Q) *Event* 272379006 (<=)(< Q) *Observable entity* 363787002 (< Q only) *Link assertion* 416698001 (< Q only) *Procedure* 71388002 (< Q only)	*Family history of stroke (situation)* • ASSOCIATED FINDING *Cerebrovascular accident (disorder)*

Note:

When ASSOCIATED FINDING is used in post-coordinated expressions, its range is broader than when used in distributed content.

ASSOCIATED FINDING must not reference concepts that already have pre-coordinated context themselves.

For example, the following definition uses *family history of thyroid disease* incorrectly:

History of thyroid disease in father:

- SUBJECT RELATIONSHIP CONTEXT = *father*
- ASSOCIATED FINDING = *family history of thyroid disease*.

The following is the correct definition:

History of thyroid disease in father:

- SUBJECT RELATIONSHIP CONTEXT = *father*
- ASSOCIATED FINDING = *thyroid disease*.

FINDING CONTEXT

The FINDING CONTEXT attribute is used to represent a situation in which a *Clinical finding* is known or unknown, and if known, whether it is present, absent, or uncertain (possible); and also to express the meaning that the finding is not actual but instead an anticipated or possible future finding.

Table 60: Permissible values for FINDING CONTEXT

Attribute Values	Examples
Finding context value 410514004 (<=)(< Q)	*No cough (situation)* • ASSOCIATED FINDING *Cough (finding)* • FINDING CONTEXT *Known absent (qualifier value)*

ASSOCIATED PROCEDURE

This attribute links concepts in the *Situation with explicit context* hierarchy to concepts in the *Procedure* hierarchy for which there is additional specified context.

Table 61: Permissible values for ASSOCIATED PROCEDURE

Attribute Values	Examples
Procedure 71388002 (<=)(< Q) *Observable entity* 363787002 (< Q only)	*Operative procedure planned (situation)* • ASSOCIATED PROCEDURE *Surgical procedure (procedure)*

PROCEDURE CONTEXT

This attribute indicates the degree of completion, or status, of a *Procedure*, as well as its various possible future states prior to its being initiated or completed.

Table 62: Permissible values for PROCEDURE CONTEXT

Attribute Values	Examples
Context values for actions 288532009 (<=)(< Q)	*Operative procedure planned (situation)* • ASSOCIATED PROCEDURE *Surgical procedure (procedure)* • PROCEDURE CONTEXT *Planned (qualifier value)*

TEMPORAL CONTEXT

This attribute indicates the time of occurrence of the situation, indicating whether the procedure or finding that it represents is actual and therefore occurred in the present, in the past, or at a specified time; or that it is planned or expected, that is, temporally located in the future. 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 its time. The word "specified" in the TEMPORAL CONTEXT values means that there is a date-time stamp associated with the code in the record, that gives a date and/or time, as a point and/or interval, that applies to the concept.

Table 63: Permissible values for TEMPORAL CONTEXT

Attribute Values	Examples
Temporal context value 410510008 (<=)(< Q)	*History of - hematuria (situation)* • ASSOCIATED FINDING *Blood in urine (finding)* • TEMPORAL CONTEXT *In the past (qualifier value)*

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. In the example below, the subject of the record is the patient and the subject who smokes is the patient's father.

Table 64: Permissible values for SUBJECT RELATIONSHIP CONTEXT

Concept Values	Examples
Person 125676002 (<=)(< Q)	*Father smokes (situation)* • ASSOCIATED FINDING *Smoker (finding)* • SUBJECT RELATIONSHIP CONTEXT *Father of subject (person)*

Attributes used to define Event concepts

Table 65: Attributes for Event concepts summary table

Defining Attribute	Allowable Values
ASSOCIATED WITH	*Clinical Finding* 404684003 (<<) *Procedure* 71388002 (<<) *Event* 272379006 (<<) *Organism* 410607006 (<<) *Substance* 105590001 (<<) *Physical object* 260787004 (<<) *Physical force* 78621006 (<<) *Pharmaceutical/biologic product* 373873005 (<< Q only) *SNOMED CT Concept* 138875005 (==)
CAUSATIVE AGENT	*Organism* 410607006 (<<) *Substance* 105590001 (<<) *Physical object* 260787004 (<<) *Physical force* 78621006 (<<) *Pharmaceutical/biologic product* 373873005 (<< Q only) *SNOMED CT Concept* 138875005 (==)
DUE TO	*Clinical Finding* 404684003 (<=) *Event* 272379006 (<=)
AFTER	*Clinical Finding* 404684003 (<<) *Procedure* 71388002 (<<)
OCCURRENCE	*Periods of life* 282032007 (<)

Note:

Meaning of Allowable Values (Range) notations:

(<<) this code and descendants,
(<) descendants only,
(<=) descendants only (stated) except for supercategory groupers,
(==) this code only,
(< Q) descendants only when in a qualifying relationship,
(< Q only) descendants only, and only allowed in a qualifying relationship.

For guidance and examples on the use of these attributes and value ranges to define events, see the section on clinical findings.

Attributes used to define Physical Object concepts

Table 66: Attributes for Physical object concepts summary table

Defining Attribute	Allowable Values
HAS ACTIVE INGREDIENT	*Substance* 105590001 (<<)

Note:

Allowable values for this attribute includes the concept listed and its descendants.

A limited number of concepts (e.g. drug-eluting stents) reside in the *Pharmaceutical/biologic product* hierarchy and the *Physical object* hierarchy. These concepts are all under *Drug-device combination product (product)*. This is the domain of HAS ACTIVE INGREDIENT within the *Physical Object* hierarchy. Editorial policies for the use of other attributes in the *Physical object* hierarchy generally, outside this particular domain, have yet to be established.

Relationship Groups in SNOMED CT

Multiple attributes and their values can be grouped together into "Relationship groups" to add clarity to concept definitions. A Relationship group combines an attribute-value pair with one or more other attribute-value pairs. Relationship groups originated to add clarity to *Clinical finding* concepts which require multiple ASSOCIATED MORPHOLOGY attributes and multiple FINDING SITE attributes and to *Procedures* which require multiple METHOD attributes and multiple PROCEDURE SITE attributes. However, Relationship groups are not limited to *Clinical finding* and *Procedure* concepts.

In the case of *Procedures*, Relationship groups generally associate the correct method with the correct site. In the example below, the Relationship groups clarify that there is exploration of the bile duct, and excision of the gall bladder. Without Relationship groups, the four attributes would be ungrouped and it would be unclear whether the excision was of the bile duct or of the gall bladder.

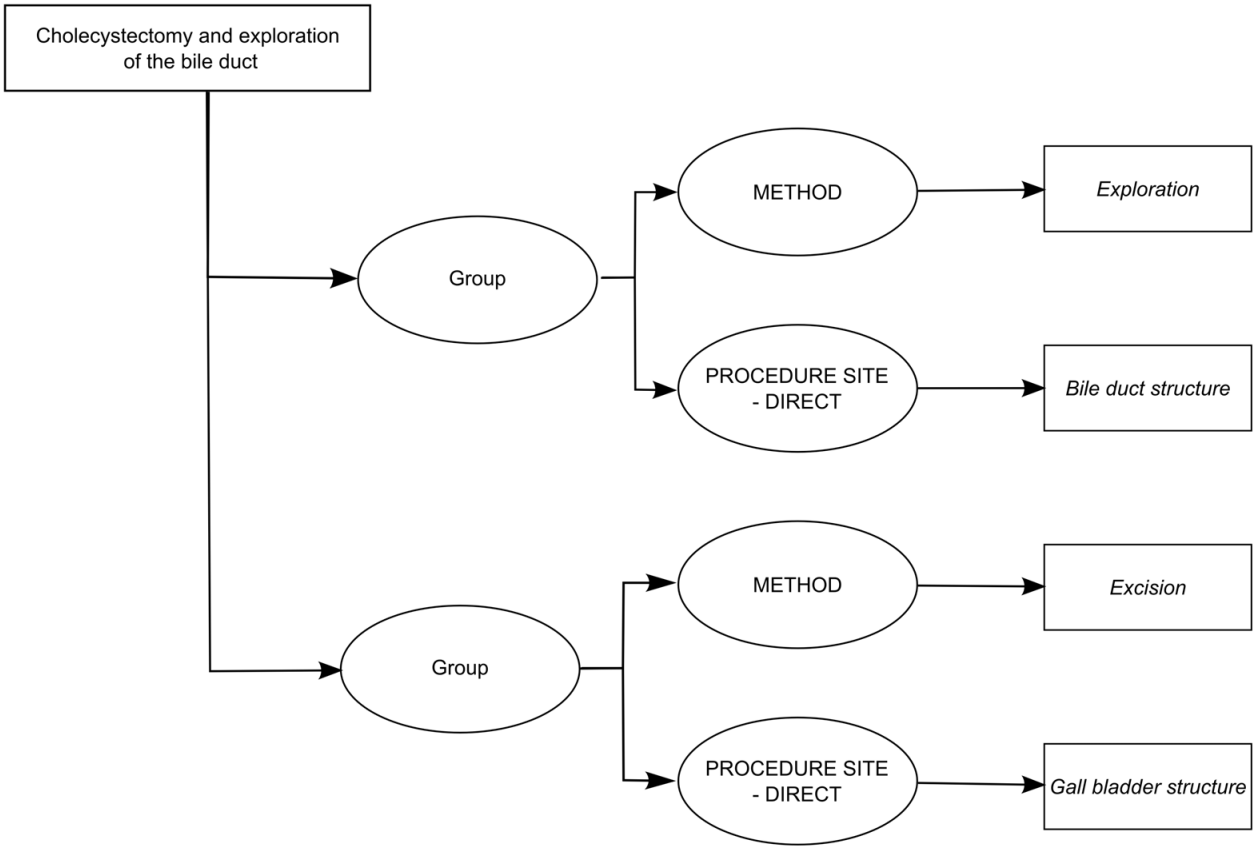


Figure 5: Example Cholecystectomy and exploration of bile duct

Chapter 4

Hierarchies

Topics:

SNOMED CT concepts are organized into hierarchies. There are two special Codes referred to as the *Root Concept Code* and the *Root Metadata Code*. They are at the "root" of the two hierarchies that contain all Concept Codes in SNOMED CT. The root named "SNOMED CT Concept" subsumes (is the supertype of) the top-level concepts and all the concepts beneath them (their subtypes), and the root named "SNOMED CT Model Component" subsumes all the metadata components. As the hierarchies are descended, the concepts within them become increasingly specific (or granular). A brief description of the content in each hierarchy is given below.

