

INTRODUCTION TO SNOMED CT

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Source SNOMED CT Starter Guide
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SNOMED CT COMPONENTS

SNOMED CT is a core clinical healthcare terminology that contains concepts with unique meanings and formal logic based definitions organized into hierarchies.

SNOMED CT content is represented using three types of components:

- Concepts representing clinical thoughts and phrases that are organized into hierarchies.
- Descriptions which link appropriate human readable terms to concepts.
- Relationships which link each concept to other related concepts.

CONCEPTS

- SNOMED CT concepts represent clinical thoughts and phrases.
- Every concept has a unique numeric concept identifier.
- Within each hierarchy, concepts are organized from the general to the more detailed. This allows detailed clinical data to be recorded and later accessed or aggregated at a more general level.

DESCRIPTIONS

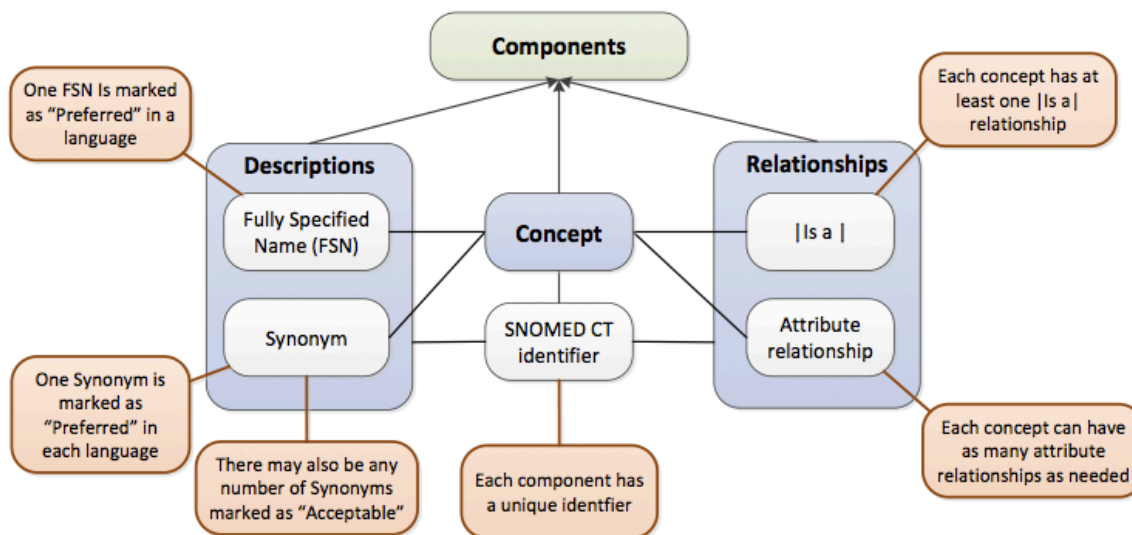
- SNOMED CT descriptions link appropriate human readable terms to concepts.
- Two types of description that are used to represent every concept - Fully Specified Name (FSN) and Synonym.
- A concept can have several associated descriptions, each representing a synonym that describes the same clinical concept.

RELATIONSHIPS

- SNOMED CT relationships link each concept to other concepts that have a related meaning.
- These relationships provide formal definitions and other characteristics of the concept.
- One type of link is the |is a| relationship which relates a concept to more general concepts. These |is a| relationships define the hierarchy of SNOMED CT concepts.



SNOMED CT COMPONENTS



FSN - FULLY SPECIFIED NAME

The FSN or Fully Specified Name represents a unique, unambiguous description of a concept to convey its meaning, and is not intended to be displayed in clinical records, but to disambiguate the different concepts which may be referred to by the same commonly used word or phrase. A concept can have only one FSN in each language or dialect.

