Expression Constraint Language - Specification and Guide

Expression Constraint Language

Exported on 10/01/2023

Table of Contents

1 1. Introduction 8
1.0.1 Background 8
1.0.2 Purpose 8
1.0.3 Scope 8
1.0.4 History 9
1.0.5 Audience 10
1.0.6 Document Overview 10
2 2. Use Cases 12
2.1 2.1 Terminology Binding 12
2.2 2.2 Intensional Reference Set Definitions 12
2.3 2.3 SNOMED CT Content Queries 13
2.4 2.4 SNOMED CT Concept Model 13
3 3. Requirements 14
3.1 3.1 General SNOMED CT Language Requirements 14
3.2 3.2 Expression Constraint and Query Requirements 14
3.3 3.3 Concept Model Requirements 17
4 4. Logical Model 18
4.1 4.1 Details 19
5 5. Syntax Specification 21
5.1 5.1 Brief Syntax (Normative) 21
5.2 5.2 Long Syntax (Informative) 25
5.3 5.3 Informative Comments 29
5.4 5.4 Order of Operation 53
5.4.1 Unary Operators 53
5.4.2 Binary Operators 53
5.4.3 Filter Constraints 56
5.4.4 History Supplements 57
5.5 5.5 Character Collation for Term Filters 57
6 6. Examples 61
6.1 6.1 Simple Expression Constraints 61

6.1.1 Self 61
6.1.2 Descendant of 61
6.1.3 Descendant or Self of 62
6.1.4 Child of 63
6.1.5 Child or Self of 63
6.1.6 Ancestor of 64
6.1.7 Ancestor or Self of 64
6.1.8 Parent of 64
6.1.9 Parent or Self of 65
6.1.10 Member of 66
6.1.11 Any 67
6.2 6.2 Refinements 69
6.2.1 Attributes 69
6.2.2 Attribute Groups 70
6.2.3 Attribute Constraint Operators 71
6.2.4 Concrete Values 73
6.2.5 Reverse Attributes 74
6.2.6 Dotted Attributes 75
6.2.7 Any Attribute Name and Value 77
6.3 6.3 Cardinality 78
6.3.1 Attribute cardinality 78
6.3.1.1 Overview 78
6.3.1.2 Unconstrained Cardinalities 79
6.3.1.3 Default Cardinalities 80
6.3.1.4 Non-redundant Attributes 80
6.3.1.5 Attribute Cardinality in Groups 81
6.3.2 Attribute Group Cardinality 82
6.3.2.1 Unconstrained Cardinalities 83
6.3.2.2 Default Cardinalities 84
6.3.2.3 Non-redundant Attribute Groups 84
6.3.2.4 Attribute and Attribute Group Cardinalities 85
6.3.3 Reverse Cardinalities 85
6.4 6.4 Conjunction and Disjunction 87
6.4.1 Compound Expression Constraints 87
6.4.2 Attribute Conjunction and Disjunction 89

6.4.3 Attribute Group Conjunction and Disjunction ... 92
6.4.4 Attribute Value Conjunction and Disjunction ... 93
6.5 6.5 Exclusion and Not Equals ... 93
6.5.1 Exclusion of Simple Expressions ... 93
6.5.2 Exclusion of Attribute Values ... 94
6.5.3 Not Equal to Attribute Value ... 94
6.6 6.6 Constraint Comments ... 96
6.6.1 Comments ... 96
6.7 6.7 Nested Expression Constraints ... 97
6.7.1 Constraint Operators ... 97
6.7.2 MemberOf Function ... 98
6.7.3 Compound Expression Constraints ... 99
6.7.4 Dotted Attributes ... 100
6.7.5 Refinement ... 101
6.7.6 Attribute Values ... 102
6.8 6.8 Description Filters ... 102
6.8.1 Overview ... 102
6.8.2 Term Filter ... 102
6.8.3 Language Filter ... 104
6.8.4 Description Type Filter ... 105
6.8.5 Dialect Filter ... 106
6.8.6 Acceptability Filter ... 107
6.8.7 Filters with Negation ... 108
6.8.8 Module Filter ... 109
6.8.9 Effective Time Filter ... 110
6.8.10 Active Filter ... 112
6.8.11 Description Id Filter ... 112
6.9 6.9 Concept Filters ... 113
6.9.1 Overview ... 113
6.9.2 Module Filter ... 115
6.9.3 Effective Time Filter ... 115
6.9.4 Active Filter ... 117
6.10 6.10 Member Filters ... 118
6.10.1 Overview ... 118

6.10.2 Member Field Filters 118
6.10.3 Module Filter 120
6.10.4 Effective Time Filter 120
6.10.5 Active Filter 121
6.11 6.11 History Supplements 121
6.11.1 Background 121
6.11.2 History Supplements 122
6.11.2.1 Overview 122
6.11.2.2 Template 122
6.11.2.3 Profiles 123
6.11.3 Use Case Examples 125
6.11.3.1 Use Case 1 125
6.11.3.2 Use Case 2 126
7 7. Implementation Considerations 127
7.1 7.1 Authoring 127
7.1.1 Language-Based Authoring 127
7.1.2 Form-Based Authoring 128
7.2 7.2 Parsing 129
7.3 7.3 Validating 130
7.4 7.4 Executing 130
7.5 7.5 Storing 130
7.6 7.6 Displaying 131
7.7 7.7 Exchanging 131
8 Appendix A – Examples Of Valid Expressions 133
8.1 A.1 Simple Expression Constraints - Valid Expressions 133
8.2 A.2 Refinements - Valid Expressions 136
8.3 A.3 Cardinality - Valid Expressions 143
8.4 A.4 Conjunction and Disjunction - Valid Expressions 149
8.5 A.5 Exclusion and Not Equals - Valid Expressions 153
8.6 A.6 Nested Expression Constraints - Valid Expressions 157
9 Appendix B – Examples Of Invalid Expressions 160
9.1 B.1 Simple Expression Constraints - Invalid Expressions 160

9.2 B.2 Refinements - Invalid Expressions 162
9.3 B.3 Cardinality - Invalid Expressions 171
9.4 B.4 Conjunction and Disjunction - Invalid Expressions 177
9.5 B.5 Exclusion and Not Equals - Invalid Expressions 180
9.6 B.6 Nested Expression Constraints - Invalid Expressions 184
10 Appendix C - Dialect Aliases 187
11 Appendix D - ECL Quick Reference 190
11.1 Syntax Overview 190
11.2 Examples 192
12 Appendix E - Reference Set Fields 199
13 References 203
14 Previous Versions 204
15 Recent Updates 205
15.1 The most recently updated pages in this document are listed below 205

The *Expression Constraint Language* is a formal syntax for representing SNOMED CT expression constraints. Expression constraints are computable rules used to define a bounded sets of clinical meanings represented by either precoordinated or postcoordinated expressions. Expression constraints can be used to restrict the valid values for a data element in an EHR, as the intensional definition of a concept-based reference set, as a machine processable query that identifies a set of matching expressions, or as a constraint that restricts the range of an attribute defined in the SNOMED CT concept model.
This document defines and describes the current version of the Expression Constraint Language - ECL v2.1.

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

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

1 http://www.ihtsdo.org/
2 mailto:info@ihtsdo.org

1 1. Introduction

1.0.1 Background

SNOMED CT is a clinical terminology with global scope covering a wide range of clinical specialties and requirements. The use of SNOMED CT expressions in Electronic Health Records (EHRs) provides a standardized way to represent clinical meanings captured by clinicians and enables the automatic interpretation of these meanings. SNOMED CT expressions are a structured combination of one or more concept identifiers used to represent a clinical idea in a logical manner. The SNOMED CT Compositional Grammar[3] provides a lightweight syntax for the representation of SNOMED CT expressions.

In contrast, a *SNOMED CT Expression Constraint* is a computable rule that can be used to define *a bounded set of* clinical meanings represented by either precoordinated or postcoordinated expressions. Expression constraints can be used as formal constraints on the content of a particular data element in an EHR, as the intensional definition of a concept-based reference set, as a machine processable query that identifies a set of matching precoordinated or postcoordinated expressions, or as a constraint that restricts the range of an attribute defined in the SNOMED CT concept model.

1.0.2 Purpose

The purpose of this document is to define and describe a formal language for representing SNOMED CT Expression Constraints. A SNOMED CT Expression Constraint is a computable rule that defines a bounded set of clinical meanings represented by either precoordinated or postcoordinated expressions. Two equivalent syntaxes are presented – a brief syntax, which is designed to be as compact as possible for interoperable communication between systems, and a long syntax, which introduces textual alternatives to the symbols from the brief syntax. This document also provides examples and guidance to assist in the implementation of this language.

1.0.3 Scope

This document presents the specification of an Expression Constraint Language, which can be used to represent SNOMED CT Expression Constraints. It includes a logical model of the language, two syntaxes, a set of example expression constraints and a summary of implementation considerations.

The Expression Constraint Language specified in this document is part of a consistent set of computer processable languages designed to support a variety of use cases involving the use of SNOMED CT. Other SNOMED CT computable languages include:

- Compositional Grammar[4]: designed to represent SNOMED CT expressions; and
- Template Syntax[5]: which allow slots to be added to expressions, expression constraints or queries that can be filled with specific values at a later time.

The compositional grammar is designed to provide a common foundation for the additional functionality added by the other languages.

This document does not include a full description of how to implement an expression constraint parser, classifier or interpreter. It does not describe how to transform an expression constraint into other languages, such as OWL, SPARQL or SQL; or how to determine whether two expression constraints are equivalent. It also does not describe how to implement an EHR which uses expression constraints to constrain or query its content, or a terminology

3 http://snomed.org/scg
4 http://snomed.org/scg
5 http://snomed.org/sts

server which uses expression constraints to query its content. Instead, it provides a specification, examples and general guidance to assist in the implementation of expression constraints in any of these applications.

This document defines and describes the current version of the Expression Constraint Language - ECL 2.1.

1.0.4 History

Expression constraints have been used in projects and programs around the world for a number of years – for example HL7 TermInfo[6], and the NHS Logical Record Architecture[7].

In 2013, a draft document on "SNOMED CT Expression Constraint Syntax Specification for Terminology Binding" was developed as an assignment for the SNOMED CT Implementation Advisor (SIA) scheme.

In 2014, this work was revised and extended to support a wider range of relevant use cases to produce version 1.0 of the Expression Constraint Language specification (2015). These updates included:

- Concrete values (e.g. integers, decimals and strings) are now permitted as attribute values. This is to provide alignment with the recent extensions to SNOMED CT Compositional Grammar;
- Cardinality constraints have been introduced, and as a result the optional operator (i.e. ~) is no longer provided;
- Attributes may now be preceded by a 'descendantOf' or 'descendantOrSelfOf' operator to indicate whether attribute descendants and/or the attribute itself should be used in the matching process;
- A reverse flag has been introduced, which allows relationships to be traversed in the reverse direction;
- Exclusion has been changed from a unary operator ('negation') to a binary operator ('minus');
- A wildcard character ('*') has been introduced to represent any concept in the substrate;
- A number of clarifications have been made, including the 'memberOf' operator and the default substrate upon which the expression constraints are executed.

An update to the Expression Constraint Language was then published in 2016 (version 1.1) to incorporate some additional features requested by implementers of the language. These updates include:

- Two new operators 'childOf' and 'parentOf' were added to support querying immediate children and immediate parents of a concept during user interface design;
- A new 'dot notation' was introduced (as an alternative to the Reverse flag) to refer to an attribute value for a concept or expression;
- The ability for a constraint operator (e.g. 'descendantOf') to be applied to a nested expression constraint was added;
- The ability to add comments within the text of an expression constraint was added;
- Additional optional brackets were allowed around subexpressions; and
- The non-normative syntax (previously named the 'Full Syntax') was renamed to the 'Long Syntax'.

