

6. SNOMED CT Concept Model

This section provides an overview of:

- Concept Model – Top Level Hierarchies
- Concept Model Attributes – Representing Characteristics of a Concept

Why is this important?

The SNOMED CT concept model specifies the way in which SNOMED CT concepts are defined using a combination of formal logic and editorial rules. Concept model rules specify the top level concepts under which concepts are arranged in the subtype hierarchy and the types of relationships that are permitted between concepts in particular branches of the hierarchy.

What is this?

Concept Model – Top Level Hierarchies

The top of the SNOMED CT hierarchy is occupied by the root concept (`|SNOMED CT concept|`). All concepts are descended from this root concept through at least one sequence of `|is a|` relationships. This means that the root concept is a supertype of all other concepts and all other concepts are subtypes of the root concept.

The direct subtypes of the root concept are referred to as 'Top Level Concepts'. These concepts are used to name the main branches of the hierarchy. Each of these Top Level Concepts, together with their many subtype descendants, forms a major branch of the SNOMED CT hierarchy and contains similar types of concepts. As the hierarchies descend (that is, more `|is a|` relationships are added below the Top Level Concepts) the concepts within them become increasingly specific.

Below is a list of the Top Level Concepts with a brief description of the content represented in their branch of the hierarchy.

- **Clinical finding** represents the result of a clinical observation, assessment or judgment and includes normal and abnormal clinical states (e.g. `|asthma|`, `|headache|`, `|normal breath sounds|`). The `|clinical finding|` hierarchy includes concepts used to represent diagnoses.
- **Procedure** represents activities performed in the provision of health care. This includes not only invasive procedures but also administration of medicines, imaging, education, therapies and administrative procedures (e.g. `|appendectomy|`, `|physiotherapy|`, `|subcutaneous injection|`).
- **Situation with explicit context** represents concepts in which the clinical context is specified as part of the definition of the concept itself. These include presence or absence of a condition, whether a clinical finding is current, in the past or relates to someone other than the subject of the record (e.g. `|endoscopy arranged|`, `|past history of myocardial infarction|`, `|family history of glaucoma|`).
- **Observable entity** represents a question or assessment which can produce an answer or result (e.g. `|systolic blood pressure|`, `|color of iris|`, `|gender|`).
- **Body structure** represents normal and abnormal anatomical structures (e.g. `|mitral valve structure|`, `|adenosarcoma|`).
- **Organism** represents organisms of significance in human and animal medicine (e.g. `|streptococcus pyogenes|`, `|beagle|`, `|texon cattle breed|`).
- **Substance** represents general substances, the chemical constituents of pharmaceutical/biological products, body substances, dietary substances and diagnostic substances (e.g. `|methane|`, `|insulin|`, `|albumin|`).
- **Pharmaceutical/biologic product** represents drug products (e.g. `|amoxicillin 250mg capsule|`, `|paracetamol + codeine tablet|`).
- **Specimen** represents entities that are obtained (usually from the patient) for examination or analysis (e.g. `|urine specimen|`, `|prostate needle biopsy specimen|`).
- **Special concept** represents concepts that do not play a part in the formal logic of the concept model of the terminology, but which may be useful for specific use cases (e.g. `|navigational concept|`, `|alternative medicine poisoning|`).
- **Physical object** represents natural and man-made physical objects (e.g. `|vena cava filter|`, `|implant device|`, `|automobile|`).
- **Physical force** represents physical forces that can play a role as mechanisms of injury (e.g. `|friction|`, `|radiation|`, `|alternating current|`).
- **Event** represents occurrences excluding procedures and interventions (e.g. `|flood|`, `|earthquake|`).
- **Environments and geographical locations** represents types of environments as well as named locations such as countries, states and regions (e.g. `|intensive care unit|`, `|academic medical center|`, `|Denmark|`).
- **Social context** represents social conditions and circumstances significant to health care (e.g. `|occupation|`, `|spiritual or religious belief|`).
- **Staging and scales** represents assessment scales and tumor staging systems (e.g. `|Glasgow Coma Scale|`, `|FIGO staging system of gynecological malignancy|`).
- **Qualifier value** represents the values for some SNOMED CT attributes, where those values are not subtypes of other top level concepts. (e.g. `|left|`, `|abnormal result|`, `|severe|`).
- **Record artefact** represents content created for the purpose of providing other people with information about record events or states of affairs. (e.g. `|patient held record|`, `|record entry|`, `|family history section|`).
- **SNOMED CT Model Component** contains technical metadata supporting the SNOMED CT release.