Note: The *Root Metadata Code* and the hierarchy under it have been included in a technology preview release, but have been omitted from the official January 2010 International Release of SNOMED CT. The technology preview provides SNOMED CT in a new release format, called Release Format 2 (RF2), as a draft for trial use.

Subtype (or “child”) concepts are the descendant concepts of Supertype (or “parent”) concepts.

Example:

Streptococcal arthritis (disorder) is a subtype of *Bacterial arthritis (disorder)*.

Supertype concepts are the ancestor concepts of Subtype concepts.

Example:

Bacterial arthritis (disorder) is a supertype of *Streptococcal arthritis (disorder)*.

Summary of Top Level Hierarchies

Top Level Concepts

- *Clinical finding*
- *Procedure*
- *Observable entity*
- *Body structure*
- *Organism*
- *Substance*
- *Pharmaceutical/biologic product*
- *Specimen*
- *Special concept*
- *Linkage concept*
- *Physical force*
- *Event*
- *Environment or geographical location*
- *Social context*
- *Situation with explicit context*
- *Staging and scales*
- *Physical object*
- *Qualifier value*
- *Record artifact*

Top Level Metadata

- *Core metadata concept*
- *Foundation metadata concept*

Clinical finding

Concepts in this hierarchy represent the result of a clinical observation, assessment or judgment, and include both normal and abnormal clinical states.

Examples of Clinical finding concepts:

- *Clear sputum (finding)*
- *Normal breath sounds (finding)*
- *Poor posture (finding)*

The *Clinical finding* hierarchy contains the sub-hierarchy of *Disease*. Concepts that are descendants of *Disease* (or disorders) are always and necessarily abnormal clinical states. Multi-axial subtype hierarchies allow diseases to be subtypes of other disorders as well as subtypes of findings.

Examples of Disease concepts:

- *Tuberculosis (disorder)*
- *Non-Hodgkin's lymphoma (disorder)*

Procedure

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. *Excision of intracranial artery (procedure)*), administration of medicines (e.g. *Pertussis vaccination (procedure)*), imaging procedures (e.g. *Ultrasonography of breast (procedure)*), education procedures (e.g. *Low salt diet education (procedure)*), and administrative procedures (e.g. *Medical records transfer (procedure)*).

Examples of Procedure concepts:

- *Removal of ureteral catheter (procedure)*
- *Intravenous steroid injection (procedure)*
- *Irrigation of oral wound (procedure)*
- *Appendectomy (procedure)*

Situation with explicit context

Concepts in the *Procedure* and *Clinical findings* hierarchies (given the appropriate record structure) can be used in a clinical record to represent:

- Conditions and procedures that have not yet occurred (e.g. *Endoscopy arranged (situation)*).
- Conditions and procedures that refer to someone other than the patient (e.g. *Family history: Diabetes mellitus (situation)*, *Discussed with next of kin (situation)*).
- Conditions and procedures that have occurred at some time prior to the time of the current entry in the record (e.g. *History of-aortic aneurysm (situation)*, *History of-splenectomy (situation)*).

In each of these examples, clinical context is specified. The second example, in which someone other than the patient is the focus of the concept, could be represented in an application or record structure by combining a header term Family history with the value Diabetes. The specific context (in this case, family history) would be represented using the record structure. In this case, the pre-coordinated context-dependent concept *Family history: Diabetes mellitus (situation)* would not be used because the information model has already captured the family history aspect of the diabetes.

Concepts in the *Procedure* and *Clinical findings* hierarchy have a default context of the following:

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

In addition to using the record structure to represent context, there is sometimes a need to override these defaults and specify a particular context using the formal logic of the terminology. For that reason, SNOMED has developed a context model to allow users and/or implementers to specify context using the terminology, without depending on a particular record structure. The *Situation with explicit context* hierarchy and various attributes assigned to concepts in this hierarchy accomplish this.

Examples of Situation with explicit context concepts:

- *Family history: Myocardial infarction (situation)*
- *No family history of stroke (situation)*
- *Nasal discharge present (situation)*
- *Suspected epilepsy (situation)*

Observable entity

Concepts in this hierarchy can be thought of as representing a question or procedure which can produce an answer or a result. For instance, *Left ventricular end-diastolic pressure (observable entity)* could be interpreted as the question, “What is the left ventricular end diastolic pressure?” or “What is the measured left ventricular end-diastolic pressure?”

Observables are entities that could be used to code elements on a checklist or any element where a value can be assigned. *Color of nail (observable entity)* is an observable. *Gray nails (finding)* is a finding.

One use for *Observable entities* in a clinical record is to code headers on a template. For example, *Gender (observable entity)* could be used to code a section of a template titled “Gender” where the user would choose “male” or “female”. “Female gender” would then constitute a finding.

Body structure

Body structure concepts include normal as well as abnormal anatomical structures. Normal anatomical structures can be used to specify the body site involved by a disease or procedure.

Examples of Body structure concepts:

- *Mitral valve structure (body structure)*
- *Uterine structure (body structure)*

Morphologic alterations from normal body structures are represented in the sub-hierarchy *Body structure, altered from its original anatomical structure (morphologic abnormality)*.

Examples of Body Structure, altered from its original anatomical structure concepts:

- *Adenosarcoma (morphologic abnormality)*
- *Polyp (morphologic abnormality)*

Organism

This hierarchy includes organisms of significance in human and animal medicine. Organisms are also used in modeling the causes of diseases in SNOMED CT. They are important for public health reporting of the causes of notifiable conditions and for use in evidence-based infectious disease protocols in clinical decision support systems. Sub-hierarchies of organism include, but are not limited to: *Animal (organism)*, *Microorganism (organism)*, *Plant (organism)*.

Examples of Organism concepts:

- *Streptococcus pyogenes (organism)*
- *Texon cattle breed (organism)*
- *Bacillus anthracis (organism)*
- *Lichen (plant) (organism)*

Substance

The *Substance* hierarchy contains concepts that can be used for recording active chemical constituents of drug products, food and chemical allergens, adverse reactions, toxicity or poisoning information, and physicians and nursing orders. Concepts from this hierarchy represent general substances and chemical constituents of *Pharmaceutical/biologic product (product)* which are in a separate hierarchy. However, sub-hierarchies of *Substance* also include but are not limited to: *Body substance (substance)* (concepts to represent body substances); *Dietary substance (substance)*; *Diagnostic substance (substance)*.

Examples of Substance concepts:

- *Insulin (substance)*
- *Methane (substance)*
- *Chromatin (substance)*
- *Dental porcelain material (substance)*
- *Albumin (substance)*
- *Endorphin (substance)*
- *Acetaminophen (substance)*

Pharmaceutical/biologic product

The *Pharmaceutical/biologic product* hierarchy is separate from the *Substance* hierarchy. This hierarchy was introduced as a top-level hierarchy in order to clearly distinguish drug products (products) from their chemical constituents (substances).

It contains concepts that represent the multiple levels of granularity required to support a variety of uses cases such as computerized provider order entry (CPOE), e-prescribing, decision support and formulary management. The levels of drug products represented in the International Release include Virtual Medicinal Product (VMP), Virtual Therapeutic Moiety (VTM), and Product Category. Additionally, US and UK drug extensions have been developed, which represent Actual Medicinal Products (AMPs).

Virtual Medicinal Product (VMP)

The most granular level is the Virtual Medicinal Product (VMP). The VMP is a representation at the level of generality that would appear on a physician's prescription. The product name, strength, and dose form are all represented in the Fully Specified Name. This level can be used to support providers with drug ordering in CPOE and e-prescribing use cases.

Example:

- *Diazepam 5mg tablet (product)*

  (Name, Strength, Dose form)

Virtual Therapeutic Moiety (VTM)

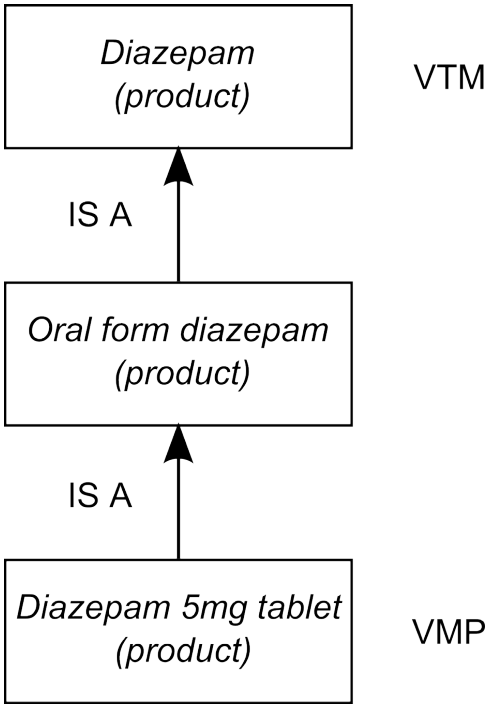
The Virtual Therapeutic Moiety (VTM) level represents a more general level of granularity than the VMP level. VTMs include the product name but not formulation, dose or strength in the Fully Specified Name. The HAS ACTIVE INGREDIENT attribute (which relates the product to the *Substance* it contains) can be assigned to this level or to any of the subtypes of this level.

Example:

- *Diazepam (product)*

All Virtual Medicinal Products (VMP) have a direct link to the Virtual Therapeutic Moiety (VTM) via an IS A relationship.

Example:



There are additional levels in the *Pharmaceutical/biologic product* hierarchy that provide structure and organization. For example, some subtypes of VTM contain only Dose form information and not Strength.

Example:

Concept with granularity between that of a VTM and VMP:

- *Parenteral form epinephrine (product)*

  (Dose form, Name)

Product category

A Product category concept supports a group of *Pharmaceutical/biologic products* related by their functionality mechanism of action or therapeutic use. *Product category* concepts typically describe common drug categories used in prescribing.