Early in 2017 version 1.2 was published, to include a new feature requested by implementers: namely, the ability for the 'memberOf' function to be applied to a set of reference set concepts defined using an expression constraint. In this version, the explanation of *Operator Precedence* was also moved from section 6.7 to section 5.4. Version 1.3 was then published in mid 2017 to support a range of additional features - including allowing the refinement of subexpression constraints, permitting the use of subexpression constraints to represent a set of valid attribute names and simplifying the parsing of dotted expression constraints.

In mid 2020, version 1.4 was published to support boolean attribute values and to introduce the 'childOrSelfOf' and 'parentOrSelfOf' operators. Later that year, version 1.5 was published to support description filter constraints. These constraints filter the result set, by matching only on concepts which have a description that satisfies the filter criteria. Section 5.5 (Character Collation for Term Filters) and section 6.8 (Filter Constraints) were added in ECL version 1.5.

---

6 http://snomed.org/hl7terminfo
7 https://isd.hscic.gov.uk/trud3/user/guest/group/0/pack/12

In 2021, version 1.6 added concept filters, which allow the result set to be filtered based on the definition status, module, effectiveTime and active status of each concept.

And then in early 2022, version 2.0 was published. Version 2.0 includes a number of significant features, including:

- History supplements, to supplement the results with relevant inactive concepts,
- Reference set member filters, to filter the rows of a reference set, based on the value of specified fields,
- Support for returning multiple fields of a reference set, including fields other than the referencedComponentId,
- Support for module, effectiveTime and active filters on descriptions, and
- Support for word-prefix-any-order and wildcard searches for string-based concrete attribute values (for consistency with term searches in a Description filter).

Most significantly, version 2.0 is the first version of ECL that is specifically designed to support querying over historical patient records, which may contain inactive codes.

In August 2022, version 2.1 was published to allow description filters to filter results using description identifiers, and to harmonise the dialect alias filter (see Appendix C(see page 187)) with BCP-47 (Internet Best Current Practice Specification)[8].

For a list of previous PDF versions, please refer to Previous Versions(see page 204).

1.0.5 Audience

The target audiences of this document include:

- SNOMED National Release Centres;
- SNOMED CT designers and developers, including designers and developers of EHR systems, information models, data entry interfaces, storage systems, decision support systems, retrieval and analysis systems, communication standards and terminology services;
- SNOMED CT terminology developers, including concept model designers, content authors, map developers, subset and constraint developers and release process managers.

It should be noted that this document contains both technical and non-technical content. In particular, the detailed logical model and formal syntax is specifically focussed at more technical readers. Less technical readers are encouraged to read the introductory material (including the use cases and requirements) and the extensive set of examples that is presented. It should also be noted that even though complex expression constraints are possible, most expression constraints are likely to be very simple, such as those described in Simple Expression Constraints[9].

1.0.6 Document Overview

This document defines the SNOMED CT Expression Constraint Language[10] and describes how and where it may be implemented. Chapter 2[11] begins by describing the use cases in which it is anticipated that SNOMED CT Expression Constraint Language will be used. Chapter 3[12] then describes the requirements used to guide the definition of this language. In Chapter 4[13], the logical model of the Expression Constraint Language is presented, while in Chapter 5[14] two syntaxes are defined using an ABNF serialisation of the logical model. Chapter 6[15] then presents some examples of expression constraints that conform to the SNOMED CT Expression Constraint syntaxes, and Chapter 7

8 https://www.rfc-editor.org/rfc/rfc5646.html
9 https://confluence.ihtsdotools.org/display/WIPECL/6.1+Simple+Expression+Constraints
10 http://snomed.org/ecl
11 https://confluence.ihtsdotools.org/display/WIPECL/2.+Use+Cases
12 https://confluence.ihtsdotools.org/display/WIPECL/3.+Requirements
13 https://confluence.ihtsdotools.org/display/WIPECL/4.+Logical+Model
14 https://confluence.ihtsdotools.org/display/WIPECL/5.+Syntax+Specification
15 https://confluence.ihtsdotools.org/display/WIPECL/6.+Examples

[16] discusses some implementation considerations. Appendix A – Examples Of Valid Expressions(see page 133) provides some examples of precoordinated and postcoordinated expressions that satisfy each of the expression constraints presented earlier in the document. Appendix B – Examples Of Invalid Expressions(see page 160) then provides some examples that do not satisfy these expression constraints. Appendix C - Dialect Aliases(see page 187) provides a list of example aliases that may be used to specify a particular dialect in an ECL filter constraint. Appendix D - ECL Quick Reference(see page 190) provides a quick reference to the key syntax features of the Expression Constraint Language. And finally, Appendix E - Reference Set Fields(see page 199) explains how reference set field names are used in ECL 2.0+.

16 https://confluence.ihtsdotools.org/display/WIPECL/7.+Implementation+Considerations

2 2. Use Cases

The SNOMED CT Expression Constraint Language enables the intensional definition of a bounded set of clinical meanings. This is important for a number of use cases, including:

- Terminology Binding(see page 12);
- Intensional Reference Set Definitions(see page 12);
- SNOMED CT Content Queries(see page 12); and
- SNOMED CT Concept Model(see page 12).

In the following subsections, we describe each of these key use cases.

2.1 2.1 Terminology Binding

Most Electronic Health Records (EHRs) are designed and developed using one or more information models, which describe the information that is collected, stored, communicated and displayed. Some information models are designed for a specific proprietary system, while others are based on a common health information standard (e.g. HL7 FHIR resource, HL7 CDA template, ISO 13606 archetype). Information models may also be defined using a wide variety of representations (e.g. UML class diagram, database table design, Archetype Definition Language, or XML Schema). Irrespective of the purpose, design and representation of the information models, however, the use of clinical terminology is an important part of making the models complete and useful.

Terminology binding provides the links between the information model and the terminology. These links may be used to constrain the set of possible values which can populate a given coded data element in the information model, or they may define the meaning of an information model artefact using the terminology. Terminology binding is an important part of supporting the following clinical information system functions:

- Data capture;
- Retrieval and querying;
- Information model library management; and
- Semantic interoperability.

To enable terminology binding to be defined using intensional rules, a formal language must be used. The SNOMED CT Expression Constraint Language[17] can be used in this way to define terminology bindings which constrain the set of possible coded values within an information model.

2.2 2.2 Intensional Reference Set Definitions

Reference sets are a flexible, extensible SNOMED CT file structure used to support a variety of requirements for the customization and enhancement of SNOMED CT content. These include the representation of subsets, language preferences, or maps to/from other code systems.

Some reference sets (using the Query Specification type) allow a serialised query to represent the membership of a subset of SNOMED CT components. A query contained in this reference set is executed against the content of SNOMED CT to produce a subset of concepts, descriptions or relationships. This query is referred to as an intensional definition of the subset. It can be run against future releases of SNOMED CT to generate a potentially different set of subset members. The members of the resulting subset may also be represented in an enumerated form as a Simple Reference Set. An enumerated representation of a subset is referred to as an extensional definition.

17 http://snomed.org/ecl

The SNOMED CT Expression Constraint Language[18] can be used in this way to represent the intensional definition of a subset of SNOMED CT concepts that can be enumerated as a Simple Reference Set.

2.3 2.3 SNOMED CT Content Queries

SNOMED CT provides both hierarchies and formal concept definitions to allow a range of advanced query techniques. SNOMED CT queries can be performed over different sets of terminology artefacts (known as the substrate of the query), including:

- The precoordinated components distributed as part of the SNOMED CT international edition;
- The precoordinated components distributed by a local release centre as part of a national or local SNOMED CT edition;
- The postcoordinated expressions stored within an expression repository; or
- The SNOMED CT expressions stored within an Electronic Health Record (EHR).

The SNOMED CT Expression Constraint Language[19] enables queries over SNOMED CT content to be expressed. These queries may be performed for a range of purposes, including the authoring and quality assurance of new SNOMED CT content, the design and development of extensional reference sets, and the design and display of SNOMED CT subsets in clinical user interfaces. While the language itself does not support querying over the full EHR content, the SNOMED CT Expression Constraint Language[20] could be embedded within record-based query languages (such as SQL) to represent the terminological aspects of these queries.

2.4 2.4 SNOMED CT Concept Model

The SNOMED CT Concept Model is the set of rules that determines the permitted sets of attributes and values that may be applied to particular types of concepts. There are also additional rules on the cardinality and grouping of each type of attribute. The SNOMED CT Concept Model includes the definition of the domain and range of each attribute. The domain is the set of concepts which are permitted to be used as the source of the attribute, while the range is the set of concepts which are permitted to be used as the target of the attribute. For example, the domain of the attribute 363698007 | Finding site|[21] is the descendants and self of 404684003 | Clinical finding|[22], while the range is the descendants and self of 442083009 | Anatomical or acquired body structure|[23] The SNOMED CT Concept Model rules are represented in a computable form in the SNOMED CT Machine Readable Concept Model[24].

18 http://snomed.org/ecl
19 http://snomed.org/ecl
20 http://snomed.org/ecl
21 http://snomed.info/id/363698007
22 http://snomed.info/id/404684003
23 http://snomed.info/id/442083009
24 http://snomed.org/mrcm

3 3. Requirements

In this chapter, we state the requirements of the SNOMED CT Expression Constraint Language[25]. These requirements are grouped into General SNOMED CT Language Requirements(see page 14) (which are shared by all SNOMED CT computable languages), Expression Constraint and Query Requirements(see page 14), and Concept Model Requirements(see page 17).

3.1 3.1 General SNOMED CT Language Requirements

The general SNOMED CT language requirements include:

Requirement G.1: Backward compatibility

> The language must be backwardly compatible with any version of the language that has previously been adopted as an SNOMED International standard.

Requirement G.2: Consistency

> Each logical feature of the language should have a single, consistent meaning across all the languages in the SNOMED CT family of languages. Each logical feature should also have a consistent set of syntax representations.

Requirement G.3: Sufficient and necessary

> Each language must be sufficiently expressive to meet the requirements of the use cases for which it was designed. However, functionality without a corresponding use case will not be included, as this increases the complexity of implementation unnecessarily.

Requirement G.4: Machine processability

> In order to facilitate the easy adoption by technical audiences, instances of each language must be able to be parsed into a logical representation using a machine processable syntax specification. This requirement will be met by defining the language syntax in ABNF.

Requirement G.5: Human readability

> Non-technical stakeholders require that the language is as human readable as possible, while still meeting the other requirements. This is essential for both the clinical validation of expressions, as well as for the education and training required to author expressions.

3.2 3.2 Expression Constraint and Query Requirements

The general expression constraint language requirements include:

Requirement E.1: Able to be evaluated against SNOMED CT content

> Expression constraints must be able to be evaluated against a specific set of SNOMED CT content (referred to as the substrate). When evaluated against a finite set of precoordinated concepts or postcoordinated SNOMED CT expressions, a finite subset of the substrate can be found which satisfies the expression constraint.
>
> Please note that the substrate over which the expression constraint is evaluated is not explicitly defined within the expression constraint, and must therefore be established by some other means. By default, the assumed substrate is the set of active components from the snapshot release (in distribution normal form) of the SNOMED CT versioned edition currently loaded into the given tool.

Requirement E.2: Expression constraint functional requirements

25 http://snomed.org/ecl

The expression constraint language must support the following capabilities:

Function	Details
Concept reference	The ability to reference a precoordinated SNOMED CT concept using its identifier and optional human-readable term.
Concept hierarchy	The ability to refer to a set of concepts which is exactly equal to the descendants, descendants and self, ancestors, or ancestors and self of a given concept.
Immediate children and parents	The ability to refer to a set of concepts which are either immediate children or immediate parents of a given concept (based on non-redundant 116680003 | is a |[26] relationships) (with or without the given concept itself).
Conjunction	The ability to connect two expression constraints, attribute groups or attribute sets via a logical AND operator.
Disjunction	The ability to connect two expression constraints, attribute groups or attribute sets via a logical OR operator.
Refinement	The ability to refine (or specialize) the meaning of an expression constraint using one or more attributes values.
Reverse	The ability to constrain the source concepts of a set of relationships, and refer to the destination concepts of these relationships.
Dotted attribute	The ability to refer to the value (or set of values) of an attribute that is included in the definition of a set of concepts.
Attribute group	The ability to group a collection of attributes which operate together as part of a refinement.
Attribute	The ability to specify an attribute name-value pair which further refines the meaning of the matching expressions.
Attribute descendants	The ability to define an attribute which may apply to either the descendants of the given attribute name, or the descendants and self of the given attribute name.