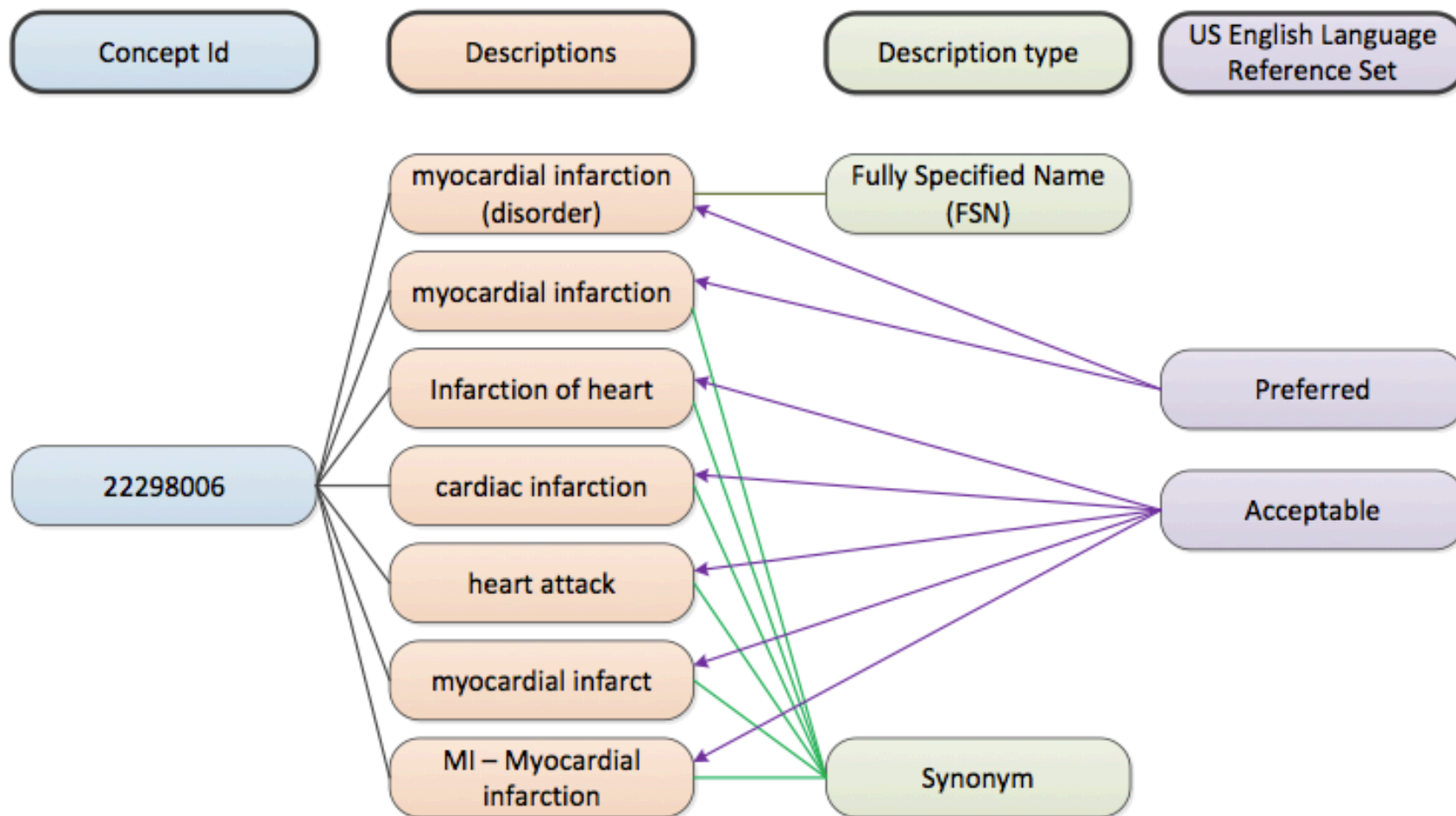
SYNONYMS

A concept may have several synonyms and this allows users of SNOMED CT to apply the terms they prefer to use for a specific clinical meaning.

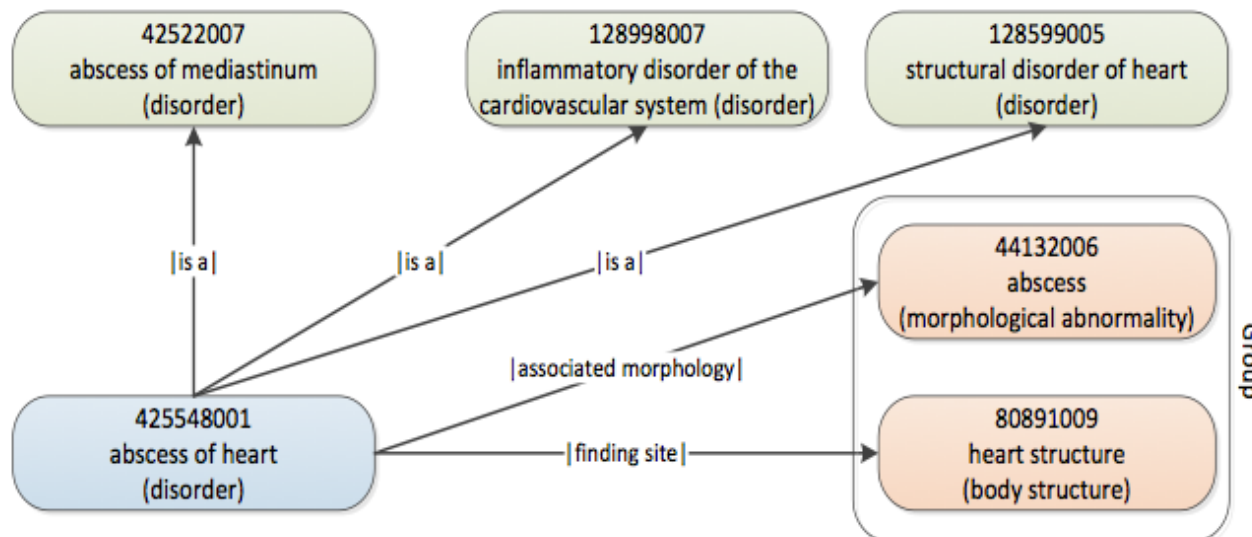
Concepts can have multiple synonyms and the synonyms are not necessarily unique – thus two concepts can have the same synonym. Therefore, interpretation of a synonym may depend on recording the concept identifier, which provides on context of use, as unlike the FSN, it does not represent a unique description of a concept.