Examples of Product category concepts:

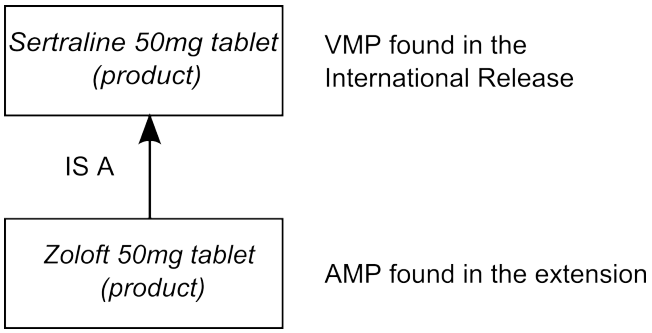
- *Sex hormone product (product)*
- *Mineralocorticoid preparation (product)*
- *beta-Blocking agent (product)*
- *Tissue plasminogen activator preparation (product)*

Actual Medicinal Products (AMPs)

Actual Medicinal Products can be represented in extensions. The AMP represents the single unit dose of a medicinal product that is (or has been) made or marketed by a specific manufacturer (trademarked brand name pharmaceutical products). Its description requires product name, strength, dosage form, flavor (where applicable) and manufacturer, but it does not include explicit information about packaging.

Because AMP concepts contain brand and country-specific information, they are not represented within the International Release of SNOMED CT, but may instead exist within an identified domain extension (contact your IHTSDO National Release CenterCentre for further information). Actual Medicinal Products in an extension have a direct link to their virtual equivalent in the International Release via the IS A relationship.

Example:



All concepts in the *Pharmaceutical/biologic product* hierarchy have a FSN tag of “(product)” regardless of their level of granularity.

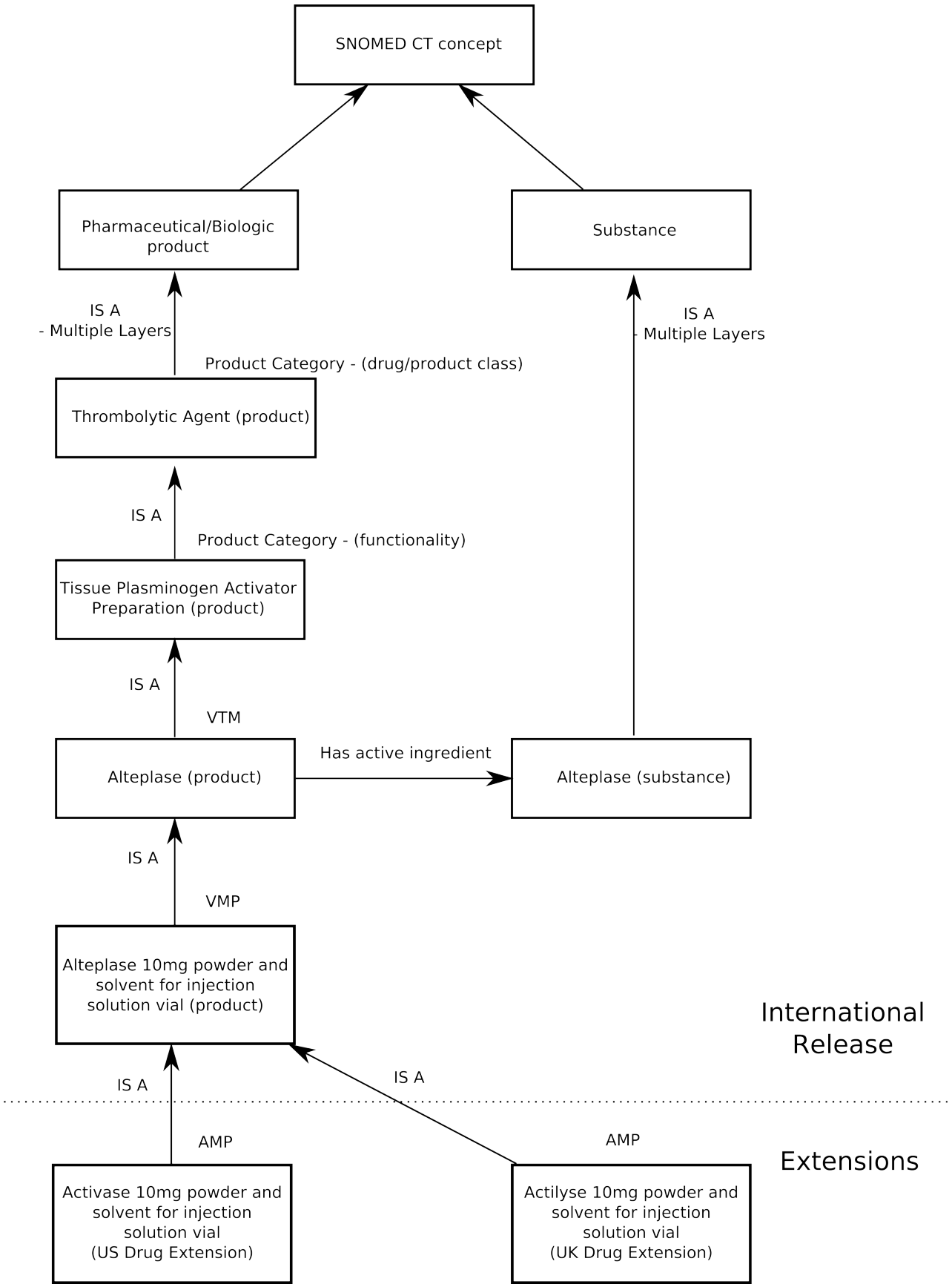


Figure 6: Pharmaceutical/Biologic Product hierarchy structure

Specimen

The *Specimen* hierarchy contains concepts representing entities that are obtained (usually from a patient) for examination or analysis. *Specimen* concepts can be defined by attributes which specify: the normal or abnormal body structure from which they are obtained; the procedure used to collect the specimen; the source from which it was collected; and the substance of which it is comprised.

Examples of Specimen concepts:

- *Specimen from prostate obtained by needle biopsy (specimen)*
- *Urine specimen obtained by clean catch procedure (specimen)*
- *Calculus specimen (specimen)*
- *Cerebroventricular fluid cytologic material (specimen)*

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).

Examples of Physical object concepts:

- *Military vehicle (physical object)*
- *Implant, device (physical object)*
- *Artificial kidney, device (physical object)*
- *Latex rubber gloves (physical object)*
- *Book (physical object)*
- *Pressure support ventilator (physical object)*
- *Vena cava filter (physical object)*

Physical force

The concepts in the *Physical force* hierarchy are directed primarily at representing physical forces that can play a role as mechanisms of injury.

Examples of Physical force concepts:

- *Spontaneous combustion (physical force)*
- *Alternating current (physical force)*
- *Friction (physical force)*

Event

The *Event* hierarchy includes concepts that represent occurrences (excluding procedures and interventions).

Examples of Event concepts:

- *Flood (event)*
- *Bioterrorist attack (event)*
- *Earthquake (event)*

Environments and geographic locations

The *Environments and geographic locations* hierarchy includes types of environments as well as named locations such as countries, states, and regions.

Examples of Environments and geographic locations concepts:

- *Canary islands (geographic location)*
- *California (geographic location)*
- *Rehabilitation department (environment)*
- *Intensive care unit (environment)*

Social context

The *Social context* hierarchy contains social conditions and circumstances significant to healthcare. Content includes such areas as family status, economic status, ethnic and religious heritage, life style, and occupations. These concepts represent social aspects affecting patient health and treatment. Some sub-hierarchies of *Social context* and concepts typical of those sub-hierarchies are shown in the following examples.

Examples:

- *Ethnic group (ethnic group)*:
  - *Afro-Caribbean (ethnic group)*
  - *Estonians (ethnic group)*
- *Occupation (occupation)*:
  - *Bank clerk (occupation)*
  - *Carpenter, general (occupation)*
- *Person (person)*:
  - *Employer (person)*
  - *Boyfriend (person)*
  - *Caregiver (person)*
- *Religion / philosophy (religion/philosophy)*:
  - *Hinduism (religion/philosophy)*
  - *Orthodox Christian religion (religion/philosophy)*
- *Economic status (social concept)*:
  - *Middle class economic status (social concept)*

Staging and scales

This hierarchy contains such sub-hierarchies as *Assessment scales (assessment scale)*, which names assessment scales; and *Tumor staging (tumor staging)*, which names tumor staging systems.

Examples of Assessment scales (assessment scale) concepts:

- *Glasgow coma scale (assessment scale)*
- *Stanford Binet intelligence scale (assessment scale)*

Examples of Tumor staging (tumor staging) concepts:

- *International Federation of Gynecology and Obstetrics (FIGO) staging system of gynecological malignancy (tumor staging)*
- *Dukes staging system (tumor staging)*

Qualifier value

The *Qualifier value* hierarchy contains some of the concepts used as values for SNOMED CT attributes that are not contained elsewhere in SNOMED CT. Such a code may be used as the value of an attribute in a defining Relationship in pre-coordinated definitions, and/or as the value of an attribute in a qualifier in a post-coordinated expression. However, the values for attributes are not limited to this hierarchy and are also found in hierarchies other than *Qualifier value*.

For example, the value for the attribute LATERALITY in the concept shown below is taken from the *Qualifier value* hierarchy:

- *Left kidney structure (body structure)* LATERALITY *Left (qualifier value)*

However, the value for the attribute FINDING SITE in the concept shown below is taken from the *Body structure* hierarchy, not the *Qualifier value* hierarchy.

- *Pneumonia (disorder)* FINDING SITE *Lung structure (body structure)*

Examples of Qualifier value concepts:

- *Unilateral (qualifier value)*
- *Left (qualifier value)*
- *Puncture - action (qualifier value)*

Special Concept

The Top Level Concept Code *Special concept* and its subclass codes provide a place for concept codes that are no longer active in the terminology.

The subclasses of *Special concept* are:

- *Navigational concept*
- *Inactive concept*

Navigational concept

These concept codes are to be used only as nodes in a Navigation Subset. They are not suitable for data recording or aggregation.