26 http://snomed.info/id/116680003

Nesting	The ability to use an expression constraint to represent the valid set of attribute names and/or attribute values.
Concrete values	The ability to use integers, decimals, strings and booleans as attribute values.
Concrete value comparison	The ability to compare the attribute value of the matching expressions with the attribute value in the expression constraint using mathematical comparison operators (e.g. =, <, >, <=, >=, !=).
Member of	The ability to refer to a set of concepts that are referenced by members of a reference set (or set of reference sets).
Reference set field value selection	The ability to return the value of any non-metadata field of a reference set.
Exclusion	The ability to filter out a set of expressions from the result, by either removing expressions whose focus concept is in a specific set, or removing expressions whose attribute value matches a given value.
Any	The ability to refer to any concept in the substrate, without relying on the availability of a single root concept.
Description filter	The ability to filter the result set, based on the properties of each concept's descriptions. Expression constraints should be able to filter the concepts based on whether or not it has a description with a matching term, type, language, membership of a language reference set, and acceptability within that language reference set. Term matching approaches should include wildcard and word-prefix-any-order. Expression constraints should also be able to filter concepts based on the module, effectiveTime, active status and identifier of their descriptions.
Concept filter	The ability to filter the result set, based on the properties of each concept. Expression constraints should be able to restrict the definition status, module, effectiveTime and active status of matching concepts.
Member filter	The ability to filter rows of a reference set member, based on the value of specified fields.
History supplements	The ability to include inactive concepts that are associated with any active concept in a given result set, via an historical association reference set.

3.3 3.3 Concept Model Requirements

The SNOMED CT concept model requirements include:

Requirement C.1: The ability to express SNOMED CT concept model constraints

> The language must support the ability to express SNOMED CT concept model constraints, such that the resulting expression constraint can be used to validate SNOMED CT concept definitions and postcoordinated expressions.
>
> In particular, the language must support the ability to define the domain and cardinality of each attribute in the SNOMED CT concept model, and the range of all concept model **object** attributes (whose range is a set of SNOMED CT concepts). The domain of an attribute is the set of valid source concepts of relationships of that type. In most cases, this will be defined as the descendants and self of a given concept. The range of a concept model object attribute is the set of valid destination concepts of relationships of that type. This will be defined as the set of concepts that match a given expression constraint. The cardinality of an attribute constrains the number of times an active relationship of this type can be added to a concept in the SNOMED CT snapshot release (in necessary normal form). For more information about the SNOMED CT necessary normal form, please refer to 2.5. Generating Necessary Normal Form[27] in the SNOMED CT OWL Guide (http://snomed.org/owl).
>
> Please note that the range of a concept model **data** attribute (whose value is concrete) will be specified using a value list constraint[28] from the SNOMED CT Template Syntax (http://snomed.org/sts).

27 https://confluence.ihtsdotools.org/display/WIPOWL/2.5.+Generating+Necessary+Normal+Form+Relationships+from+the+OWL+Refsets
28 https://confluence.ihtsdotools.org/display/DOCSTS/8.3.+Constrained+Replacement+Slots

4 4. Logical Model

A SNOMED CT Expression Constraint contains either a single focus concept, or a series of focus concepts joined by either conjunction, disjunction or exclusion. Each focus concept in an Expression Constraint is either a concept reference or a wildcard, and is normally preceded by either a constraint operator or a memberOf function. An Expression Constraint may also contain a refinement, which consists of grouped or ungrouped attributes (or both). Each attribute consists of the attribute name (optionally preceded by a cardinality, reverse flag and/or attribute operator) together with the value of the attribute. The attribute name is either a concept reference or a wild card. The attribute value is either an expression constraint or a concrete value (i.e. string, integer, decimal or boolean). Conjunction or disjunction can be applied at a variety of levels, including between expression constraints, refinements, attribute groups, and attributes. An expression constraint can also be followed by a dot and attribute name pair. One or more description filters may be applied to an expression constraint, which can include description identifier, module, effective time, active status, term, language, type, dialect and acceptability criteria. Similarly, one or more concept filters may be applied to an expression constraint, which can include definition status, module, effective time and active status criteria. Member filters may be applied to results of the memberOf function, and may include module, effective time, active status and specific refset field criteria. Finally, history supplements may be applied, which include an ECL query to specify the set of historical association reference sets to be used.

Figure 1 below illustrates the overall structure of an expression constraint using an abstract representation. Those parts of an expression constraint, which are in common with SNOMED CT Compositional Grammar[29] expressions, are shown with dotted lines to emphasise the new features (using solid lines) in the Expression Constraint Language[30]. Please note that no specific semantics should be attributed to each arrow in this abstract diagram.

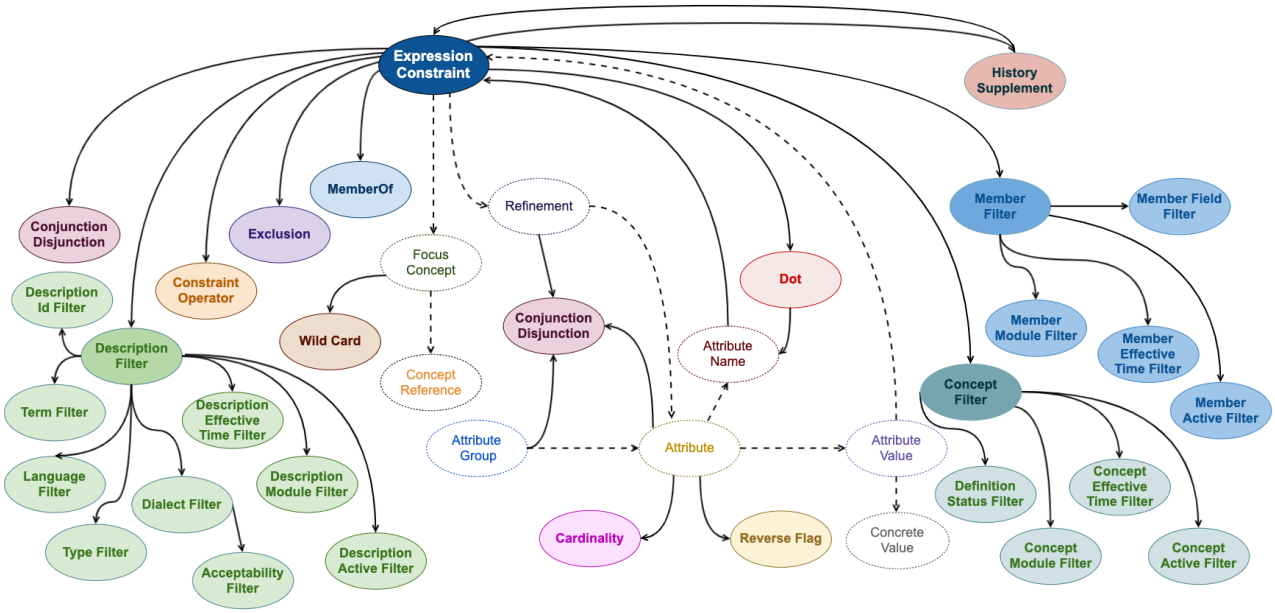

Figure 1: Abstract Model of a SNOMED CT Expression Constraint

Figure 2 below shows an example of an expression constraint 1 (see page 0) with the main components marked. These components will be explained further in the subsequent sections of this document.

29 http://snomed.org/scg
30 http://snomed.org/ecl

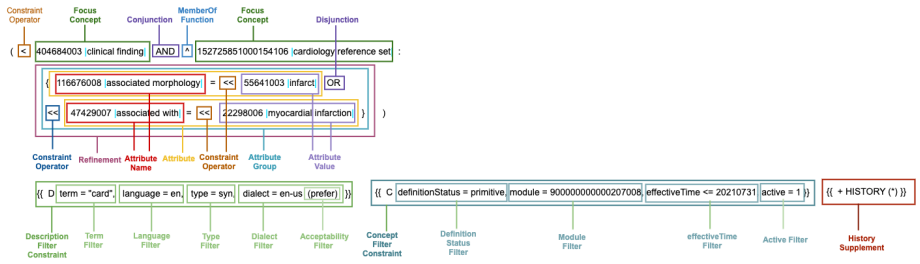

Figure 2: The main components of an example expression constraint

---

1 (see page 18) The expression constraint in Figure 2 is satisfied by concepts which are clinical findings **and** members of the cardiology reference set **and** have an attribute group that either has an associated morphology of infarct (or descendant) **or** are associated with myocardial infarction (or descendant). In addition, all matching concepts must also have a description that matches the term "card", has a language of English, has a type of | Synonym|[31] and are preferred in the en-us language reference set. And matching concepts must be primitive, belong to the international core module, be published on or before 31st July 2021, and be active. The results of this expression constraint are then supplemented by any inactive concept that is associated with the active results via an historical association reference set.

4.1 4.1 Details

Figure 3 below provides a non-normative representation of the logical model of the SNOMED CT Expression Constraint Language[32] using a UML class diagram. Please note that each of the classes in this diagram corresponds to a rule in the syntax specification defined in Chapter 5(see page 21). For a short description of each of these, please refer to Section 5.4(see page 29).