Concept Model Attributes – Representing Characteristics of a Concept

SNOMED CT attributes (or relationship types) are used to represent a characteristic of the meaning of a concept. SNOMED CT currently uses more than fifty defining attributes when defining the meaning of concepts. Each SNOMED CT attribute can be applied to concepts in one or more branches of the hierarchy. The set of concepts to which an attribute can be applied is called the 'domain' of the attribute. The permitted set of values for each attribute is called the 'range' of the attribute.

Domain

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

For example:

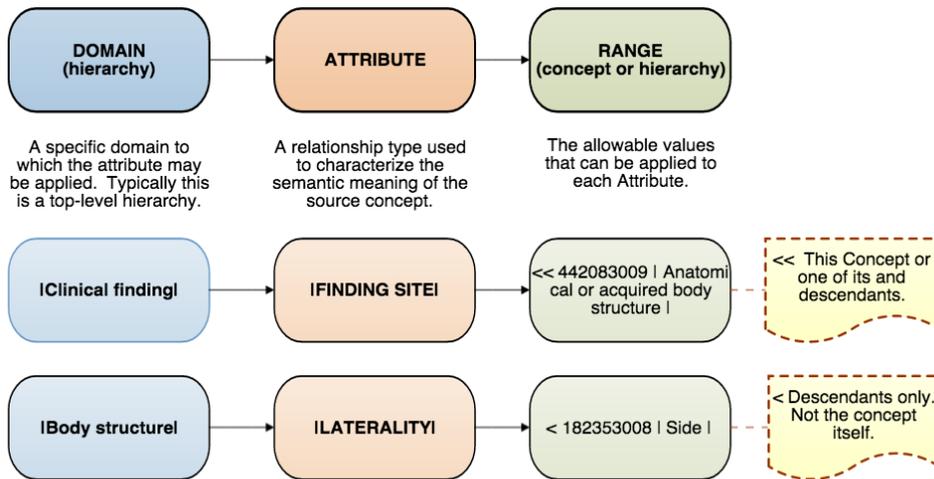
The domain of the attribute `|associated morphology|` is the `|clinical finding|` hierarchy. Therefore, a `|procedure|` cannot have an `|associated morphology|`. However, a `|procedure|` can have a `|procedure morphology|`.

Range

The *range* is the set of SNOMED CT concepts that are allowed as the value of a specified attribute.

For example:

The range for the attribute `|associated morphology|` is the concept `|morphologically abnormal structure|` and its subtype descendants. The range for the attribute `|finding site|` is `|anatomical or acquired body structure|` and its subtype descendants in the `|body structure|` hierarchy.



Examples of the domain and range specified for the attributes `|finding site|` and `|laterality|`

Some SNOMED CT attributes (or relationship types) have a hierarchical relationship to one another. The hierarchy formed from such relationships is known as an 'attribute hierarchy'. In an attribute hierarchy, one general attribute is the parent of one or more specific subtypes of that attribute. Subtypes of a concept defined using the more general attribute can be defined using a more specific subtype of that attribute. For example, `|after|`, `|causative agent|` and `|due to|` are subtypes of `|associated with|`, because they have a more specific meaning.

Attributes Used to Define SNOMED CT Concepts

The SNOMED CT defining attributes are used to represent the meaning of concepts in these 9 hierarchies:

- Clinical finding concepts
- Procedure concepts
- Evaluation procedure concepts
- Specimen concepts
- Body structure concepts
- Pharmaceutical/biologic product concepts
- Situation with explicit context concepts
- Event concepts
- Physical object concepts

Attributes Used to Define Clinical Finding Concepts

Below is a list of attributes used to define `|clinical finding|` concepts, and a brief description of their meaning:

|Finding site| specifies the body site affected by a condition.

|Associated morphology| specifies the morphologic changes seen at the tissue or cellular level that are characteristic features of a disease.

|Associated with| represents a clinically relevant association between concepts without either asserting or excluding a causal or sequential relationship between the two.

|After| represents a sequence of events where a clinical finding occurs after another `|clinical finding|` or a `|procedure|`.

|Due to| relates a `|clinical finding|` directly to a cause such as another `|clinical finding|` or a `|procedure|`.