The subclasses of *Navigational concept* have the following characteristics:

- They have no IS A subclasses.
- They have no IS A superclasses other than *Navigational concept*.
- They may be associated with other concept codes by the use of Navigation Links (See *SNOMED CT Subsets* on page 74.)

Inactive concept

These concept codes are no longer current within SNOMED CT and should not be used for encoding data. There is one hierarchical level which consists of these subclasses:

- *Reason not stated*
- *Duplicate*
- *Outdated*
- *Ambiguous*
- *Erroneous*
- *Limited / Classification*
- *Moved Elsewhere*

Each inactive concept code falls into one of these seven subclasses based upon its ConceptStatus value of 1, 2, 3, 4, 5, 6, or 10. There is no further subclassing of inactive concepts. Note that concept codes with a ConceptStatus value of 6 (Limited) were formerly considered active, but are now inactive and are included in the inactive hierarchy. This also means that the former confusing distinction between "active" and "current" no longer is required. "Active" and "current" now mean the same thing, and "inactive" and "non-current" also now mean the same thing.

Namespace concept

These codes have integer-valued names that are the Extension namespace identifiers that have been assigned. (See *Extensions* on page 76 and *SCTIDs and Extensions* on page 84.)

Record Artifact

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), and consists of its information elements (usually words, phrases and sentences, but also numbers, graphs, and other information elements). *Record artifacts* need not be complete reports or complete records. They can be parts of larger *Record artifacts*. For example, a complete health record is a *Record artifact* that also may contain other *Record artifacts* in the form of individual documents or reports, which in turn may contain more finely granular *Record artifacts* such as sections and even section headers.

Core metadata concept

These codes provide structural information for the so-called "core" tables, which include the concepts table, the descriptions table, and the relationships table.

Foundation metadata concept

These metadata codes provide structural information for other release structures (besides the core tables).

Linkage concept

Linkage concept codes are intended to link two or more other codes to each other to express compositional meanings. All concept codes that can be used as a Relationship Type are included under *Linkage concept*. The ones approved for use are the Concept Model Attributes. Implementation guidance is as yet quite limited for the other Linkage concept codes. Use of them should be regarded as non-standard, tentative and experimental, requiring extra care.

The *Linkage concept* hierarchy contains the sub-hierarchies:

- *Link assertion*
- *Attribute*

Link assertion

The Link assertion sub-hierarchy enables the use of SNOMED CT concepts in HL7 statements that assert relationships between statements. Currently this content supports the UK NHS Connecting for Health requirements for encoding of Statement relationships for the implementation of HL7 Version 3 messaging in the UK realm.

Examples of Link assertion concepts:

- *Has reason (link assertion)*
- *Has explanation (link assertion)*

Attribute

Concepts that descend from this sub-hierarchy are used to construct relationships between two SNOMED CT concepts, since they indicate the relationship type between those concepts. Some attributes (relationship types) can be used to logically define a concept (defining attributes). This sub-hierarchy also includes non-defining attributes (like those used to track historical relationships between concepts) or attributes that may be useful to model concept definitions but which have not yet been used in modeling pre-coordinated concepts in SNOMED CT.

Examples of Defining attributes:

- *IS A (attribute)*
- *Concept model attribute (attribute)*:
  - *Laterality (attribute)*
  - *Procedure site (attribute)*
  - *Finding site (attribute)*
  - *Associated morphology (attribute)*

Examples of Non-defining attributes:

- *Concept history attribute (attribute)*
  - *REPLACED BY (attribute)*
  - *SAME AS (attribute)*

- *Unapproved attribute (attribute)*
  - *Relieved by (attribute)*
  - *Has assessment (attribute)*

Chapter 5

Structure and Technology Considerations

Topics:

Introduction

The structure and technology behind SNOMED CT enables organizations to implement it and integrate it into their own clinical and business processes and applications. SNOMED CT offers additional capabilities to facilitate customization of an implementation to meet the unique requirements of an organization.

This section provides an introduction to SNOMED CT structure and technology, highlighting its core and extended capabilities. This overview is intended to provide project managers and others involved with SNOMED CT implementations a better understanding of technology requirements and support considerations for SNOMED CT implementation and maintenance. Topics addressed include:

- SNOMED CT data structure: SNOMED CT data components and their relationships, including the core table structure, as well as:
  - History
  - Subsets
  - Cross Mapping
  - Extensions
- SNOMED CT applications and services

Detailed information for each topic is available in the *SNOMED CT Technical Reference Guide* (TRG), *SNOMED CT Technical Implementation Guide* (TIG) and the *SNOMED CT Developer Toolkit*. See *Inventory of Documentation* on page 8 for descriptions of the content and target audiences for each available document.

SNOMED CT tables

SNOMED CT is distributed as a set of tab-delimited text files that can be imported into a relational database. The three tables shown below, the Concepts table, the Descriptions table, and the Relationships table, are commonly referred to as the “core” tables.

The association of a set of Descriptions and a set of Relationships to each Concept is implemented using the ConceptID which is the primary or foreign key in the three tables.

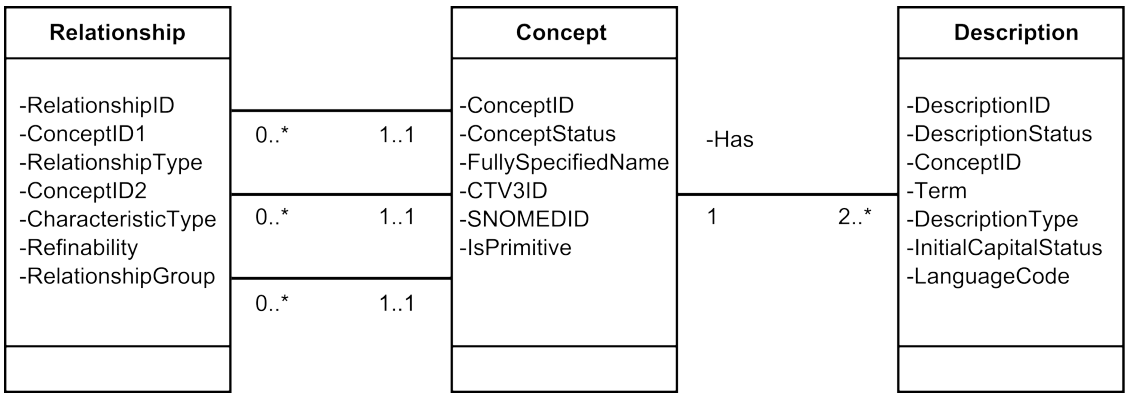


Figure 7: SNOMED CT table structure

The Concepts Table

The Concepts Table contains all the concepts in SNOMED CT. Each concept is represented by one row of the table. Each row of the Concepts Table contains the following fields:

- SNOMED CT concepts are identified by their *ConceptIDs*, and all information about a SNOMED CT concept is ultimately linked to the *ConceptID*. *ConceptID* is the primary key of the Concepts Table.
- The original SNOMED RT identifier and original CTV3 identifier for each concept that originated in those terminologies. Any newly created SNOMED CT concept is assigned a SNOMED RT identifier and a CTV3 identifier. This allows users of SNOMED CT to work with legacy data coded with SNOMED RT or CTV3 codes.
- The *FullySpecifiedName* field appears in both the Concepts Table and the Descriptions Table. In the Concepts Table, it serves to provide a human-readable name for each concept.
- The *ConceptStatus* field indicates whether a concept is in active use or retired. This field flags concepts that have been retired so that data encoded with these concepts can be properly accessed and retrieved long after it has been coded.
- The *IsPrimitive* field indicates whether or not a concept has been flagged as primitive during the modeling process. This flag can be useful in advanced applications that take advantage of the description logic features of SNOMED CT (A more detailed description of fully defined and primitive concepts can be found in *User Guide Glossary* on page 85).

The Descriptions Table

This table relates the various terms used to name a single SNOMED CT concept. The Descriptions Table includes the following fields:

- *DescriptionID*: Each description has a unique *DescriptionID*, which serves as the primary key of this table.
- *DescriptionType*: This field indicates if the description is one of three types:
  - The *Fully Specified Name* (FSN): A term that uniquely and unambiguously identifies each concept in a human-readable way, just as the *ConceptID* uniquely identifies each term in a machine-readable way. There is only one Fully Specified Name for each concept in each edition.
  - The *Preferred Term*: Intended to represent the common way a concept is expressed in natural language by clinicians. In many cases it is a shortened version of the Fully Specified Name
  - *Synonyms*: Other terms that can be used to name a concept. The large numbers of synonyms in SNOMED CT provide flexibility of expression.
- *LanguageCode*: This field in the Descriptions Table associates each description with a particular language or dialect, such as UK English, Spanish, etc.

The Relationships Table

This table contains the relationships between SNOMED CT concepts. A Relationship in the table is stored as a combination of three concepts in the order: ConceptID1 RelationshipType ConceptID2. This is represented in the table by the following fields:

- *RelationshipID*: The RelationshipID uniquely identifies each set of three concepts in a relationship, and serves as the primary key of this table.
- *ConceptID1*: The first concept in the relationship
- *RelationshipType*: This is the type of relationship (either the IS A relationship or an attribute or a Historical or Additional relationship) that exists between two concepts.
- *ConceptID2*: The target concept in the relationship. Either the Parent concept in an IS A relationship or the concept that represents the value assigned in an attribute relationship.

The most common *RelationshipType* used in SNOMED is the IS A relationship (a.k.a. subsumption relationship, hierarchical relationship, supertype-subtype relationship, or parent-child relationship). When an IS A relationship is listed in the Relationships Table, it indicates that *Concept1* is a subtype of *Concept2*.

See the *Technical Reference Guide* for more information about SNOMED CT tables.