31 http://snomed.info/id/900000000000013009
32 http://snomed.org/ecl

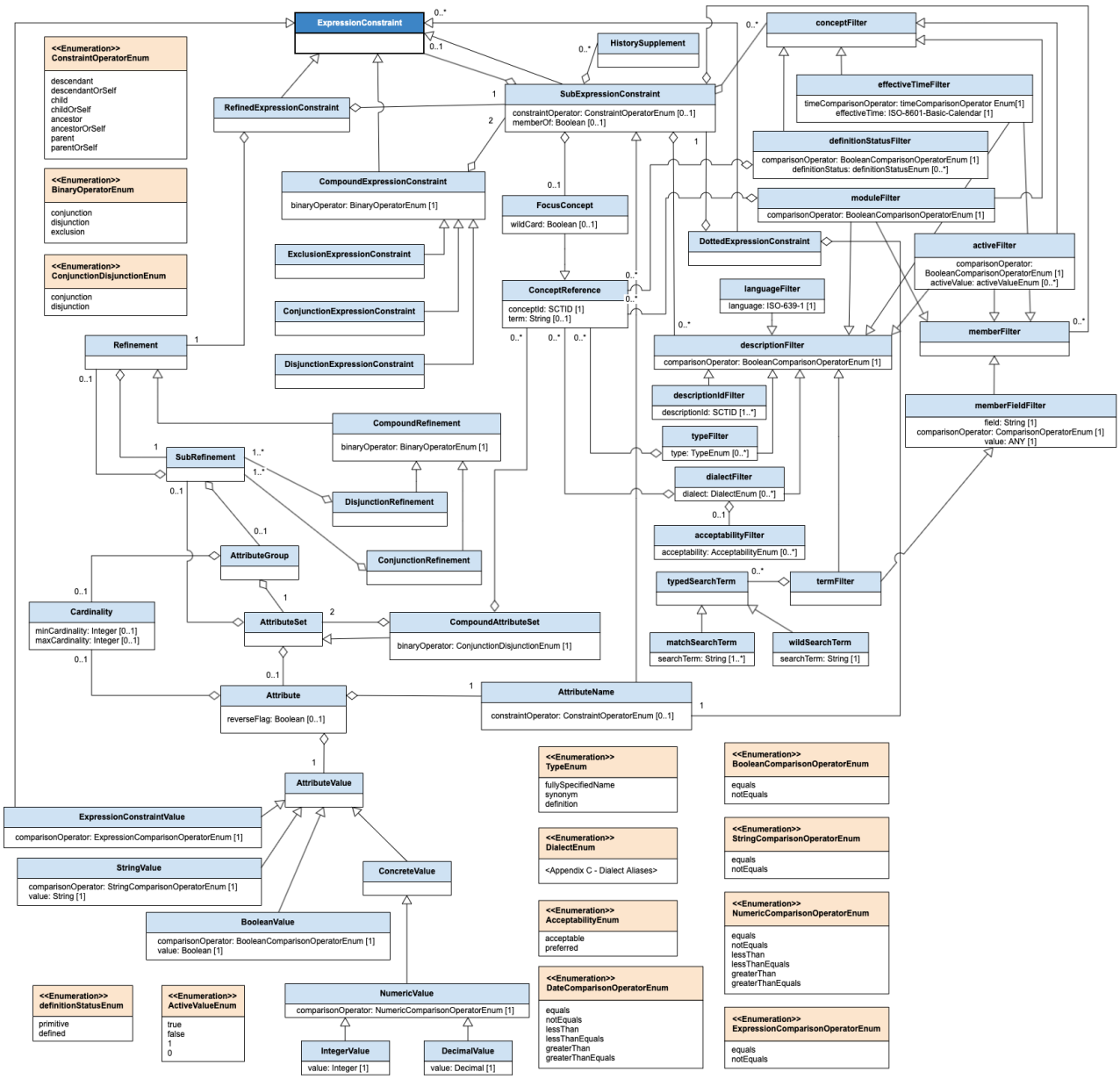

Figure 3: Logical Model of Expression Constraint Language

5 5. Syntax Specification

The following sections describe two syntaxes for use with the SNOMED CT Expression Constraint Language. These syntaxes are serialised representations of the logical model presented in the previous chapter, and are therefore logically equivalent.

The first of these syntaxes is referred to as the 'brief syntax' as it primarily uses a symbolic representation aimed to be as compact as possible. This syntax is considered to be the normative syntax, and is recommended for use in interoperable communications between systems.

The second syntax is referred to as the 'long syntax'. The long syntax introduces English-based textual alternatives to the symbols defined in the 'brief syntax', with the aim of increasing the human readability of the language. The textual alternatives provided in the 'long syntax' may (in theory) be translated into other languages to provide equivalent expression constraint representations that are human-readable by non-English speakers. Please note that the 'long syntax' (and any translations) is non-normative, and should only be used when a reliable mapping to the normative brief syntax is possible.

Please note that by default each expression constraint is evaluated against only the active components (and active members of each reference set) from the snapshot release (in distribution normal form) of a specified SNOMED CT versioned edition.

- 5.1 Brief Syntax (Normative)(see page 21)
- 5.2 Long Syntax (Informative)(see page 25)
- 5.3 Informative Comments(see page 29)
- 5.4 Order of Operation(see page 53)
- 5.5 Character Collation for Term Filters(see page 57)

5.1 5.1 Brief Syntax (Normative)

The following ABNF definition specifies the Brief Syntax of the SNOMED CT Expression Constraint Language.

> ***expressionConstraint*** *= ws (refinedExpressionConstraint / compoundExpressionConstraint / dottedExpressionConstraint / subExpressionConstraint) ws*
> ***refinedExpressionConstraint*** *= subExpressionConstraint ws ":" ws eclRefinement*
> ***compoundExpressionConstraint*** *= conjunctionExpressionConstraint / disjunctionExpressionConstraint / exclusionExpressionConstraint*
> ***conjunctionExpressionConstraint*** *= subExpressionConstraint 1*(ws conjunction ws subExpressionConstraint)*
> ***disjunctionExpressionConstraint*** *= subExpressionConstraint 1*(ws disjunction ws subExpressionConstraint)*
> ***exclusionExpressionConstraint*** *= subExpressionConstraint ws exclusion ws subExpressionConstraint*
> ***dottedExpressionConstraint*** *= subExpressionConstraint 1*(ws dottedExpressionAttribute)*
> ***dottedExpressionAttribute*** *= dot ws eclAttributeName*
> ***subExpressionConstraint*** *= [constraintOperator ws] (([memberOf ws] (eclFocusConcept / "(" ws expressionConstraint ws ")") *(ws memberFilterConstraint)) / (eclFocusConcept / "(" ws expressionConstraint ws ")")) *(ws (descriptionFilterConstraint / conceptFilterConstraint)) [ws historySupplement]*
> ***eclFocusConcept*** *= eclConceptReference / wildCard*
> ***dot*** *= "."*
> ***memberOf*** *= "^" [ws "[" ws (refsetFieldNameSet / wildCard) ws "]"]*
> ***refsetFieldNameSet*** *= refsetFieldName *(ws "," ws refsetFieldName)*
> ***refsetFieldName*** *= 1*alpha*
> ***eclConceptReference*** *= conceptId [ws "|" ws term ws "|"]*
> ***eclConceptReferenceSet*** *= "(" ws eclConceptReference 1*(mws eclConceptReference) ws ")"*
> ***conceptId*** *= sctId*
> ***term*** *= 1*nonwsNonPipe *(1*SP 1*nonwsNonPipe)*
> ***wildCard*** *= "*"*

constraintOperator = childOf / childOrSelfOf / descendantOrSelfOf / descendantOf / parentOf / parentOrSelfOf / ancestorOrSelfOf / ancestorOf
descendantOf = "<"
descendantOrSelfOf = "<<"
childOf = "<!"
childOrSelfOf = "<<!"
ancestorOf = ">"
ancestorOrSelfOf = ">>"
parentOf = ">!"
parentOrSelfOf = ">>!"
conjunction = (("a"/"A") ("n"/"N") ("d"/"D") mws) / ","
disjunction = ("o"/"O") ("r"/"R") mws
exclusion = ("m"/"M") ("i"/"I") ("n"/"N") ("u"/"U") ("s"/"S") mws
eclRefinement = subRefinement ws [conjunctionRefinementSet / disjunctionRefinementSet]
conjunctionRefinementSet = 1*(ws conjunction ws subRefinement)
disjunctionRefinementSet = 1*(ws disjunction ws subRefinement)
subRefinement = eclAttributeSet / eclAttributeGroup / "(" ws eclRefinement ws ")"
eclAttributeSet = subAttributeSet ws [conjunctionAttributeSet / disjunctionAttributeSet]
conjunctionAttributeSet = 1*(ws conjunction ws subAttributeSet)
disjunctionAttributeSet = 1*(ws disjunction ws subAttributeSet)
subAttributeSet = eclAttribute / "(" ws eclAttributeSet ws ")"
eclAttributeGroup = ["[" cardinality "]" ws] "{" ws eclAttributeSet ws "}"
eclAttribute = ["[" cardinality "]" ws] [reverseFlag ws] eclAttributeName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue)
cardinality = minValue to maxValue
minValue = nonNegativeIntegerValue
to = ".."
maxValue = nonNegativeIntegerValue / many
many = "*"
reverseFlag = "R"
eclAttributeName = subExpressionConstraint
expressionComparisonOperator = "=" / "!="
numericComparisonOperator = "=" / "!=" / "<=" / "<" / ">=" / ">"
timeComparisonOperator = "=" / "!=" / "<=" / "<" / ">=" / ">"
stringComparisonOperator = "=" / "!="
booleanComparisonOperator = "=" / "!="
idComparisonOperator = "=" / "!="
descriptionFilterConstraint = "{{" ws ["d" / "D"] ws descriptionFilter *(ws "," ws descriptionFilter) ws "}}"
descriptionFilter = termFilter / languageFilter / typeFilter / dialectFilter / moduleFilter / effectiveTimeFilter / activeFilter / descriptionIdFilter
descriptionIdFilter = descriptionIdKeyword ws idComparisonOperator ws (descriptionId / descriptionIdSet)
descriptionIdKeyword = ("i"/"I") ("d"/"D")
descriptionId = sctId
descriptionIdSet = "(" ws descriptionId *(mws descriptionId) ws ")"
termFilter = termKeyword ws stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet)
termKeyword = ("t"/"T") ("e"/"E") ("r"/"R") ("m"/"M")
typedSearchTerm = ([matchKeyword ws ":" ws] matchSearchTermSet) / (wild ws ":" ws wildSearchTermSet)
typedSearchTermSet = "(" ws typedSearchTerm *(mws typedSearchTerm) ws ")"
wild = ("w"/"W") ("i"/"I") ("l"/"L") ("d"/"D")
matchKeyword = ("m"/"M") ("a"/"A") ("t"/"T") ("c"/"C") ("h"/"H")
matchSearchTerm = 1*(nonwsNonEscapedChar / escapedChar)
matchSearchTermSet = QM ws matchSearchTerm *(mws matchSearchTerm) ws QM

wildSearchTerm *= 1*(anyNonEscapedChar / escapedWildChar)*
wildSearchTermSet *= QM wildSearchTerm QM*
languageFilter *= language ws booleanComparisonOperator ws (languageCode / languageCodeSet)*
language *= ("l"/"L") ("a"/"A") ("n"/"N") ("g"/"G") ("u"/"U") ("a"/"A") ("g"/"G") ("e"/"E")*
languageCode *= 2alpha*
languageCodeSet *= "(" ws languageCode *(mws languageCode) ws ")"*
typeFilter *= typeIdFilter / typeTokenFilter*
typeIdFilter *= typeId ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
typeId *= ("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E") ("i"/"I") ("d"/"D")*
typeTokenFilter *= type ws booleanComparisonOperator ws (typeToken / typeTokenSet)*
type *= ("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E")*
typeToken *= synonym / fullySpecifiedName / definition*
typeTokenSet *= "(" ws typeToken *(mws typeToken) ws ")"*
synonym *= ("s"/"S") ("y"/"Y") ("n"/"N")*
fullySpecifiedName *= ("f"/"F") ("s"/"S") ("n"/"N")*
definition *= ("d"/"D") ("e"/"E") ("f"/"F")*
dialectFilter *= (dialectIdFilter / dialectAliasFilter) [ws acceptabilitySet]*
dialectIdFilter *= dialectId ws booleanComparisonOperator ws (subExpressionConstraint / dialectIdSet)*
dialectId *= ("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("d"/"D")*
dialectAliasFilter *= dialect ws booleanComparisonOperator ws (dialectAlias / dialectAliasSet)*
dialect *= ("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T")*
dialectAlias *= alpha *(dash / alpha / integerValue)*
dialectAliasSet *= "(" ws dialectAlias [ws acceptabilitySet] *(mws dialectAlias [ws acceptabilitySet]) ws ")"*
dialectIdSet *= "(" ws eclConceptReference [ws acceptabilitySet] *(mws eclConceptReference [ws acceptabilitySet]) ws ")"*
acceptabilitySet *= acceptabilityConceptReferenceSet / acceptabilityTokenSet*
acceptabilityConceptReferenceSet *= "(" ws eclConceptReference *(mws eclConceptReference) ws ")"*
acceptabilityTokenSet *= "(" ws acceptabilityToken *(mws acceptabilityToken) ws ")"*
acceptabilityToken *= acceptable / preferred*
acceptable *= ("a"/"A") ("c"/"C") ("c"/"C") ("e"/"E") ("p"/"P") ("t"/"T")*
preferred *= ("p"/"P") ("r"/"R") ("e"/"E") ("f"/"F") ("e"/"E") ("r"/"R")*
conceptFilterConstraint *= "{{" ws ("c" / "C") ws conceptFilter *(ws "," ws conceptFilter) ws "}}"*
conceptFilter *= definitionStatusFilter / moduleFilter / effectiveTimeFilter / activeFilter*
definitionStatusFilter *= definitionStatusIdFilter / definitionStatusTokenFilter*
definitionStatusIdFilter *= definitionStatusIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
definitionStatusIdKeyword *= ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S") ("i"/"I") ("d"/"D")*
definitionStatusTokenFilter *= definitionStatusKeyword ws booleanComparisonOperator ws (definitionStatusToken / definitionStatusTokenSet)*
definitionStatusKeyword *= ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S")*
definitionStatusToken *= primitiveToken / definedToken*
definitionStatusTokenSet *= "(" ws definitionStatusToken *(mws definitionStatusToken) ws ")"*
primitiveToken *= ("p"/"P") ("r"/"R") ("i"/"I") ("m"/"M") ("i"/"I") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")*
definedToken *= ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("e"/"E") ("d"/"D")*
moduleFilter *= moduleIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
moduleIdKeyword *= ("m"/"M") ("o"/"O") ("d"/"D") ("u"/"U") ("l"/"L") ("e"/"E") ("i"/"I") ("d"/"D")*
effectiveTimeFilter *= effectiveTimeKeyword ws timeComparisonOperator ws (timeValue / timeValueSet)*
effectiveTimeKeyword
= ("e"/"E") ("f"/"F") ("f"/"F") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E") ("t"/"T") ("i"/"I") ("m"/"M") ("e"/"E")