Each concept has one synonym which is marked as 'Preferred' in a given language, dialect on context of use. This is known as the 'preferred term' and is a word or phrase commonly used by clinicians to name that concept. In each language, dialect or context of use one and only one synonym can be marked as 'Preferred'.





RELATIONSHIPS



SUBTYPE RELATIONSHIPS

Subtype relationships are the most widely used defining relationships.

They are represented by the relationship type `|is a|` and are also known as `|is a|` relationships.

Almost every active SNOMED CT concept is the source of at least one `|is a|` relationship. The only exception is the root concept `|SNOMED CT Concept|` which is the most general concept.

The `|is a|` relationship states that the source concept is a subtype of the destination concept.

Because this relationship is directional and symmetrical this also means that the destination is a supertype of source concept.

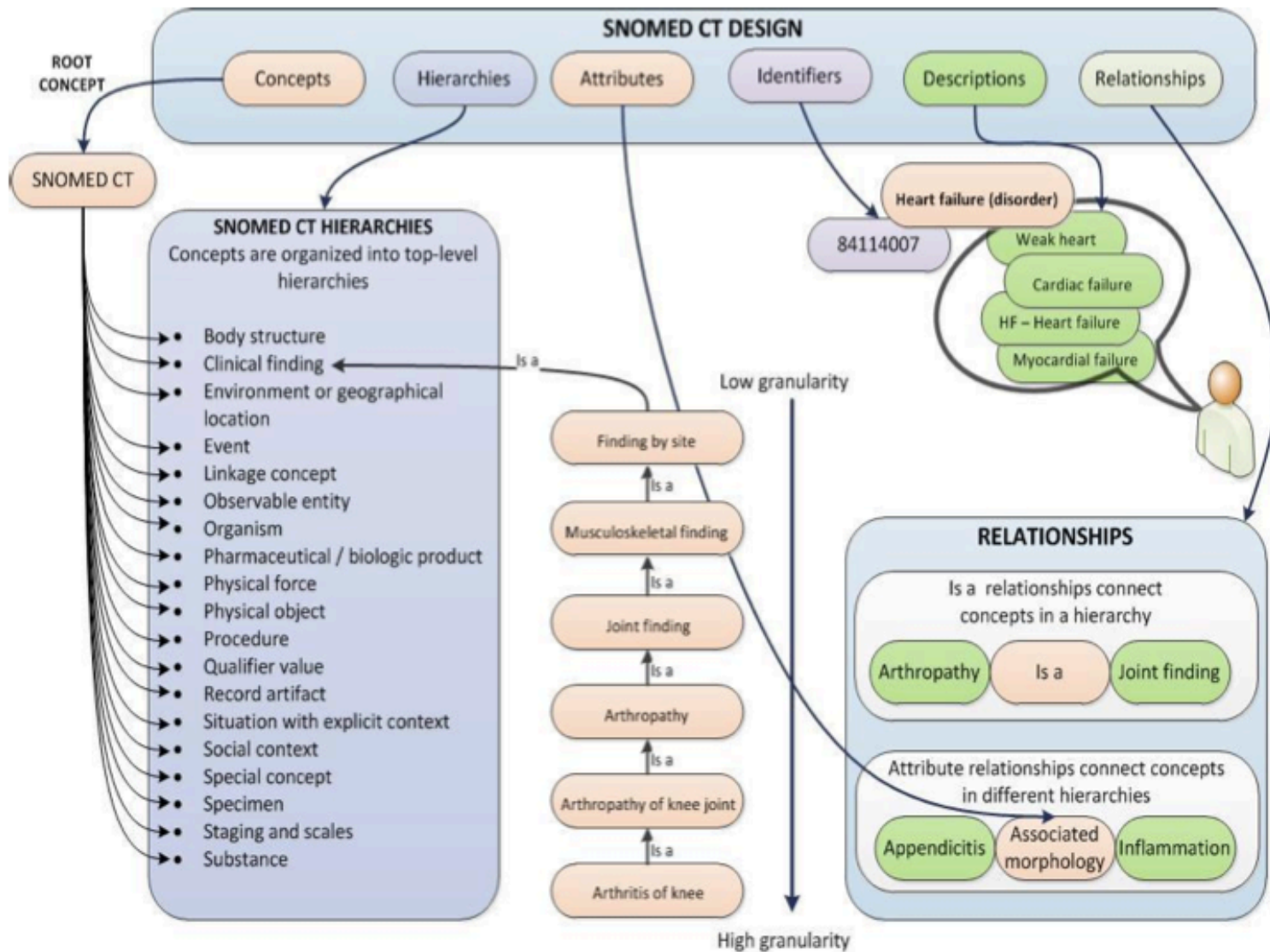
The `|is a|` relationships also provide the polyhierarchical structure of SNOMED CT, because a concept can have more than one `|is a|` relationship to other concepts (so a child concept may have multiple parent concepts).