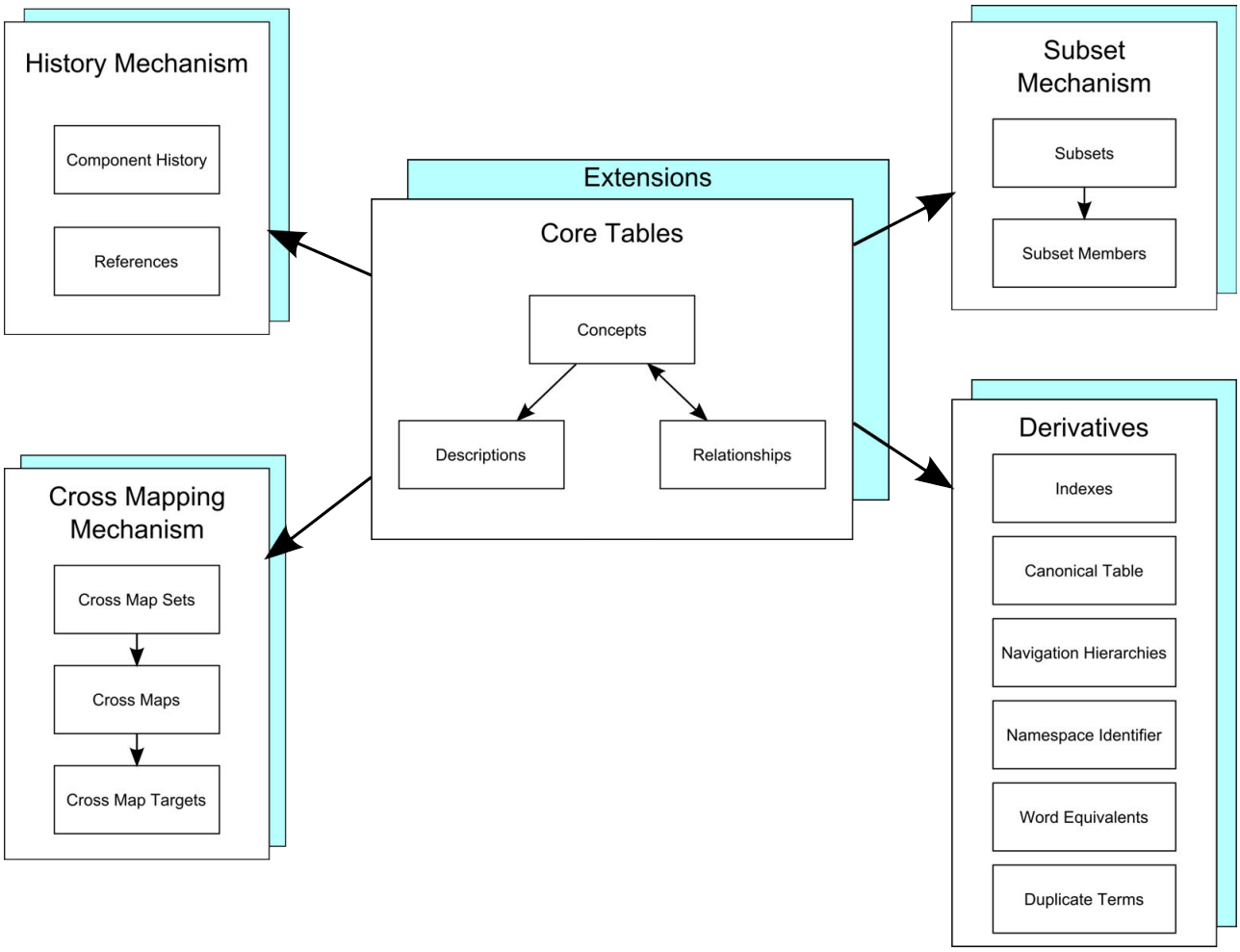


Figure 8: SNOMED CT Data Structure Summary

History

Introduction

The content of SNOMED CT evolves with each release. The types of changes made include new Concepts, new Descriptions, new Relationships between Concepts, new Cross Maps, and new Subsets, as well as updates and retirement of any of these Components. Drivers of these changes include changes in understanding of health and disease processes; introduction of new drugs, investigations, therapies and procedures; and new threats to health, as well as proposals and work provided by SNOMED users.

History Mechanism

The history mechanism involves the following tables:

- Component History Table
- References Table

The Component History Table includes any changes to SNOMED CT Components (Concepts, Descriptions, Subsets, Cross Maps). “Significant” changes generally require retirement of the component and addition of replacement component(s). The retirement and addition are recorded in the history records. Changes designated as minor require only a history record to record the change.

The References Table provides a reference from an inactive SNOMED CT component (Concept moved to an Extension, Description, Subset or Cross Map Set) to a component that is current for the Release in which the first component is made inactive. The type of reference indicates the nature of the relationship between the two components. This is similar to the information that historical relationships provide for inactive Concepts.

SNOMED CT Subsets

Introduction

A Subset refers to a set of Concepts, Descriptions, or Relationships that are appropriate to a particular language, dialect, country, specialty, organization, user or context.

In its simplest form, the Subset Mechanism is a list of SNOMED identifiers (SCTIDs). Each SCTID refers to one component of SNOMED CT, that is, a member of the Subset (called a Subset Member). As an analogy, think of SNOMED CT as a book. A Subset is like an index entry pointing to a set of pages relevant to a particular topic.

The Subset Mechanism may be used to derive tables that contain only part of SNOMED CT. In some cases, these derived tables may also be centrally distributed (e.g. a release table containing only Descriptions for a particular International Edition).

A Subset is a value-added feature of SNOMED CT. Subsets provide important information for the use and implementation of SNOMED CT. The fact that a SNOMED CT Component belongs to a particular subset provides information above and beyond the Component itself.

SNOMED CT is a large terminology and subsets can define portions of the terminology for use by specific audiences. For example, a UK dialect subset for English may direct the user to descriptions for UK terms rather than all descriptions for English.

Subsets may also be used to specify simplified or shortened hierarchies for browsing, sometimes called "navigation hierarchies".

Note that it is up to the implementer to determine if a subset is used dynamically or statically, and whether the subset contents are given precedence or used exclusively. Refer to the SNOMED CT Technical Implementation Guide for more information.

Note that Subsets are not necessarily mutually exclusive. The contents of Subsets may overlap.

Subset table and file structures

A common file structure is used for all Subsets. This approach simplifies the release structure and installation process for all SNOMED users.

Subsets are released using two tables:

- Subsets Table
  - Each row in this table describes one release of a Subset.
  - This table includes SNOMED CT Subsets that are packaged together in the Subset Memberstable.
- Subset Members Table
  - Each row in this table represents one member of a Subset.
  - The member may be a Concept or a Description.
  - One or more Subsets may be packaged together in this table.

Cross Mappings

Introduction

Cross Mappings enable SNOMED CT to effectively reference other terminologies and classifications. Each cross map matches SNOMED CT concepts with another coding scheme that is called the “target scheme”. The Cross Mapping mechanism enables the distribution of Cross Maps from SNOMED Clinical Terms in a common structure.

The cross mapping structure enables:

- Automatic mapping from one SNOMED CT Concept to a single appropriate matching code in the Target Scheme.
- Automatic mapping from one SNOMED CT Concept to a single collection of codes in a Target Scheme that together represent the same Concept.
- Manual choice from a set of options for mapping a SNOMED CT Concept to a Target Scheme with several possible ways of representing the same or similar Concepts (For Future Use).

The cross mapping structure does **not** enable:

- Mapping from post-coordinated collections of SNOMED CT Concepts to a single Target Code or a specific collection of Target Codes (e.g. mapping a combination of a disorder qualified by severity or a procedure qualified by urgency).
- Mapping from multiple fields in a patient record to a specific Target Code that represents a combination of characteristics (e.g. mapping a combination of a disorder, procedure and the age and sex of the patient to a single group code).

This structure is based on the practical experience of the Cross Mapping tables of Clinical Terms Version 3 (CTV3), one of SNOMED CT's source terminologies.

Cross Mapping tables

The SNOMED CT structure to support Cross Mapping includes three tables:

- Cross Map Sets Table: Each row in this table represents a Target Scheme for which Cross Maps are available.
- Cross Maps Table: Each row in this table represents one option for mapping a SNOMED CT Concept to a target code or set of codes in the Target Scheme.
- Cross Map Targets Table: Each row in this table represents a code or set of codes in the Target Scheme, which provides a mapping for one or more SNOMED CT Concepts.

Extensions

SNOMED CT is a deep and detailed clinical terminology with a broad scope. However, some groups of users will need additional Concepts, Descriptions or Subsets to support national, local or organizational needs.

The Extension mechanism is a structure that enables authorized organizations to add Concepts, Descriptions, Relationships and Subsets to complement the core content of the SNOMED CT International Release. One example of the Extension mechanism is for extensibility of SNOMED CT for the specialized terminology needs of an organization.

Goals of Extensions are to:

- Provide a structure where these Extensions maintain unique identification across organizations for data transmission and sharing, but share a common structure for ease in application development, and so that subsets can be constructed over a combination of International Release and extension content.
- Define a structure so that it is easy to submit, include, use, and migrate terminology developed as part of an extension into the International Release content.

When content overlaps the scope of SNOMED CT, it should be submitted to your IHTSDO National Release Center for consideration, so that other SNOMED CT users can also take advantage of this work. Using the extension structure can also help organizations transfer responsibility for terminology to the IHTSDO or to another organization, subject to the terms of the Affiliate License.

SNOMED CT applications and services

SNOMED Clinical Terms is a terminological resource that can serve many roles in healthcare software applications. The IHTSDO supplies content that can be loaded into these applications, but it does NOT supply any of the software itself.

User requirements for these software applications will vary according to way in which they are used. Healthcare software applications usually address a particular set of requirements associated with one or more clinical and/or business processes. Detailed requirements for integrating SNOMED CT into a particular application inevitably depend upon intended uses, the perceptions of users and the technical environments in which they are implemented.