timeValue = QM [year month day] QM
timeValueSet = "(" ws timeValue *(mws timeValue) ws ")"
year = digitNonZero digit digit digit
month = "01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12"
day = "01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12" / "13" / "14" / "15" / "16" / "17" / "18" / "19" / "20" / "21" / "22" / "23" / "24" / "25" / "26" / "27" / "28" / "29" / "30" / "31"
activeFilter = activeKeyword ws booleanComparisonOperator ws activeValue
activeKeyword = ("a"/"A") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")
activeValue = activeTrueValue / activeFalseValue
activeTrueValue = "1" / "true"
activeFalseValue = "0" / "false"
memberFilterConstraint = "{{" ws ("m" / "M") ws memberFilter *(ws "," ws memberFilter) ws "}}"
memberFilter = moduleFilter / effectiveTimeFilter / activeFilter / memberFieldFilter
memberFieldFilter = refsetFieldName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue / ws timeComparisonOperator ws (timeValue / timeValueSet))
historySupplement = "{{" ws "+" ws historyKeyword [historyProfileSuffix / ws historySubset] ws "}}"
historyKeyword = ("h"/"H") ("i"/"I") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("y"/"Y")
historyProfileSuffix = historyMinimumSuffix / historyModerateSuffix / historyMaximumSuffix
historyMinimumSuffix = ("-"/"_") ("m"/"M") ("i"/"I") ("n"/"N")
historyModerateSuffix = ("-"/"_") ("m"/"M") ("o"/"O") ("d"/"D")
historyMaximumSuffix = ("-"/"_") ("m"/"M") ("a"/"A") ("x"/"X")
historySubset = "(" ws expressionConstraint ws ")"
numericValue = ["-"/"+"] (decimalValue / integerValue)
stringValue = 1*(anyNonEscapedChar / escapedChar)
integerValue = digitNonZero *digit / zero
decimalValue = integerValue "." 1*digit
booleanValue = true / false
true = ("t"/"T") ("r"/"R") ("u"/"U") ("e"/"E")
false = ("f"/"F") ("a"/"A") ("l"/"L") ("s"/"S") ("e"/"E")
nonNegativeIntegerValue = (digitNonZero *digit) / zero
sctId = digitNonZero 5*17(digit)
ws = *(SP / HTAB / CR / LF / comment) ; optional white space
mws = 1*(SP / HTAB / CR / LF / comment) ; mandatory white space
comment = "/*" *(nonStarChar / starWithNonFSlash) "*/"
nonStarChar = SP / HTAB / CR / LF / %x21-29 / %x2B-7E /UTF8-2 / UTF8-3 / UTF8-4
starWithNonFSlash = %x2A nonFSlash
nonFSlash = SP / HTAB / CR / LF / %x21-2E / %x30-7E /UTF8-2 / UTF8-3 / UTF8-4
SP = %x20 ; space
HTAB = %x09 ; tab
CR = %x0D ; carriage return
LF = %x0A ; line feed
QM = %x22 ; quotation mark
BS = %x5C ; back slash
star = %x2A ; asterisk
digit = %x30-39
zero = %x30
digitNonZero = %x31-39
nonwsNonPipe = %x21-7B / %x7D-7E / UTF8-2 / UTF8-3 / UTF8-4
anyNonEscapedChar = SP / HTAB / CR / LF / %x20-21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4
escapedChar = BS QM / BS BS
escapedWildChar = BS QM / BS BS / BS star

nonwsNonEscapedChar *= %x21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4*
alpha *= %x41-5A / %x61-7A*
dash *= %x2D*
UTF8-2 *= %xC2-DF UTF8-tail*
UTF8-3 *= %xE0 %xA0-BF UTF8-tail / %xE1-EC 2(UTF8-tail) / %xED %x80-9F UTF8-tail / %xEE-EF 2(UTF8-tail)*
UTF8-4 *= %xF0 %x90-BF 2(UTF8-tail) / %xF1-F3 3(UTF8-tail) / %xF4 %x80-8F 2(UTF8-tail)*
UTF8-tail *= %x80-BF*

5.2 5.2 Long Syntax (Informative)

The following ABNF definition specifies the Long Syntax the SNOMED CT Expression Constraint Language[33]. Please note that all keywords are case insensitive.

expressionConstraint *= ws (refinedExpressionConstraint / compoundExpressionConstraint / dottedExpressionConstraint / subExpressionConstraint) ws*
refinedExpressionConstraint *= subExpressionConstraint ws ":" ws eclRefinement*
compoundExpressionConstraint *= conjunctionExpressionConstraint / disjunctionExpressionConstraint / exclusionExpressionConstraint*
conjunctionExpressionConstraint *= subExpressionConstraint 1*(ws conjunction ws subExpressionConstraint)*
disjunctionExpressionConstraint *= subExpressionConstraint 1*(ws disjunction ws subExpressionConstraint)*
exclusionExpressionConstraint *= subExpressionConstraint ws exclusion ws subExpressionConstraint*
dottedExpressionConstraint *= subExpressionConstraint 1*(ws dottedExpressionAttribute)*
dottedExpressionAttribute *= dot ws eclAttributeName*
subExpressionConstraint= *[constraintOperator ws] (([memberOf ws] (eclFocusConcept / "(" ws expressionConstraint ws ")") *(ws memberFilterConstraint)) / (eclFocusConcept / "(" ws expressionConstraint ws ")")) *(ws (descriptionFilterConstraint / conceptFilterConstraint)) [ws historySupplement]*
eclFocusConcept *= eclConceptReference / wildCard*
dot *= "."*
memberOf *= ("^" / ("m"/"M") ("e"/"E") ("m"/"M") ("b"/"B") ("e"/"E") ("r"/"R") ("o"/"O") ("f"/"F")) [ws "[" ws (refsetFieldNameSet / wildCard) ws "]"]*
refsetFieldNameSet *= refsetFieldName *(ws "," ws refsetFieldName)*
refsetFieldName *= 1*alpha*
eclConceptReference *= conceptId [ws "|" ws term ws "|"]*
eclConceptReferenceSet *= "(" ws eclConceptReference 1*(mws eclConceptReference) ws ")"*
conceptId *= sctId*
term *= 1*nonwsNonPipe *(1*SP 1*nonwsNonPipe)*
wildCard *= "*" / (("a"/"A") ("n"/"N") ("y"/"Y"))*
constraintOperator *= childOf / childOrSelfOf / descendantOrSelfOf / descendantOf / parentOf / parentOrSelfOf / ancestorOrSelfOf / ancestorOf*
descendantOf *= "<" / (("d"/"D") ("e"/"E") ("s"/"S") ("c"/"C") ("e"/"E") ("n"/"N") ("d"/"D") ("a"/"A") ("n"/"N") ("t"/"T") ("o"/"O") ("f"/"F") mws)*
descendantOrSelfOf *= "<<" / (("d"/"D") ("e"/"E") ("s"/"S") ("c"/"C") ("e"/"E") ("n"/"N") ("d"/"D") ("a"/"A") ("n"/"N") ("t"/"T") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O") ("f"/"F") mws)*
childOf *= "<!" / (("c"/"C") ("h"/"H") ("i"/"I") ("l"/"L") ("d"/"D") ("o"/"O") ("f"/"F") mws)*
childOrSelfOf *= "<<!" / (("c"/"C") ("h"/"H") ("i"/"I") ("l"/"L") ("d"/"D") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O") ("f"/"F") mws)*
ancestorOf *= ">" / (("a"/"A") ("n"/"N") ("c"/"C") ("e"/"E") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("o"/"O") ("f"/"F") mws)*
ancestorOrSelfOf *= ">>" / (("a"/"A") ("n"/"N") ("c"/"C") ("e"/"E") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O") ("f"/"F") mws)*
parentOf *= ">!" / (("p"/"P") ("a"/"A") ("r"/"R") ("e"/"E") ("n"/"N") ("t"/"T") ("o"/"O") ("f"/"F") mws)*

33 http://snomed.org/ecl

parentOrSelfOf = ">>!" / (("p"/"P") ("a"/"A") ("r"/"R") ("e"/"E") ("n"/"N") ("t"/"T") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O") ("f"/"F") mws)
conjunction = (("a"/"A") ("n"/"N") ("d"/"D") mws) / ","
disjunction = ("o"/"O") ("r"/"R") mws
exclusion = ("m"/"M") ("i"/"I") ("n"/"N") ("u"/"U") ("s"/"S") mws
eclRefinement = subRefinement ws [conjunctionRefinementSet / disjunctionRefinementSet]
conjunctionRefinementSet = 1*(ws conjunction ws subRefinement)
disjunctionRefinementSet = 1*(ws disjunction ws subRefinement)
subRefinement = eclAttributeSet / eclAttributeGroup / "(" ws eclRefinement ws ")"
eclAttributeSet = subAttributeSet ws [conjunctionAttributeSet / disjunctionAttributeSet]
conjunctionAttributeSet = 1*(ws conjunction ws subAttributeSet)
disjunctionAttributeSet = 1*(ws disjunction ws subAttributeSet)
subAttributeSet = eclAttribute / "(" ws eclAttributeSet ws ")"
eclAttributeGroup = ["[" cardinality "]" ws] "{" ws eclAttributeSet ws "}"
eclAttribute = ["[" cardinality "]" ws] [reverseFlag ws] eclAttributeName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue)
cardinality = minValue to maxValue
minValue = nonNegativeIntegerValue
to = ".." / (mws ("t"/"T") ("o"/"O") mws)
maxValue = nonNegativeIntegerValue / many
many = "*" / (("m"/"M") ("a"/"A") ("n"/"N") ("y"/"Y"))
reverseFlag = (("r"/"R") ("e"/"E") ("v"/"V") ("e"/"E") ("r"/"R") ("s"/"S") ("e"/"E") ("o"/"O") ("f"/"F")) / "R"
eclAttributeName = subExpressionConstraint
expressionComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"
numericComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>" / "<=" / "<" / ">=" / ">"
timeComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>" / "<=" / "<" / ">=" / ">"
stringComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"
booleanComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"
idComparisonOperator = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"
filterConstraint = descriptionFilterConstraint / conceptFilterConstraint / memberFilterConstraint / historySupplement
descriptionFilterConstraint = "{{" ws ["d" / "D"] ws descriptionFilter *(ws "," ws descriptionFilter) ws "}}"
descriptionFilter = termFilter / languageFilter / typeFilter / dialectFilter / moduleFilter / effectiveTimeFilter / activeFilter / descriptionIdFilter
descriptionIdFilter = descriptionIdKeyword ws idComparisonOperator ws (descriptionId / descriptionIdSet)
descriptionIdKeyword = ("i"/"I") ("d"/"D")
descriptionId = sctId
descriptionIdSet = "(" ws descriptionId *(mws descriptionId) ws ")"
termFilter = termKeyword ws stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet)
termKeyword = ("t"/"T") ("e"/"E") ("r"/"R") ("m"/"M")
typedSearchTerm = ([matchKeyword ws ":" ws] matchSearchTermSet) / (wild ws ":" ws wildSearchTermSet)
typedSearchTermSet = "(" ws typedSearchTerm *(mws typedSearchTerm) ws ")"
wild = ("w"/"W") ("i"/"I") ("l"/"L") ("d"/"D")
matchKeyword = ("m"/"M") ("a"/"A") ("t"/"T") ("c"/"C") ("h"/"H")
matchSearchTerm = 1*(nonwsNonEscapedChar / escapedChar)
matchSearchTermSet = QM ws matchSearchTerm *(mws matchSearchTerm) ws QM
wildSearchTerm = 1*(anyNonEscapedChar / escapedWildChar)
wildSearchTermSet = QM wildSearchTerm QM
languageFilter = language ws booleanComparisonOperator ws (languageCode / languageCodeSet)
language = ("l"/"L") ("a"/"A") ("n"/"N") ("g"/"G") ("u"/"U") ("a"/"A") ("g"/"G") ("e"/"E")
languageCode = 2alpha
languageCodeSet = "(" ws languageCode *(mws languageCode) ws ")"

