4.1.4. Reasoning with Description Logic

Overview

Description logic (DL) reasoners can apply additional logic-based techniques to assist with clinical decision support reasoning. Two of the DL techniques supported by SNOMED CT have been briefly described below.

It is also worth pointing out that DL can be applied over the terminology or to the terminology in combination with the record structure. For more information on this topic, please refer to sections 6.4 Description Logic Over Terminology and 6.5 Description Logic Over Terminology and Structure in the guide Data Analytics with SNOMED CT.
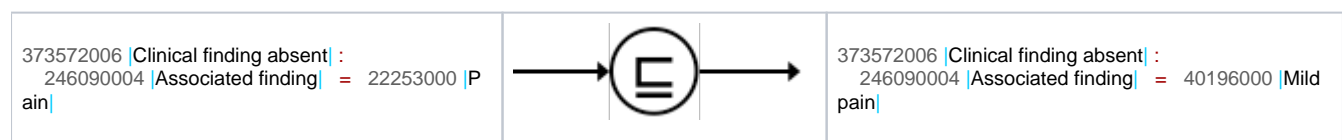
Expression Subsumption

SNOMED CT supports the use of postcoordinated expressions to define additional clinical meanings beyond the standard precoordinated concepts. Postcoordinated expressions are comprised of two or more concepts, and are structured in accordance with the compositional grammar. A simple example of a postcoordinated expression is:

399963005 |Abrasion| :
   363698007 |Finding site| = 67269001 |Skin structure of ankle|

This can be read as "an abrasion with a finding site of skin of ankle".

When postcoordinated expressions are used to capture and record clinical meaning in a health record, the CDS inference engine may need to be able to test if one expression subsumes another to execute the CDS rules. For example, it would be reasonable to conclude that the first expression listed below, subsumes the second expression if you were aware that 40196000 | Mild pain| is subsumed by 22253000 | Pain| .

373572006 |Clinical finding absent| :
   246090004 |Associated finding| = 22253000 |Pain|
	⊑	373572006 |Clinical finding absent| :
		   246090004 |Associated finding| = 40196000 |Mild pain|

However, many expressions are much more complex than this and may involve multiple focus concepts, attribute groups, and nesting as examples. There are a couple of methods which can be utilized to determine if one expression subsumes another. The first process, which is a manual process, involves 12.4.2 Normalize Expression the expressions , comparing the primitive focus concepts, and then comparing the defining attributes. The other is an automated process which can be used to compare expressions for subsumption. Expressions can be imported into a description logic classifier and classified in the same way as SNOMED CT concept definitions, which tests for subsumption in the process.

Property Chaining

The transitive nature of the 116680003 | is a| attribute allows us to make subtype inferences. This topic was explored in the section on Reasoning using Subsumption. In some cases, different types of attribute relationships may be related to one another in such a way that additional inferences are possible. For example (using fictitious concepts) if Lucy 619999999100 | Has sister| Beth, and Beth 629999999107 | Has daughter| Jane, then Lucy 639999999109 | Has niece| Jane. The chain from 619999999100 | Has sister| to 629999999107 | Has daughter| implies 639999999109 | Has niece| . This rule can be expressed as:

619999999100	Has sister|	o	629999999107	Has daughter|		639999999109	Has niece|

At present, the only property chain recognized in the International Edition of SNOMED CT is from | Direct substance| to | Active ingredient| and can be expressed as such:

363701004	Direct substance|	o	127489000	Has active ingredient|		363701004	Direct substance|

This can be used to provide a link from product administration (as part of a procedure) to substance administration. Additional property chains can be added at the local implementation level, if required.