The following examples illustrate a few possible types of implementation:

- A SNOMED CT enabled clinical record system incorporating clinical data entry, decision support, links to knowledge bases, sophisticated analysis, order-report message interfaces, support for record communication or sharing, etc.
- A data warehouse storing and analyzing records expressed with SNOMED CT encoded concepts.
- A diagnostic departmental system sending reports that include SNOMED CT encoded concepts to other systems.
- A hand-held data collection device used for input of a limited range of frequently used coded concepts.
- A decision support system using SNOMED CT concepts to represent guidelines and protocols for distribution to other systems.
- A system designed to enable the creation of queries for use in analysis of data held by various other systems, some of which contain SNOMED CT encoded data.
- A coding system mapping SNOMED CT encoded concepts (entered manually or read from an electronic record) to administrative groupings or classifications such as DRGs or ICD10.
- A system designed to support design and/or implementation of messages that convey specified information using a specified set of SNOMED CT concept identifiers.

The *SNOMED CT Technical Implementation Guide* (TIG) provides information and guidance for software professionals responsible for designing, developing and implementing SNOMED CT enabled software applications. The TIG describes the technical requirements and design issues for integrating SNOMED CT into new and existing applications.

Appendix A

Changes and historical notes

Topics:

EPISODICITY no longer modeled in active content

EPISODICITY originated in the National Health Service Clinical Terms Version 3 where it was used not to specify the first episode of a disease for a patient but rather, the first time a patient presented to their general practitioner (GP) for a particular disorder. A first episode of asthma was not intended to represent the first time a patient had asthma, but rather the first time a patient presented to their GP with asthma. EPISODICITY has been removed from existing concepts and is no longer used in pre-coordinated definitions. It can still be used in post-coordination as a qualifier.

ONSET and COURSE retired

In earlier releases, there were two attributes named ONSET and COURSE. These were retired because they could not be used reproducibly. While ONSET was intended to specify the rapidity of onset or the temporal pattern of presentation for a given condition, it was easily confused with the attribute COURSE used to represent the duration of a condition. There was not consistent agreement between observers making this distinction.

Dose form values moved

The concept *Type of drug preparation (product)* 105904009 and its subtypes were moved to the *Qualifier value* hierarchy as of the July 2007 release. *Type of drug preparation (qualifier value)* 105904009 better represents these concepts because they are not products.

Renaming the context/situation hierarchy

The hierarchy named "Situation with explicit context" was called "Context-dependent category" until the July 2006 release. The hierarchy was renamed to better describe the meanings in this hierarchy.

Domain change for measurement/evaluation attributes

In releases prior to July 2009, six attributes were approved for use for measurement procedures only. For the July 2009 release, the domain for these attributes was expanded to Evaluation procedures. See *Measurement procedures and laboratory procedures* on page 83 for a definition and full discussion of evaluation and measurement procedures.

Move of findings to events

In January 2006, a number of concepts from the *Clinical finding* hierarchy were moved to the *Event* hierarchy. The attributes used to define those concepts when they were descendants of *Clinical finding* were retained after the concepts were moved to the *Event* hierarchy. Additional editorial policies for the use of attributes in the *Event* hierarchy have yet to be established.

Appendix B

Miscellaneous Topics

Topics:

Terms Prefaced with Symbols

There are some terms in SNOMED CT that are prefaced with a symbol in square brackets. These concept codes were inherited from CTV3 and were used to facilitate mapping to ICD-10. They have all been retired by moving them to the UK NHS extension, and are not recommended for use in clinical records.

Explanations of these term prefixes are as follows:

[X]	Terms starting with [X] were initially used in the Read codes in the 1995 release, in order to identify ICD-10 terms that were not present in ICD-9.
[D]	Terms starting with [D] are also from CTV3, and identify terms contained in ICD-9 Chapter XVI 'Symptoms signs and ill-defined conditions' and ICD-10 Chapter XVIII 'Symptoms signs and abnormal clinical and laboratory findings, not elsewhere classified'. The [D] meant that in CTV3 the code was intended for use in a diagnosis field in the record, even though the term meaning is not a kind of disease.
[V]	A term starting with [V] identifies concept codes derived from ICD-9 'Supplementary classification of factors influencing health status and contact with health services (V codes)', and ICD-10 Chapter XXI 'Factors influencing health status and contact with health services (Z codes)'.
[M]	A term starting with [M] identifies Morphology of Neoplasm terms present in ICD9 and ICD 10.
[SO]	A term starting with [SO] signifies that the term was contained in OPCS-4 (Office of Population, Censuses and Surveys - Classification of Surgical Operations and Procedures - 4th Revision) Chapter Z subsidiary classification of sites of operation in CTV3.
[Q]	A term starting with [Q] identifies temporary qualifying terms inherited from CTV3.

Negation

Introduction

The meaning of some concept codes in SNOMED CT depends conceptually on negation (e.g. absence of *X*, lack of *X*, unable to do X etc).

Negation and Context

The *Situation with explicit context* hierarchy is intended to manage this kind of semantic situation. The concept model allows a concept code in the *Situation with explicit context* hierarchy to be related to the *Clinical finding* about which context is asserted. For example, *Absence of nausea and vomiting (situation)* is modeled as a *Situation with explicit context* in which the finding of *Nausea and vomiting (disorder)* is absent.

The inclusion of negated meanings introduces complications into query formulation, machine classification, and reasoning tasks. The inclusion of a NOT logical operator into the SNOMED compositional model could simplify modeling of negated meanings. The current release of SNOMED CT does not directly support classification using this operator, but some modeling formalisms in current use today (including database formalisms, Description Logic formalisms) include a NOT operator as a fundamental modeling primitive.

Known Problems with Negation

There is still work to be done in moving all appropriate concept codes to the *Situation with explicit context* hierarchy. In particular, many negated meanings are still represented by concept codes that are under a *Clinical finding* parent. In the July 2008 release, a significant number of subtypes of *Functional finding (finding)* were changed from primitive to sufficiently defined. Sufficiently defining some concept codes in this subhierarchy (e.g. *Unable to stand (finding)*, and *Does not retract tongue (finding)*) resulted in incorrect subsumption related to negation. For example *Does not retract tongue (finding)* autoclassifies as a subtype of *Does not move tongue (finding)*; with correct representation of negation, the subtype relationship would be inverted, so that *Does not move tongue (finding)* would imply *Does not retract tongue (finding)*. While this negated content ultimately needs to be moved to the *Situation with explicit context* hierarchy, the incorrect direction of subsumption relations for negated meanings also occurs in the *Situation with explicit context* hierarchy.

This is a limitation of the classifier currently being used, rather than a fundamental limitation of the concept model. The classifier will currently place concept codes in the wrong subsumption relationship when they are negated. As another example, it will infer that *Adnexal tenderness absent (situation)* IS A *Tenderness absent (situation)* This is an incorrect direction of subsumption and needs to be reversed. To achieve the correct inferences in queries and reasoning systems, *Situation with explicit context* concept codes with a finding context of known absent or subtypes thereof should have their IS A relationships reinterpreted by reversing the *Concept1* and *Concept2* of the IS A relationships. This is a temporary fix, and will be addressed systematically in a future release so that such *ad hoc* solutions will not be necessary.

Measurement procedures and laboratory procedures

Measurements are observations that designate the value of a property, quality or attribute that is inherent in the individual or population (or their specimens, by proxy), according to specified rules. Although measurement is generally considered to be the observation of a quantitative value for a quality or attribute, measurements need not necessarily result in a numeric or ordinal result. In other words, detection (detected/not detected) and identification (selection of one or more possibilities from a specified set by detecting their presence or absence) are considered types of measurement procedures. This is admittedly a broad definition, but does require that measurement procedures be done according to pre-determined rules and that they specify the property, quality or attribute that is being measured. Measurement can definitely be done by physical examination techniques as well as by laboratory techniques, but physical examination by itself is not a kind of measurement. Of course, several of the routine procedures carried out during a physical examination involve measurements of properties such as height, weight, vital signs, range of motion, deep tendon reflexes, etc. However, the interpretation of primary observations as being normal or abnormal is not considered a kind of measurement, since normality is not an inherent property, quality or attribute that can be measured but rather a second-level interpretation of where the primary value lies relative to a range determined externally to the individual.

Structure of the SNOMED Clinical Terms Identifier (SCTID)

SCTID Data Type

The SCTID data type is a 64-bit integer, which is subject to the following constraints:

- Only positive integer values are permitted.
- The minimum permitted value is 100,000 (6 digits)
- The maximum permitted value is 999,999,999,999,999,999 (18-digits).
- As a result of rules for the partition-identifier and check-digit, many integers within this range are not valid SCTIDs.

SCTIDs and Extensions

If the partition-identifier indicates that the SCTID is part of an Extension the next seven-digits (from the right) are a namespace-identifier (see *Figure 9: SCTID Structure for a component in an Extension* on page 84). Namespace-identifiers are allocated to organizations which are authorized to issue Extensions. They enable unique SCTIDs to be issued by many organizations and allow each SCTID to be traced to an authorized originating organization.

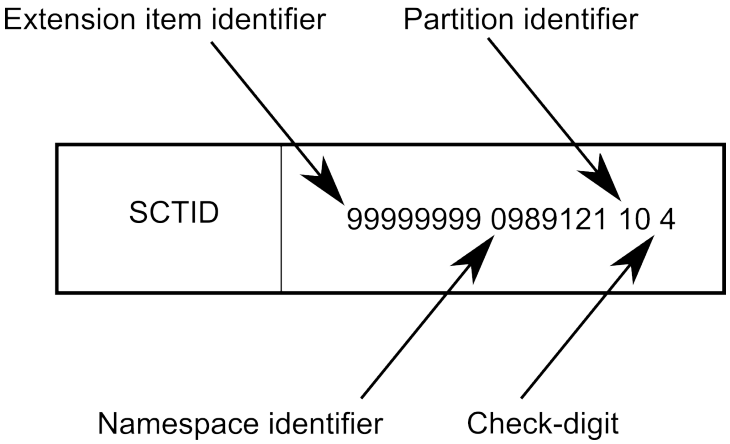


Figure 9: SCTID Structure for a component in an Extension

Appendix C

User Guide Glossary

Topics:

- *RelationshipId*
- *Relationships Table*
- *Release Version*
- *Role*
- *Root Concept*
- *Root Metadata Code*
- *SCT Enabled Application*
- *SNOMED®*
- *SNOMED Clinical Terms*
  SNOMED CT®
- *SNOMED CT Core Tables*
- *SNOMED CT Identifier (SCTID)*
- *Sufficiently defined*
- *Subset*
- *Synonym*
- *Top-Level Concept Code*
- *Top-Level Metadata Code*

Attribute

An attribute is a code that represents a type of relationship used to express characteristics of code meanings. Concept codes have relationships to other concept codes through attributes.