typeFilter = *typeIdFilter / typeTokenFilter*
typeIdFilter = *typeId ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
typeId = *("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E") ("i"/"I") ("d"/"D")*
typeTokenFilter = *type ws booleanComparisonOperator ws (typeToken / typeTokenSet)*
type = *("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E")*
typeToken = *synonym / fullySpecifiedName / definition*
typeTokenSet = *"(" ws typeToken *(mws typeToken) ws ")"*
synonym = *("s"/"S") ("y"/"Y") ("n"/"N") [("o"/"O") ("n"/"N") ("y"/"Y") ("m"/"M")]*
fullySpecifiedName = *(("f"/"F") ("s"/"S") ("n"/"N")) /*
(("f"/"F") ("u"/"U") ("l"/"L") ("l"/"L") ("y"/"Y") ("s"/"S") ("p"/"P") ("e"/"E") ("c"/"C") ("i"/"I") ("f"/"F") ("i"/"I") ("e"/"E") ("d"/"D") ("n"/"N") ("a"/"A") ("m"/"M") ("e"/"E"))
definition = *("d"/"D") ("e"/"E") ("f"/"F") [("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N")]*
dialectFilter = *(dialectIdFilter / dialectAliasFilter) [ws acceptabilitySet]*
dialectIdFilter = *dialectId ws booleanComparisonOperator ws (subExpressionConstraint / dialectIdSet)*
dialectId = *("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("d"/"D")*
dialectAliasFilter = *dialect ws booleanComparisonOperator ws (dialectAlias / dialectAliasSet)*
dialect = *("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T")*
dialectAlias = *alpha *(dash / alpha / integerValue)*
dialectAliasSet = *"(" ws dialectAlias [ws acceptabilitySet] *(mws dialectAlias [ws acceptabilitySet]) ws ")"*
dialectIdSet = *"(" ws eclConceptReference [ws acceptabilitySet] *(mws eclConceptReference [ws acceptabilitySet]) ws ")"*
acceptabilitySet = *acceptabilityConceptReferenceSet / acceptabilityTokenSet*
acceptabilityConceptReferenceSet = *"(" ws eclConceptReference *(mws eclConceptReference) ws ")"*
acceptabilityTokenSet = *"(" ws acceptabilityToken *(mws acceptabilityToken) ws ")"*
acceptabilityToken = *acceptable / preferred*
acceptable = *("a"/"A") ("c"/"C") ("c"/"C") ("e"/"E") ("p"/"P") ("t"/"T") [("a"/"A") ("b"/"B") ("l"/"L") ("e"/"E")]*
preferred = *("p"/"P") ("r"/"R") ("e"/"E") ("f"/"F") ("e"/"E") ("r"/"R") [("r"/"R") ("e"/"E") ("d"/"D")]*
conceptFilterConstraint = *"{{" ws ("c" / "C") ws conceptFilter *(ws "," ws conceptFilter) ws "}}"*
conceptFilter = *definitionStatusFilter / moduleFilter / effectiveTimeFilter / activeFilter*
definitionStatusFilter = *definitionStatusIdFilter / definitionStatusTokenFilter*
definitionStatusIdFilter = *definitionStatusIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
definitionStatusIdKeyword = *("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S") ("i"/"I") ("d"/"D")*
definitionStatusTokenFilter = *definitionStatusKeyword ws booleanComparisonOperator ws (definitionStatusToken / definitionStatusTokenSet)*
definitionStatusKeyword = *("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S")*
definitionStatusToken = *primitiveToken / definedToken*
definitionStatusTokenSet = *"(" ws definitionStatusToken *(mws definitionStatusToken) ws ")"*
primitiveToken = *("p"/"P") ("r"/"R") ("i"/"I") ("m"/"M") ("i"/"I") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")*
definedToken = *("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("e"/"E") ("d"/"D")*
moduleFilter = *moduleIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)*
moduleIdKeyword = *("m"/"M") ("o"/"O") ("d"/"D") ("u"/"U") ("l"/"L") ("e"/"E") ("i"/"I") ("d"/"D")*
effectiveTimeFilter = *effectiveTimeKeyword ws timeComparisonOperator ws (timeValue / timeValueSet)*
effectiveTimeKeyword
= ("e"/"E") ("f"/"F") ("f"/"F") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E") ("t"/"T") ("i"/"I") ("m"/"M") ("e"/"E")
timeValue = *QM [year month day] QM*
timeValueSet = *"(" ws timeValue *(mws timeValue) ws ")"*
year = *digitNonZero digit digit digit*
month = *"01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12"*

day *= "01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12" / "13" / "14" / "15" / "16" / "17" / "18" / "19" / "20" / "21" / "22" / "23" / "24" / "25" / "26" / "27" / "28" / "29" / "30" / "31"*
activeFilter *= activeKeyword ws booleanComparisonOperator ws activeValue*
activeKeyword *= ("a"/"A") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")*
activeValue *= activeTrueValue / activeFalseValue*
activeTrueValue *= "1" / "true"*
activeFalseValue *= "0" / "false"*
memberFilterConstraint *= "{{" ws ("m" / "M") ws memberFilter *(ws "," ws memberFilter) ws "}}"*
memberFilter *= moduleFilter / effectiveTimeFilter / activeFilter / memberFieldFilter*
memberFieldFilter *= refsetFieldName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue / ws timeComparisonOperator ws (timeValue / timeValueSet))*
historySupplement *= "{{" ws "+" ws historyKeyword [historyProfileSuffix / ws historySubset] ws "}}"*
historyKeyword *= ("h"/"H") ("i"/"I") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("y"/"Y")*
historyProfileSuffix *= historyMinimumSuffix / historyModerateSuffix / historyMaximumSuffix*
historyMinimumSuffix *= ("-"/"_") ("m"/"M") ("i"/"I") ("n"/"N")*
historyModerateSuffix *= ("-"/"_") ("m"/"M") ("o"/"O") ("d"/"D")*
historyMaximumSuffix *= ("-"/"_") ("m"/"M") ("a"/"A") ("x"/"X")*
historySubset *= "(" ws expressionConstraint ws ")"*
numericValue *= ["-"/"+"] (decimalValue / integerValue)*
stringValue *= 1*(anyNonEscapedChar / escapedChar)*
integerValue *= digitNonZero *digit / zero*
decimalValue *= integerValue "." 1*digit*
booleanValue *= true / false*
true *= ("t"/"T") ("r"/"R") ("u"/"U") ("e"/"E")*
false *= ("f"/"F") ("a"/"A") ("l"/"L") ("s"/"S") ("e"/"E")*
nonNegativeIntegerValue *= (digitNonZero *digit) / zero*
sctId *= digitNonZero 5*17(digit)*
ws *= *(SP / HTAB / CR / LF / comment) ; optional white space*
mws *= 1*(SP / HTAB / CR / LF / comment) ; mandatory white space*
comment *= "/*" *(nonStarChar / starWithNonFSlash) "*/"*
nonStarChar *= SP / HTAB / CR / LF / %x21-29 / %x2B-7E /UTF8-2 / UTF8-3 / UTF8-4*
starWithNonFSlash *= %x2A nonFSlash*
nonFSlash *= SP / HTAB / CR / LF / %x21-2E / %x30-7E /UTF8-2 / UTF8-3 / UTF8-4*
SP *= %x20 ; space*
HTAB *= %x09 ; tab*
CR *= %x0D ; carriage return*
LF *= %x0A ; line feed*
QM *= %x22 ; quotation mark*
BS *= %x5C ; back slash*
star *= %x2A ; asterisk*
digit *= %x30-39*
zero *= %x30*
digitNonZero *= %x31-39*
nonwsNonPipe *= %x21-7B / %x7D-7E / UTF8-2 / UTF8-3 / UTF8-4*
anyNonEscapedChar *= SP / HTAB / CR / LF / %x20-21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4*
escapedChar *= BS QM / BS BS*
escapedWildChar *= BS QM / BS BS / BS star*
nonwsNonEscapedChar *= %x21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4*
alpha *= %x41-5A / %x61-7A*
dash *= %x2D*
UTF8-2 *= %xC2-DF UTF8-tail*

> ***UTF8-3*** *= %xE0 %xA0-BF UTF8-tail / %xE1-EC 2(UTF8-tail) / %xED %x80-9F UTF8-tail / %xEE-EF 2(UTF8-tail)*
> ***UTF8-4*** *= %xF0 %x90-BF 2(UTF8-tail) / %xF1-F3 3(UTF8-tail) / %xF4 %x80-8F 2(UTF8-tail)*
> ***UTF8-tail*** *= %x80-BF*

5.3 5.3 Informative Comments

This section provides a short description of each ABNF rule listed above. The related brief and long syntax rules are grouped together with the same description. Where the syntaxes are the same, the rule is listed once and preceded with the text "BS/LS". Where the brief and long syntaxes are different, both rules are listed separately and preceded with "BS" and "LS" respectively.

BS/LS: expressionConstraint = ws (refinedExpressionConstraint / compoundExpressionConstraint / dottedExpressionConstraint / subExpressionConstraint) ws	
	An expression constraint is either a refined expression constraint, a compound expression constraint, a dotted expression constraint, or a sub expression constraint.
BS/LS: refinedExpressionConstraint = subExpressionConstraint ws ":" ws eclRefinement	
	A refined expression constraint includes a subexpression constraint followed by a refinement.
BS/LS: compoundExpressionConstraint = conjunctionExpressionConstraint / disjunctionExpressionConstraint / exclusionExpressionConstraint	
	A compound expression constraint contains two or more expression constraints joined by either a conjunction, disjunction or exclusion. When potential ambiguity in binary operator precedence may occur, round brackets must be used to clearly disambiguate the order in which these operator are applied. Brackets are not required in expression constraints in which all binary operators are conjunctions, or all binary operators are disjunctions. Please note that unary operators (i.e. constraint operators and member of functions) are always applied before binary operators (i.e. conjunction, disjunction and exclusion).
BS/LS: conjunctionExpressionConstraint = subExpressionConstraint 1*(ws conjunction ws subExpressionConstraint)	
	A conjunction expression constraint combines two or more expression constraints with a conjunction ("and") operator. More than one conjunction may be used without brackets. However any compound expression constraint (using a different binary operator) that appears within a conjunction expression constraint must be enclosed by brackets.
BS/LS: disjunctionExpressionConstraint = subExpressionConstraint 1*(ws disjunction ws subExpressionConstraint)	