ATTRIBUTE RELATIONSHIPS

An attribute relationship contributes to the definition of the source concept by associating it with the value of a defining characteristic.

The characteristic (attribute name) is specified by the relationship type and the value is provided by the destination of the relationship. Relationship types are also represented by SNOMED CT concepts.





SNOMED CT CONCEPT MODEL

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' that name the main branches of the subtype hierarchy.

Each of these Top Level Concepts, together with their many subtype descendants, forms a major branch of the hierarchy containing similar types of concept.

As the hierarchies descend, the concepts within them become increasingly specific.

Top level hierarchies - examples

|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|).

|procedure| Represents activities performed in the provision of health care. This includes not only invasive procedures but also administration of medicines, imaging, education and administrative procedures (e.g. |appendectomy|, |physiotherapy|, |subcutaneous injection|).

|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|).



EXPRESSIONS

Clinical expressions using SNOMED CT concepts can be of two types, precoordinated expressions, which are the SNOMED CT concept descriptions, and postcoordinated expressions.

SNOMED CT support of the postcoordination technique allows additional clinical detail to be represented if required. The result of postcoordination is an expression containing more than one SNOMED CT identifier

In some cases, postcoordination allows more than one way to represent the same information

A SNOMED CT expression is a structured combination of one or more concept identifiers used to express a clinical thought or phrase.

Expressions are represented using the SNOMED CT compositional grammar, which is a lightweight syntax for representation of SNOMED CT expressions which combine more than one SNOMED CT concept.

PRECOORDINATED EXPRESSIONS

SNOMED CT contains the concept 174041007|laparoscopic emergency appendectomy|. The identifier of this concept (174041007) can be used (with or without the associated term) as a precoordinated expression to record an instance of this procedure.

The procedure 'laparoscopic emergency appendectomy' has at least three distinct facets: 'removal of appendix', 'using a laparoscope' as 'emergency procedure'. The SNOMED CT concept 174041007|laparoscopic emergency appendectomy| precoordinates these facets as its definition includes the following defining relationships:

- 116680003|is a| = 80146002|appendectomy|
- 260870009|priority|=25876001|emergency|
- 425391005|using access device| = 86174004|laparoscope|

POSTCOORDINATED EXPRESSIONS

Although SNOMED CT contains the concept |laparoscopic emergency appendectomy|, it is also possible to represent this clinical phrase using the following postcoordinated expression.