Example: FINDING SITE

All of the attributes used in modeling concept meanings are themselves concept codes and can be found in the *Linkage concept* hierarchy.

Attribute-value pair

An attribute-value pair is made up of two concept codes, the combination of an attribute code with a value code that is appropriate for that attribute.

Example: FINDING SITE = *Lung structure*

Browser

A browser is a computer application or tool used for exploring and searching the terminology content. A browser can display hierarchy sections and concept code details (relationships between concept codes, descriptions, identifiers, and other components).

Check-digit

The check-digit is the final (rightmost) digit of the SNOMED CT Identifier (SCTID). It can be used to check the validity of SCTIDs. Clinical information systems can use the check-digit to identify SNOMED CT codes that have been entered incorrectly (typo errors, etc). It is calculated using the algorithm described in *Technical Reference Guide, Check-digit Calculation*.

Component

Refers to any item identified by an SCTID in the main body of SNOMED CT, or in an authorized Extension. The partition identifier indicates the type of component referred to by that SCTID. Each Component is a uniquely identifiable instance of one of the following:

- Concept
- Description
- Relationship
- Subset
- Subset Member
- Cross Map Set
- Cross Map Target
- History Component

Concept

An ambiguous term. Depending on the context, it may refer to:

- A clinical idea to which a unique ConceptId has been assigned.
- The ConceptId itself, which is the key of the Concepts Table (in this case it is less ambiguous to use the term "concept code").
- The real-world referent(s) of the ConceptId, that is, the class of entities in reality which the ConceptId represents (in this case it is less ambiguous to use the term "meaning" or "code meaning").

Concept equivalence

Equivalence is the state of two SNOMED CT concept codes or post-coordinated expressions having the same meaning. Concept equivalence can occur when a post-coordinated expression has the same meaning as a pre-coordinated concept code; or when two different post-coordinated expressions have the same meaning.

ConceptId

A SNOMED Clinical Terms Identifier (code) that uniquely identifies a Concept (meaning). For a full explanation of how this identifier is structured, see *Technical Reference Guide, SCTID*. ***Example:*** For the meaning named *Pneumonia (disorder)*, the ConceptId is 233604007.

Concepts Table

A table that includes all SNOMED CT concept codes. Each concept code is represented by a single row. For the structure of the table see *Technical Reference Guide, Concepts Table*.

Core

"Core" is a term that can have different meanings depending on context. A "core component" is a SNOMED CT Component released by the IHTSDO, and the "core namespace" is the namespace used for SCTIDs released by the IHTSDO. It is policy that all core components have SCTIDs from the core namespace.

See *SNOMED CT Core Tables* on page 94.

Cross Map

A Cross Map is a reference from a Concept code to a Cross Map Target. Each Cross Map is represented as a row in the Cross Maps Table. It links a single SNOMED CT concept code to one or more codes in a target classification (such as ICD-9-CM) or terminology. A Concept code may have a single Cross Map or a set of alternative Cross Maps.

CTV3ID

A five-character code allocated to a meaning or term in Clinical Terms Version 3 (CTV3, previously known as Read Codes). Each row in the SNOMED CT concepts table has a field for the corresponding concept code from CTV3.

Description

A human-readable phrase or name (Term) associated with a particular SNOMED CT concept code. Each of the descriptions in SNOMED CT is given a separate row in the Descriptions Table. Each Description is assigned a unique DescriptionId and connects a Term and a Concept.

DescriptionId

A SNOMED CT Identifier that uniquely identifies a Description. For a full explanation of how this identifier is structured, see *Technical Reference Guide, SCTID*.

Descriptions Table

A data table consisting of rows, each of which represents a Description. For the structure of the table see *Technical Reference Guide, Descriptions Table*.

Dialect

A language modified by the vocabulary and grammatical conventions applied to the language of a particular geographical or cultural environment.

Extension

A data table or set of data tables that is created in accordance with the structures and authoring guidelines applicable to SNOMED CT. An extension is ordinarily edited, maintained and distributed by an organization other than the IHTSDO. Components in extensions are identified using extension SCTIDs, which are structured to ensure that they do not collide with other SCTIDs, and can be traced to an authorized originator.

Fully defined

See *Sufficiently defined* on page 94.

Fully Specified Name

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.

Hierarchy

An ordered organization of concept codes linked together through IS A relationships. Concept codes linked to their more general parent concept codes directly above them in a hierarchy. Concept codes with more general meanings are usually presented as being at the top of the hierarchy, and then at each level down the hierarchy, code meanings become increasingly more specific or specialized. Formally, a hierarchy is represented as a directed acyclic graph.

History Mechanism

The history mechanism is the information distributed with SNOMED CT designed to track the history of changes to its logic definitions and descriptions. The history mechanism is supported by two distribution tables:

- Component History Table
- References Table

International Release

The collection of terminology components, related works and resources that are maintained by the IHTSDO and are regularly made available to all Member countries.

Language

For purposes of SNOMED CT translations, a language is a vocabulary and grammatical form that has been allocated an ISO639-1 language code. See also *Dialect* on page 89.

Language Subset

SNOMED CT can be translated into virtually any human language or dialect. These translations attach new language-specific terms as descriptions of existing concept codes and may also use existing descriptions if translation is not necessary. A language subset is a set of references to the descriptions that are members of a language edition of SNOMED CT. Additionally, data in the language subset specifies the DescriptionType of each description (Fully Specified Name, Preferred Term or Synonym).

Mapping Mechanism

A set of data structures for representing cross-links to other terminologies and classifications. The Mapping Mechanism data structures are distributed as three tables:

- Cross Map Sets Table
- Cross Maps Table
- Cross Map Targets Table

Modeler

A person who directly edits the logic definitions and other structures of the terminology. Also sometimes called Clinical Editor or Terminology Manager.

Modeling

The process of editing logic definitions to reflect the meaning intended by the fully specified name.

Namespace/Namespace Identifier

A Namespace is a virtual block of identifiers allocated for creating Extensions to SNOMED CT. The Namespace Identifier is a seven digit number that identifies the Namespace and is used as part of each Extension SCTID. See *Technical Reference Guide, Extensions*. When an organization creates an extension to SNOMED CT, the new components in the extension need to be identified as part of that particular organization's extension. IHTSDO allocates a Namespace Identifier to the organization which then uses it to form its Extension SCTIDs. Most SCTID's issued by IHTSDO for the International Release are from the core namespace, as determined by the partition identifier portion of the SCTID, and do not use a Namespace identifier.

Partition identifier

A pair of digits that indicate whether an SCTID identifies a Concept, Description, Relationship, Subset, History, or Extension component. The partition-identifier consists of the second and third digits from the right of the SCTID. See *Technical Reference Guide, Partition Identifier*.

Post-coordination

Representation of a clinical meaning using a combination of two or more concept identifiers is referred to as a post-coordination. Some clinical meanings may be represented in several different ways. SNOMED CT technical specifications include guidance for transforming logical expressions to a common canonical form.

Example: SNOMED CT includes the following concepts:

Fracture of bone (conceptId=125605004)
FINDING SITE (conceptId= 363698007)
Bone structure of femur (conceptId= 181255000)

SNOMED CT also includes a pre-coordinated concept for this disorder: Fracture of femur (conceptId= 71620000)

It is possible to represent "fracture of femur" in different ways:

71620000 (pre-coordinated expression)
and
125605004 : 363698007 = 181255000 (post-coordinated expression)

Pre-coordination

Pre-coordination refers to an approach to representing a meaning that relies on a single concept code that is created and distributed prior to incorporation into a data recording system. Often this means that the code is included in the International Release by IHTSDO, but other organizations can also create pre-coordinated codes. Including commonly used concept meanings as pre-coordinated codes can make the terminology easier to use. SNOMED CT also allows the use of post-coordinated expressions to represent a meaning by using a combination of two or more concept identifiers. For examples see *Post-coordination* on page 91.

Primitive

An expression, which may be just a single concept code, is primitive when its logic definition does not sufficiently express its meaning so that its subtypes can be computably recognized. A concept code's logic definition is made up of its defining relationships to other concept codes, via attributes and IS A relationships. Primitive concept codes also do not have the defining relationships that would be needed to computably distinguish them from their parent or sibling concepts. For example, if the Concept “Red sports car” is defined as [is a=car] + [color=red] this is Primitive but the same definition applied to the Concept “Red car” is sufficiently defined.

Qualifying characteristic

An attribute-value relationship associated with a concept code to indicate to users that it may be applied to refine the meaning of the code. The set of qualifying relationships provide syntactically correct values that can be presented to a user for post-coordination. Example: “‘Revision status’ = ‘First revision’” is a possible qualifying characteristic of ‘Hip replacement’. A qualifying characteristic is contrasted with a defining characteristic. It is referred to in CTV3 as a ‘Qualifier’.

Realm

A sphere of authority, expertise, or preference that influences the range of Components required, or the frequency with which they are used. A Realm may be a nation, an organization, a professional discipline, a specialty, or an individual user.

Relationship

An association between two Concepts (each identified by a ConceptId). The nature of the association is indicated by a RelationshipType. Each Relationship is represented by a row in the Relationships Table.

Relationship Type

The nature of a Relationship between two Concepts. Relationship Types are represented in SNOMED CT by Concept codes. In the Relationships Table, the RelationshipType field contains the ConceptId for the concept in SNOMED that forms the relationship between two other concepts (ConceptID1 and ConceptID2). For defining and qualifying relationships, the Relationship Type is an Attribute code. RelationshipType should not be confused with CharacteristicType. See *Technical Reference Guide, Characteristic Type*.

RelationshipId

A SNOMED CT Identifier that uniquely identifies a Relationship. RelationshipID is the key of the Relationships Table. Each row in the Relationships Table represents a relationship triplet (ConceptID1 RelationshipType - ConceptID2).

Relationships Table

A data table consisting of rows, each of which represents a Relationship.