	A disjunction expression constraint combines two or more expression constraints with a disjunction ("or") operator. More than one disjunction may be used without brackets. However any compound expression constraint (using a different binary operator) that appears within a disjunction expression constraint must be enclosed by brackets.
BS/LS: exclusionExpressionConstraint = subExpressionConstraint ws exclusion ws subExpressionConstraint	
	An exclusion expression constraint combines two expression constrains with an exclusion ("minus") operator. A single exclusion operator may be used without brackets. However when the operands of the exclusion expression constraint are compound, these compound expression constraints must be enclosed by brackets.
BS/LS: dottedExpressionConstraint = subExpressionConstraint 1*(ws dottedExpressionAttribute)	
	A dotted expression constraint contains a sub expression constraint, followed by one or more dotted attributes. When a single dotted attribute is used, the result is the set of attribute values (for the given attribute name) of each concept that results from evaluating the subExpressionConstraint. When more than one dotted attribute is used, each dottedExpressionAttribute is sequentially evaluated (from left to right) against the given result set.
BS/LS: dottedExpressionAttribute = dot ws eclAttributeName	
	A dotted expression attribute consists of a 'dot', followed by an attribute name. Please note that the attribute name may be represented by any sub expression constraint.
BS/LS: subExpressionConstraint = [constraintOperator ws] (([memberOf ws] (eclFocusConcept / "(" ws expressionConstraint ws ")") *(ws memberFilterConstraint)) / (eclFocusConcept / "(" ws expressionConstraint ws ")")) *(ws (descriptionFilterConstraint / conceptFilterConstraint)) [ws historySupplement]	
	A sub expression constraint optionally begins with a constraint operator and/or a memberOf function. It then includes either a single focus concept or an expression constraint (enclosed in brackets). If the memberOf function is applied, a member filter constraint may be used. A sub expression constraint may then optionally include one or more concept or description filter constraints, followed optionally by a history supplement. Notes: A memberOf function should be used only when the eclFocusConcept or expressionConstraint refers to a reference set concept, a set of reference set concepts, or a wild card. When both a constraintOperator and a memberOf function are used, they are applied from the inside to out (i.e. from right to left) - see 5.4 Order of Operation(see page 53). Therefore, if a constraintOperator is followed by a memberOf function, then the memberOf function is processed prior to the constraintOperator.
BS/LS: eclFocusConcept = eclConceptReference / wildCard	

	A focus concept is a concept reference or a wild card.
BS/LS: dot = "."	
	A dot connects an expression constraint with an attribute whose values are included in the result.
BS: memberOf = "^" [ws "[" ws (refsetFieldNameSet / wildCard) ws "]"] **LS: memberOf** = ("^" / ("m"/"M") ("e"/"E") ("m"/"M") ("b"/"B") ("e"/"E") ("r"/"R") ("o"/"O") ("f"/"F")) [ws "[" ws (refsetFieldNameSet / wildCard) ws "]"]	
	By default, the 'memberOf' function returns the set of referenced components in the set of reference sets which follows. In the brief syntax, the memberOf function is represented using the "^" symbol. In the long syntax, the text "memberOf " (case insensitive and followed by at least one white space) is also allowed. If a set of reference set fields is listed in square brackets after the memberOf function, then the values of these fields are returned.
BS/LS: refsetFieldNameSet = refsetFieldName *(ws "," ws refsetFieldName)	
	A refsetFieldNameSet is a set of one or more reference set fields, separated by a comma and optional whitespace.
BS/LS: refsetFieldName = 1*alpha	
	A refsetFieldName is the set of alphabetic characters used to name a reference set field.
BS/LS: eclConceptReference = conceptId [ws "|" ws term ws "|"]	
	A conceptReference is represented by a ConceptId, optionally followed by a term[34] enclosed by a pair of "|" characters. Whitespace before or after the ConceptId is ignored as is any whitespace between the initial "|" characters and the first non-whitespace character in the term[35] or between the last non-whitespace character and before second "|" character.
BS/LS: **eclConceptReferenceSet** = "(" ws eclConceptReference 1*(mws eclConceptReference) ws ")"	
	A concept reference set includes two or more concept references separated by mandatory white space and enclosed in brackets.
BS/LS: conceptId = sctId	

34 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)
35 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)

	The ConceptId must be a valid SNOMED CT identifier[36] for a concept[37]. The initial digit may not be zero. The smallest number of digits is six, and the maximum is 18.
BS/LS: term = 1*nonwsnonpipe *(1*SP 1*nonwsnonpipe)	
	The term[38] must be the term[39] from a SNOMED CT description[40] that is associated with the concept[41] identified by the preceding concept identifier[42]. For example, the term[43] could be the preferred description[44], or the preferred description[45] associated with a particular translation. The term[46] may include valid UTF-8[47] characters except for the pipe "
BS: wildCard = "*" **LS: wildCard** = "*" / (("a"/"A") ("n"/"N") ("y"/"Y"))	
	A wild card represents any concept in the given substrate. In the brief syntax, a wildcard is represented using the "*" symbol. In the long syntax, the text "ANY" (case insensitive) is also allowed.
BS/LS: constraintOperator = childOf / childOrSelfOf / descendantOrSelfOf / descendantOf / parentOf / parentOrSelfOf / ancestorOrSelfOf / ancestorOf	
	A constraint operator is either 'childOf', 'childOrSelfOf', 'descendantOrSelfOf', 'descendantOf', 'parentOf', 'parentOrSelfOf', 'ancestorOrSelfOf', or 'ancestorOf'.
BS: descendantOf = "<" **LS: descendantOf** = "<" / (("d"/"D") ("e"/"E") ("s"/"S") ("c"/"C") ("e"/"E") ("n"/"N") ("d"/"D")("a"/"A") ("n"/"N") ("t"/"T") ("o"/"O")("f"/"F") mws)	
	The descendantOf operator returns the set of all subtypes of the given concept (or set of concepts). In the brief syntax, the descendantOf operator is represented using the symbol "<". In the long syntax, the text "descendantOf" (case insensitive and followed by at least one white space) is also allowed.

36 https://confluence.ihtsdotools.org/display/DOCGLOSS/SNOMED+CT+identifier
37 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
38 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)
39 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)
40 https://confluence.ihtsdotools.org/display/DOCGLOSS/SNOMED+CT+description
41 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
42 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept+identifier
43 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)
44 https://confluence.ihtsdotools.org/display/DOCGLOSS/description
45 https://confluence.ihtsdotools.org/display/DOCGLOSS/description
46 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)
47 https://confluence.ihtsdotools.org/display/DOCRELFMT/UTF-8

BS: descendantOrSelfOf = "<<" **LS: descendantOrSelfOf** = "<<" / (("d"/"D") ("e"/"E") ("s"/"S") ("c"/"C") ("e"/"E") ("n"/"N") ("d"/"D") ("a"/"A") ("n"/"N") ("t"/"T") ("o"/"O")("r"/"R") ("s"/"S")("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O")("f"/"F") mws)	
	The descendantOrSelfOf operator returns the set of all subtypes of the given concept (or set of concepts), plus the concept (or set of concepts) itself. In the brief syntax, the descendantOrSelfOf operator is represented using the symbols "<<". In the long syntax, the text "descendantOrSelfOf" (case insensitive and followed by at least one white space) is also allowed.
BS: childOf = "<!" **LS: childOf** = "<!" / (("c"/"C") ("h"/"H") ("i"/"I") ("l"/"L") ("d"/"D") ("o"/"O") ("f"/"F") mws)	
	The childOf operator returns the set of all immediate children of the given concept (or set of concepts). In the brief syntax, the childOf operator is represented using the symbols "<!". In the long syntax, the text "childOf" (case insensitive and followed by at least one white space) is also allowed.
BS: childOrSelfOf = "<<!" **LS: childOrSelfOf** = "<<!" / (("c"/"C") ("h"/"H") ("i"/"I") ("l"/"L") ("d"/"D") ("o"/"O")("r"/"R") ("s"/"S")("e"/"E") ("l"/"L") ("f"/"F") ("o"/"O") ("f"/"F") mws)	
	The childOrSelfOf operator returns the set of all immediate children of the given concept (or set of concepts), plus the concept (or set of concepts) itself. In the brief syntax, the childOrSelfOf operator is represented using the symbols "<<!". In the long syntax, the text "childOrSelfOf" (case insensitive and followed by at least one white space) is also allowed.
BS: ancestorOf = ">" **LS: ancestorOf** = ">" / (("a"/"A") ("n"/"N") ("c"/"C") ("e"/"E") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("o"/"O") ("f"/"F") mws)	
	The ancestorOf operator returns the set of all supertypes of the given concept (or set of concepts). In the brief syntax, the ancestorOf operator is represented using the symbol ">". In the long syntax, the text "ancestorOf " (case insensitive and followed by at least one white space) is also allowed.
BS: ancestorOrSelfOf = ">>" **LS: ancestorOrSelfOf** = ">>" / (("a"/"A") ("n"/"N") ("c"/"C") ("e"/"E") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L" ("f"/"F") ("o"/"O")("f"/"F") mws)	

	The ancestorOrSelfOf operator returns the set of all supertypes of the given concept (or set of concepts), plus the concept (or set of concepts) itself. In the brief syntax, the ancestorOrSelfOf operator is represented using the symbols ">>". In the long syntax, the text "ancestorOrSelfOf" (case insensitive and followed by at least one white space) is also allowed.
BS: **parentOf** = ">!" **LS:** **parentOf** = ">!" / (("p"/"P") ("a"/"A") ("r"/"R") ("e"/"E") ("n"/"N") ("t"/"T") ("o"/"O") ("f"/"F") mws)	
	The parentOf operator returns the set of all immediate parents of the given concept (or set of concepts). In the brief syntax, the parentOf operator is represented using the symbols ">!". In the long syntax, the text "parentOf" (case insensitive and followed by at least one white space) is also allowed.
BS: **parentOrSelfOf** = ">>!" **LS:** **parentOrSelfOf** = ">>!" / (("p"/"P") ("a"/"A") ("r"/"R") ("e"/"E") ("n"/"N") ("t"/"T") ("o"/"O") ("r"/"R") ("s"/"S") ("e"/"E") ("l"/"L" ("f"/"F") ("o"/"O") ("f"/"F") mws)	
	The parentOrSelfOf operator returns the set of all immediate parents of the given concept (or set of concepts), plus the concept (or set of concepts) itself. In the brief syntax, the parentOrSelfOf operator is represented using the symbols ">>!". In the long syntax, the text "parentOrSelfOf" (case insensitive and followed by at least one white space) is also allowed.
BS/LS: **conjunction** = (("a"/"A") ("n"/"N") ("d"/"D") mws) / ","	
	A conjunction is represented either by the word "and" (case insensitive and followed by at least one white space), or by a comma.
BS/LS: **disjunction** = ("o"/"O") ("r"/"R") mws	
	A disjunction is represented by the word "or" (case insensitive and followed by at least one white space).
BS/LS: **exclusion** = ("m"/"M") ("i"/"I") ("n"/"N") ("u"/"U") ("s"/"S") mws	
	The exclusion operator is represented by the word "minus" (case insensitive and followed by at least one white space).
BS/LS: **eclRefinement** = subRefinement ws [conjunctionRefinementSet / disjunctionRefinementSet]	

	A refinement contains all the grouped and ungrouped attributes that refine the set of clinical meanings satisfied by the expression constraint. Refinements may represent the conjunction or disjunction of two smaller refinements, and may optionally be placed in brackets. Where both conjunction and disjunction are used, brackets are mandatory to disambiguate the intended meaning.
BS/LS: conjunctionRefinementSet = 1*(ws conjunction ws subRefinement)	
	A conjunction refinement set consists of one or more conjunction operators, each followed by a subRefinement.
BS/LS: disjunctionRefinementSet = 1*(ws disjunction ws subRefinement)	
	A disjunction refinement set consists of one or more disjunction operators, each followed by a subRefinement.
BS/LS: subRefinement = eclAttributeSet / eclAttributeGroup / "(" ws eclRefinement ws ")"	
	A subRefinement is either an attribute set, an attribute group or a bracketed refinement.
BS/LS: eclAttributeSet = subAttributeSet ws [conjunctionAttributeSet / disjunctionAttributeSet]	
	An attribute set contains one or more attribute name[48]-value pairs separated by a conjunction or disjunction operator. An attribute set may optionally be placed in brackets.
BS/LS: conjunctionAttributeSet = 1*(ws conjunction ws subAttributeSet)	
	A conjunction attribute set consists of one or more conjunction operators, each followed by a subAttributeSet.
BS/LS: disjunctionAttributeSet = 1*(ws disjunction ws subAttributeSet)	
	A disjunction attribute set consists of one or more disjunction operators, each followed by a subAttributeSet.
BS/LS: subAttributeSet = eclAttribute / "(" ws eclAttributeSet ws ")"	
	A subAttributeSet is either an attribute or a bracketed attribute set.
BS/LS: eclAttributeGroup = ["[" cardinality "]" ws] "{" ws eclAttributeSet ws "}"	