|Causative agent| identifies the direct causative agent of a disease such as an `|organism|`, `|substance|` or `|physical force|`. (Note: This attribute is not used for vectors, such as mosquitos transmitting malaria).

|Severity| used to sub-class a `|clinical finding|` concept according to its relative severity.

|Clinical course| represents both the onset and course of a disease.

|Episodicity| represents episodes of care provided by a physician or other care provider, such as a general practitioner. This attribute is not used to represent episodes of disease experienced by the patient.

|Interprets| refers to the entity being evaluated or interpreted, when an evaluation, interpretation or judgment is intrinsic to the meaning of a concept.

|Has interpretation|, when grouped with the attribute `|interprets|`, designates the judgment aspect being evaluated or interpreted for a concept (e.g. presence, absence etc.)

|Pathological process| 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.

|Has definitional manifestation| links disorders to the manifestations (observations) that define them.

|Occurrence| refers to a specific period of life during which a condition first presents.

|Finding method| specifies the means by which a clinical finding was determined. This attribute is frequently used in conjunction with `|finding informer|`.

|Finding informer| specifies the person (by role) or other entity (e.g. a monitoring device) from which the clinical finding information was obtained. This attribute is frequently used in conjunction with `|finding method|`.

Attributes Used to Define Procedure Concepts

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

|Procedure morphology| specifies the morphology or abnormal structure involved in a procedure.

|Method| represents the action being performed to accomplish the procedure. It does not include the surgical approach, equipment or physical forces.

|Procedure device| describes the devices associated with a procedure.

|Access| describes the route used to access the site of the procedure.

|Direct substance| describes the `|substance|` or `|pharmaceutical / biologic product|` on which the procedure's method directly acts.

|Priority| refers to the priority assigned to a procedure.

|Has focus| specifies the `|clinical finding|` or `|procedure|` which is the focus of a procedure.

|Has intent| specifies the intent of a procedure.

|Recipient category| specifies the type of individual or group upon which the action of the procedure is performed.

|Revision status| specifies whether a procedure is primary or a revision.

|Route of administration| represents the route by which a procedure introduces a given substance into the body.

|Surgical approach| specifies the directional, relational or spatial access to the site of a surgical procedure.

|Using substance| 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.

|Using energy| describes the energy used to execute an action.

Attributes Used to Define Evaluation Procedure Concepts

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

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

Time aspect specifies temporal relationships for a measurement procedure.

Property specifies the kind of property being measured.

Scale type refers to the scale of the result of an observation of a diagnostic test.

Measurement method specifies the method by which a procedure is performed.

Attributes Used to Define Specimen Concepts

Specimen procedure identifies the procedure by which a specimen is obtained.

Specimen source topography specifies the body site from which a specimen is obtained.

Specimen source morphology specifies the morphologic abnormality from which a specimen is obtained.

Specimen substance specifies the type of substance of which a specimen is comprised.

Specimen source identity specifies the type of individual, group or physical location from which a specimen is collected.

Attributes Used to Define Body Structure Concepts

Laterality 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.

Attributes Used to Define Pharmaceutical/biologic Product Concepts

Has active ingredient indicates the active ingredient of a drug product, linking the |pharmaceutical / biologic product| hierarchy to the |substance| hierarchy.

Has dose form specifies the dose form of a product.

Attributes Used to Define Situation With Explicit Context Concepts

Associated finding links concepts in the |situation with explicit context| hierarchy to their related |clinical finding|.

Finding context represents a situation in which a |clinical finding| is known, or unknown, and if known, whether it is present, absent or uncertain (possible), and to also express the meaning that the finding is not actual but is instead an anticipated or possible future finding.

Associated procedure links concepts in the |situation with explicit context| hierarchy to concepts in the |procedure| hierarchy for which there is additional specified context.

Procedure context 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.

Temporal context indicates the time of the occurrence of the situation, by indicating whether the associated procedure or finding is actual and therefore occurred in the present, in the past, or at a specified time; or that it is planned or expected in the future.

Subject relationship context specifies the subject of the |clinical finding| or |procedure| being recorded, in relation to the subject of the record.

Attributes Used to Define Event Concepts

Associated with represents a clinically relevant association between concepts without either asserting or excluding a causal or sequential relationship between the two.

Occurrence refers to the specific period of life during which a condition first presents.

Attributes Used to Define Physical Object Concepts

|has active ingredient| indicates the active ingredient of a drug product, linking the |pharmaceutical / biologic product| hierarchy to the |substance| hierarchy.