Release Version

An identifiable set of SNOMED CT tables distributed on or after a particular date for use in SCT Enabled Applications. Each Release Version is referred to by the ISO format date of which this set of files was distributed (or was scheduled for distribution). Thus release version "20030131" refers to the version released on January 31, 2003.

Role

Another name for Attribute.

Root Concept

The single concept code that is at the top of the SNOMED CT Concepts hierarchy.

Root Metadata Code

The single concept code that is at the top of the Metadata Concepts hierarchy.

SCT Enabled Application

A software application designed to support the use of SNOMED CT.

SNOMED®

An acronym for the **S**ystematized **No**menclature of **Med**icine originally developed by the College of American Pathologists.

SNOMED Clinical Terms SNOMED CT®

The clinical terminology maintained and distributed by the IHTSDO, created as a result of the merger of SNOMED RT and Clinical Terms Version 3.

SNOMED CT Core Tables

Refers to the SNOMED CT Concept, Relationship and Description Tables.

SNOMED CT Identifier (SCTID)

A unique integer identifier applied to each SNOMED CT component (Concept, Description, Relationship, Subset, etc.). The SCTID can include an item identifier, namespace identifier, a check-digit and a partition identifier. It does not always include a namespace identifier. See *Technical Reference Guide, SCTID*.

Sufficiently defined

A concept is sufficiently defined if its logic definition is sufficient to computably recognize (automatically subsume) all its subtypes. The logic definition must also differentiate the concept from its immediate supertype(s). A concept which is not sufficiently defined is primitive. For example, if the concept “Red car” is defined as [is a=car] and [color=red] it is sufficiently defined but the same definition applied to the Concept “Red sports car” is primitive.

Subset

A group of Components (e.g. Concepts, Descriptions or Relationships) that share a specified common characteristic or common type of characteristic. Subsets represent information that affects the way the Components are displayed or otherwise accessible within a particular realm, specialty, application or context.

Synonym

A Term that is an acceptable alternative to the Preferred Term as a way of expressing a Concept. Synonyms allow representations of the various ways a concept may be described. Synonyms and Preferred Terms (unlike FSNs) are not necessarily unique. More than one concept might share the same Preferred term or Synonym.

Top-Level Concept Code

A Concept Code that is directly related to the Root Concept Code by a single Relationship of the Relationship Type "IS A". All Concept Codes (except for metadata concepts) are descended from at least one Top-Level Concept Code via at least one series of Relationships of the Relationship Type "IS A".

Top-Level Metadata Code

A Concept Code that is directly related to the Root Metadata Code by a single Relationship of the Relationship Type "IS A". All Metadata Concept Codes are descended from at least one Top-Level Metadata Concept Code via at least one series of Relationships of the Relationship Type "IS A".

Appendix D

Guiding Principles, Development Process, and Acknowledgements

Topics:

SNOMED CT®: A Comprehensive Terminology for Health Care

In 1999, the College of American Pathologists (CAP) and the U.K. formed a strategic alliance to create a convergence of SNOMED® Reference Terminology (SNOMED RT) and Clinical Terms Version 3 (CTV3). The resulting work, SNOMED Clinical Terms® (SNOMED CT®) combines the robust strength of SNOMED RT in the basic sciences, laboratory and specialty medicine with the highly granular primary care content of CTV3 (formerly known as the Read Codes). The result is a comprehensive and precise clinical reference terminology that provides unsurpassed clinical content and expressivity for clinical documentation and reporting. SNOMED terminology enables clinicians, researchers and patients to share comparable data worldwide, across medical specialties and sites of care.

SNOMED CT was founded on four basic principles that have guided development activities related to the distribution table structure and clinical content, and will continue to guide the future directions of SNOMED.

These guiding principles are:

1. Development efforts must encompass broad, inclusive involvement of diverse clinical groups and medical informatics experts.
2. The clinical content must be quality focused and adhere to strict editorial policies.
3. The quality improvement process must be open to public scrutiny and vendor input, to ensure that the terminology is truly useful within healthcare applications.
4. There must be minimal barriers to adoption and use.

The design of SNOMED CT has been driven by the expressed needs of software developers for features that improve their ability to develop useful applications. In response to these needs, the design adds unique numeric identifiers, includes links to legacy codes, supports a sustainable migration and maintenance strategy, permits adaptability for national purposes, and fosters alignment with other terminologies and standards such as HL7, LOINC, and DICOM.

We believe SNOMED CT delivers on a promise of standardized quality clinical terminology that is required for effective collection of clinical data, its retrieval, aggregation and re-use as well as the sharing, linking and exchanging of medical information.

The SNOMED CT distribution structure (Release Format 1 or RF1) has been balloted and approved as an ANSI standard.

SNOMED CT Quality Development Process

The SNOMED CT development process incorporates the efforts of a team of internal and external modelers. A documented scientific process is followed which focuses on understandability, reproducibility and usefulness. Content is defined and reviewed by multiple clinician editors. Conflicts between editors are resolved through an iterative process, based on achieving agreement and consensus, before being entered into the terminology. As necessary, additional experts are consulted to review the scientific integrity of the content.

The integration of SNOMED RT and Clinical Terms Version 3 to create the first release, was a three year process that involved several stages of review and quality assurance:

- Description mapping: NHS editors evaluated each SNOMED concept and term and mapped it to the Clinical Terms Version 3 terminology; SNOMED editors performed the same task mapping primarily disorders and procedures from Clinical Terms Version 3 to SNOMED RT.
- Description mapping conflict resolution: Mapping discrepancies that occurred between NHS and SNOMED editors underwent a conflict resolution process to definitively place each concept within the merged hierarchy.
- Auto-classification: The merged database following description mapping conflict resolution underwent a series of quality control checks including auto-classification to identify and eliminate cycle errors (e.g. concept A “is-a” B and concept B “is-a” A) and equivalency errors (e.g. where two defined concepts have the exact same definition).
- Hierarchy review: The reviewed database has undergone auto-classification and further review of inferred hierarchies.
- Ongoing refinement: The quality control process is continuously supplemented by feedback from users involved in adoption of SNOMED Clinical Terms.

Extent of Review

The quality processes used in the development of SNOMED CT were complemented with external review.

- Technical review: The technical specifications for SNOMED CT were published for comment on both the SNOMED and NHS websites.
- Alpha test review: Forty-two organizations in six countries tested the SNOMED CT alpha test file and completed a structured assessment instrument.
- Alpha test feedback: Debriefing sessions were conducted in the U.S., in the U.K. and in Australia, at which time test sites shared their positive experiences and recommendations for improvement.
- Peer review: The methods used in developing SNOMED CT were presented in 6 scientific papers at the 2001 American Medical Informatics Association (AMIA) meeting, the largest association of leaders in medical informatics in the world. SNOMED CT was also part of an additional three papers and six posters at the 2002 AMIA meeting and additional posters for AMIA 2003 and 2004.

SNOMED CT was also the subject of papers in the American Health Information Management Association (AHIMA) Journal in 2001-2003, posters at 2001 and 2002 annual meetings and presentations at the 2003 and 2004 annual meetings. In addition, AHIMA introduced an education program “Introduction to Clinical Terminology” in 2004 with a SNOMED CT component.

Early adopters of SNOMED RT (a structure that mirrored SNOMED CT core tables) were debriefed on their implementation experience in order to identify the key issues to be addressed in the *SNOMED CT Technical Implementation Guide*.

Continuous Quality Improvement

Continuous improvement is our aim: Updating the breadth and scope of the content to reflect changes in clinical care and advances in medical science; refining the content to deliver greater precision for data collection, retrieval and aggregation; and enhancing the functionality to serve our users better.

Acknowledgements of Contributors to SNOMED CT®

SNOMED CT was originally created by the College of American Pathologists.

SNOMED CT has been created by combining SNOMED RT and a computer based nomenclature and classification known as Clinical Terms Version 3, formerly known as the Read Codes Version 3, which was created on behalf of the U.K. Department of Health and is Crown copyright.

The IHTSDO also acknowledges the contributions of:

- The American Academy of Ophthalmology, for the ophthalmology-related portions of this work.
- SNODENT®: the Systematized Nomenclature of Dentistry, copyright 1998, American Dental Association. Used with permission.
- SNOVET®: the Systematized Nomenclature of Veterinary Medicine, copyright 1982, 1993, American Veterinary Medical Association. Used with permission.
- LOINC®: the Logical Observation Identifier Names and Codes, copyright 1995-2008, Regenstrief Institute LOINC Committee. All rights reserved.
- NANDA®: North American Nursing Diagnosis Association Taxonomy II, copyright 2005- 2008, NANDA International. All rights reserved.
- The Perioperative Nursing Data Set® (PNDS), copyright 2002, AORN, Inc. All rights reserved.
- The Omaha System, copyright 1992, Martin and Associates. Used with permission.
- The Clinical Care Classification, copyright 2004, V.K. Saba. Used with permission.
- The Nursing Interventions Classification (NIC), copyright 2004, Mosby, Inc., and the Center for Nursing Classification and Clinical Effectiveness at the University of Iowa College of Nursing. Used with permission.
- The Nursing Outcomes Classification (NOC), copyright 2004, Mosby, Inc., and the Center for Nursing Classification and Clinical Effectiveness at the University of Iowa College of Nursing. Used with permission.
- This work contains material from the AJCC Cancer Staging Manual, Sixth Edition (2002) published by Springer-Verlag New York. Used with permission of the American Joint Committee on Cancer (AJCC), Chicago, Illinois.
- The Anesthesia Patient Safety Foundation's (APSF) Data Dictionary Task Force. Some material contributed. Copyright 2003, APSF, Inc. Used by permission of the APSF.
- This work contains terms from the British Association of Dermatology (BAD), and is used by permission of BAD. Crown Copyright 2003 British Association of Dermatologists.
- This work contains terms from The Royal College of Anaesthetists (RCoA), and is used by permission of RCoA. Crown Copyright 2003 The Royal College of Anaesthetists.
- This work contains terms from the Authorized Osteopathic Thesaurus, and is used by permission of the American Association of Colleges of Osteopathic Medicine and the American Osteopathic Association.