- 80146002|appendectomy|:260870009|priority|=25876001|emergency|, 425391005|using access device|=86174004|laparoscope|

This postcoordinated expression has exactly the same meaning as the precoordinated expression

- 174041007|laparoscopic emergency appendectomy|

The fact that the two expressions have the same meaning can be computed because

- 174041007|laparoscopic emergency appendectomy| is a fully-defined subtype descendant of 80146002|appendectomy| ;
- and
- the only differences between the defining attributes of these concepts are the addition of
 - 260870009|priority|=25876001|emergency|
 - 425391005|using access device| = 86174004|laparoscope|



The basics of SNOMED CT compositional grammar

- ◆ At its simplest level a single SNOMED CT concept identifier is a valid expression.
 - 80146002
- ◆ A concept identifier can optionally be followed by a term associated with that concept enclosed between two pipe characters
 - 80146002 | appendectomy |
- ◆ A concept identifier (with or without a following term) can be followed by a refinement. The refinement follows a colon
 - 80146002 | appendectomy | : <refinement>
- ◆ A refinement consists of a sequence of one or more attribute-value pairs. Both the attribute and the value are represented by a concept identifier (with or without a following term). The attribute is separated from the value by an equals sign
 - 80146002 | appendectomy | : 260870009 | priority | = 25876001 | emergency |
- ◆ If there is more than one attribute-value pair, the pairs are separated by commas
 - 80146002 | appendectomy | : 260870009 | priority | = 25876001 | emergency | , 425391005 | using access device | = 86174004 | laparoscope |
- ◆ Curly braces represent grouping of attributes within a refinement, for example to indicate that the method applies to a specific site
 - 80146002 | appendectomy | : { 260686004 | method | = 129304002 | excision - action | , 405813007 | procedure site - direct | = 181255000 | entire appendix | }
- ◆ Round brackets represent nesting to allow the value of an attribute to be refined
 - 161615003 | history of surgery | : 363589002 | associated procedure | = (80146002 | appendectomy | : 260870009 | priority | = 25876001 | emergency)

MAPS

Maps are associations between particular codes, concepts or terms in one code system and codes, concepts or terms in another code system that have the same (or similar meanings).

There are a number of different types of mapping activities that an organization may need to undertake. These include mapping:

- SNOMED CT to a statistical classification (such as ICD-10)
- Classifications to SNOMED CT
- Locally developed code systems to SNOMED CT
- Locally collected clinical data documented as free text to SNOMED CT

The completeness of mapping between two code systems depends on the scope, level of detail provided to the two schemes and the precision of mapping required to safely meet the intended mapping use case.

APPROACHES

The approaches used when undertaking mapping include human mapping, automatic mapping or a combination of both of these.

Automatic mapping is when computer algorithms are used to create maps between concepts and or terms, for example between the local clinical content and SNOMED CT. Lexical mapping, where the structure of the words in the clinical term are compared and analyzed as to whether the words are the same, similar or different, is often incorporated within automatic mapping. Significant care must be taken with automatic mapping for severe mapping errors can result if not done in a controlled way.

Human mapping is the use of human knowledge and skill to author maps. Each map is built singly and individually. The process requires examination of each and every concept in the coding system. Informed judgments or decisions are made about the shared meaning of concepts. Electronic or computational tools are used, but only in support of work process.

Representation of maps in SNOMED CT

SNOMED CT specifications and content include resources that support mapping to and from other code systems, classifications and terminologies. These resources support both simple and complex mappings.

Simple maps where there is a one-to-one Relationship between a SNOMED CT concept and code in a target scheme are represented using a Simple Map Reference Set.

Complex and Extended Map Reference Sets enable representation of:

- Maps from a single SNOMED CT concept to a combination of codes (rather than a single code) in the target scheme.
- Maps from a single SNOMED CT concept to choice of codes in the target scheme. In this case, the resolution of the choices may involve:
 - Manual selection supported by advisory notes.
 - Automated selection based on rules that test other relevant characteristics in the source data (e.g. age and sex of the subject, presence or absence of co-existing conditions, etc.).
 - A combination of automated processing with manual confirmation or selection where rules are insufficient to make the necessary decisions.



Belgium is an IHTSDO MEMBER

IHTSDO is the International Health Standards Development Organisation. IHTSDO is the international not-for-profit organization that owns and administers SNOMED CT, and owns the rights to SNOMED CT and related terminology standards.

IHTSDO now has more than 25 national Members. The IHTSDO member countries pay a fee, based on national wealth, to the IHTSDO which gives them the right to a seat on the General Assembly. Members of IHTSDO can be either an agency of a national government or another body endorsed by an appropriate national government authority within the country it represents.

IHTSDO Members undertake a range of activities related to their involvement in IHTSDO and their role in distributing, extending and supporting use of SNOMED CT in their country.

The organization or agency that coordinates this role in each country is referred to as a National Release Center (NRC). National Release Centers provide a single point of contact for communications with IHTSDO and other IHTSDO Members.

Within their own countries, NRCs manage the use of SNOMED CT and communicate a range of stakeholders including SNOMED CT Affiliate Licensees, healthcare institutions, clinical groups and end users.

For Belgium: Federal Public Service of health, Food Chain Safety and Environment.