48 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute+name

	An attribute group[49] contains a collection of attributes that operate together as part of the refinement[50] of the containing expression[51] constraint. An attribute group may optionally be preceded by a cardinality. An attribute group cardinality indicates the minimum and maximum number of attribute groups that must satisfy the given attributeSet constraint for the expression constraint to be satisfied.
BS/LS: eclAttribute = ["[" cardinality "]" ws] [reverseFlag ws] eclAttributeName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue)	
	An attribute is a name[52]-value pair expressing a single refinement[53] of the containing expression[54] constraint. Either the attribute value must satisfy (or not) the given expression constraint, the attribute value is compared with a given numeric value (integer or decimal) using a numeric comparison operator, the attribute value must match (or not match) the given typedSearchTerm or typedSearchTermSet, or the attribute value must be equal to (or not equal to) the given boolean value. The attribute may optionally be preceded by a cardinality constraint and/or a reverse flag.
BS/LS: cardinality = minValue to maxValue	
	The cardinality represents a constraint on the minimum and maximum number of times that the given attribute or attribute group may appear in a matching expression. The cardinality is enclosed in square brackets with the minimum cardinality appearing first, followed by a separator (two dots in the brief syntax), and then the maximum cardinality.
BS/LS: minValue = nonNegativeIntegerValue	
	A value that represents the minimum number of times that an attribute or attribute group may appear. The minimum cardinality must always be less than or equal to the maximum cardinality.
BS: to = ".." **LS: to** = ".." / (mws ("t"/"T") ("o"/"O") mws)	
	In the brief syntax, the minimum and maximum cardinality are separated by two dots (i.e. ".."). In the long syntax, the text "to" (case insensitive with at least one white space before and after) is also allowed between the two cardinalities.
BS/LS: maxValue = nonNegativeIntegerValue / many	

49 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute+group
50 https://confluence.ihtsdotools.org/display/DOCGLOSS/refinement
51 https://confluence.ihtsdotools.org/display/DOCGLOSS/expression
52 https://confluence.ihtsdotools.org/display/DOCGLOSS/attribute+name
53 https://confluence.ihtsdotools.org/display/DOCGLOSS/refinement
54 https://confluence.ihtsdotools.org/display/DOCGLOSS/expression

	A value that represents the maximum number of times that an attribute or attribute group may appear. A maximum cardinality of 'many' indicates that there is no limit on the number of times the attribute may appear.
BS: **many** = "*" **LS:** **many** = "*" / (("m"/"M") ("a"/"A") ("n"/"N") ("y"/"Y"))	
	In the brief syntax, a cardinality of 'many' is represented using the symbol "*". In the long syntax, the text "many" (case insensitive, with no trailing space) is also allowed.
BS: **reverseFlag** = "R" **LS:** **reverseFlag** = (("r"/"R") ("e"/"E") ("v"/"V") ("e"/"E") ("r"/"R") ("s"/"S") ("e"/"E") ("o"/"O") ("f"/"F")) / "R"	
	When a reverse flag is used on an attribute, the matching relationships are traversed in the reverse of the normal direction. This means that the target concept of each relationship must match the focus concept to which the attribute is applied, while the source concept of the relationship must match the attribute value. In the brief syntax, the reverse flag is represented using the character "R" (in uppercase). In the long syntax, the text "reverseOf " (case insensitive) is also allowed.
BS/LS: **eclAttributeName** = subExpressionConstraint	
	The attribute name is the name of an attribute (or relationship type) to which a value is applied to refine the meaning of a containing expression constraint. The attribute name is represented using a subExpressionConstraint, as defined above.
BS: **expressionComparisonOperator** = "=" / "!=" **LS:** **expressionComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"	
	Attributes whose value is a concept may be compared to an expression constraint using either equals ("=") or not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.
BS: **numericComparisonOperator** = "=" / "!=" / "<=" / "<" / ">=" / ">" **LS:** **numericComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>" / "<=" / "<" / ">=" / ">"	
	Attributes whose value is numeric (i.e. integer or decimal) may be compared to a specific concrete value using a variety of comparison operators, including equals ("="), less than ("<"), less than or equals ("<="), greater than (">"), greater than or equals (">=") and not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.

BS: timeComparisonOperator = "=" / "!=" / "<=" / "<" / ">=" / ">" **LS: timeComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>" / "<=" / "<" / ">=" / ">"	
	Date and time values may be compared using a variety of comparison operators, , including equals ("="), less than ("<"), less than or equals ("<="), greater than (">"), greater than or equals (">=") and not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.
BS: stringComparisonOperator = "=" / "!=" **LS: stringComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"	
	Attributes whose value is a string may be compared to an expression constraint using either equals ("=") or not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.
BS: booleanComparisonOperator = "=" / "!=" **LS: booleanComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"	
	Attributes whose value is a boolean may be compared to an expression constraint using either equals ("=") or not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.
BS: idComparisonOperator = "=" / "!=" **LS: idComparisonOperator** = "=" / "!=" / ("n"/"N") ("o"/"O") ("t"/"T") ws "=" / "<>"	
	Filter criteria whose value is a SCTID may be compared to a SNOMED CT identifier using either equals ("=") or not equals ("!="). In the long syntax "<>" and "not =" (case insensitive) are also valid ways to represent not equals.
BS/LS: descriptionFilterConstraint = "{{" ws ["d", / "D"] ws descriptionFilter *(ws "," ws descriptionFilter) ws "}}"	
	A descriptionFilterConstraint is a constraint used to filter the concepts in the result set, according to whether or not the given conditions match at least one of the concept's descriptions. A description filter constraint is always enclosed in double curly braces. Within these braces, it should (preferably) start with the letter 'D' followed by one or more description filters.
BS/LS: descriptionFilter = termFilter / languageFilter / typeFilter / dialectFilter / moduleFilter / effectiveTimeFilter / activeFilter / descriptionIdFilter	
	A description filter is either a term filter, a language filter, a type filter, a dialect filter, a module filter, an effective time filter, an active filter or a description id filter.

BS/LS: descriptionIdFilter = descriptionIdKeyword ws idComparisonOperator ws (descriptionId / descriptionIdSet)	
	A descriptionIdFilter starts with the 'id' keyword, followed by an id comparison operator and either a single description id or a set of description ids.
BS/LS: descriptionIdKeyword = ("i"/"I") ("d"/"D")	
	The description id keyword uses the text "id" (case insensitive)
BS/LS: descriptionId = sctId	
	The descriptionId must be a valid SNOMED CT identifier[55] for a description[56]. The initial digit may not be zero. The smallest number of digits is six, and the maximum is 18.
BS/LS: descriptionIdSet = "(" ws descriptionId *(mws descriptionId) ws ")"	
	A description id set consists of one or more description ids separated by mandatory white space and enclosed in brackets.
BS/LS: termFilter = termKeyword ws stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet)	
	A termFilter starts with the 'term' keyword, followed by a string comparison operator and either a typed search term or a typed search term set (with optional white space between). For example: term = "respiratory".
BS/LS: termKeyword = ("t"/"T") ("e"/"E") ("r"/"R") ("m"/"M")	
	The term keyword uses the text "term" (case insensitive).
BS/LS: typedSearchTerm = ([matchKeyword ws ":" ws] matchSearchTermSet) / (wild ws ":" ws wildSearchTermSet)	
	A typed search term is either a match search term set or a wild search term set. A match search term set is optionally preceded by the text "match" and a colon. A wild search term set must be preceded by the text "wild" and a colon.
BS/LS: typedSearchTermSet = "(" ws typedSearchTerm *(mws typedSearchTerm) ws ")"	

55 https://confluence.ihtsdotools.org/display/DOCGLOSS/SNOMED+CT+identifier
56 https://confluence.ihtsdotools.org/display/DOCGLOSS/description

	A typed search term set consists of one or more typed search terms separated by mandatory white space and enclosed in brackets.
BS/LS: wild = ("w"/"W") ("i"/"I") ("l"/"L") ("d"/"D")	
	A wildcard search type is indicated by the word "wild" (case insensitive).
BS/LS: matchKeyword = ("m"/"M") ("a"/"A") ("t"/"T") ("c"/"C") ("h"/"H")	
	A word prefix any order search is indicated by the word "match" (case insensitive).
BS/LS: matchSearchTerm = 1*(nonwsNonEscapedChar / escapedChar)	
	A term used in a match search includes one or more of any non-whitespace printable character (other than double quotes or backslash) or an escaped character.
BS/LS: matchSearchTermSet = QM ws matchSearchTerm *(mws matchSearchTerm) ws QM	
	A term set in a match search includes one or more terms separated by mandatory whitespace and enclosed in quotation marks.
BS/LS: wildSearchTerm = 1*(anyNonEscapedChar / escapedWildChar)	
	A term used in a wildcard search includes one or more printable characters (other than double quotes or backslash) or an escaped character.
BS/LS: wildSearchTermSet = QM wildSearchTerm QM	
	A term set in a wildcard search includes a wildcard search term (optionally including whitespace) enclosed in quotation marks.
BS/LS: languageFilter = language ws booleanComparisonOperator ws (languageCode / languageCodeSet)	
	A language filter specifies the languages that a matching description may use. A language filter starts with the 'language' keyword, followed by a boolean comparison operator and either a single language code or a set of language codes.
BS/LS: language = ("l"/"L") ("a"/"A") ("n"/"N") ("g"/"G") ("u"/"U") ("a"/"A") ("g"/"G") ("e"/"E")	
	The 'language' keyword uses the text "LANGUAGE" (case insensitive).
BS/LS: languageCode = 2alpha	

	A language code is a 2 character alphanumeric string.
BS/LS: languageCodeSet = "(" ws languageCode *(mws languageCode) ws ")"	
	A language code set is one or more language codes, separated by mandatory whitespace, and enclosed in brackets.
BS/LS: typeFilter = typeIdFilter / typeTokenFilter	
	A type filter specifies the description types that a matching description may have. A type filter is either a typeId filter or a typeToken filter.
BS/LS: typeIdFilter = typeId ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)	
	A typeId filter starts with the 'typeId' keyword, followed by a boolean comparison operator, and either a subExpressionConstraint or a set of concept references.
BS/LS: typeId = ("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E") ("i"/"I") ("d"/"D")	
	The 'typeId' keyword uses the text "TYPEID" (case insensitive).
BS/LS: typeTokenFilter = type ws booleanComparisonOperator ws (typeToken / typeTokenSet)	
	A typeToken filter starts with the 'type' keyword, followed by a boolean comparison operator, and either a single type token or a set of type tokens.
BS/LS: type = ("t"/"T") ("y"/"Y") ("p"/"P") ("e"/"E")	
	The 'type' keyword uses the text "TYPE" (case insensitive).
BS/LS: typeToken = synonym / fullySpecifiedName / definition	
	A type token is either a 'synonym' token, a 'fully specified name' token or a 'definition' token.
BS/LS: typeTokenSet = "(" ws typeToken *(mws typeToken) ws ")"	
	A type token set is one or more type tokens, separated by mandatory whitespace and enclosed in brackets.

BS: synonym = ("s"/"S") ("y"/"Y") ("n"/"N") **LS: synonym** = ("s"/"S") ("y"/"Y") ("n"/"N") [("o"/"O") ("n"/"N") ("y"/"Y") ("m"/"M")]	
	A 'synonym' token uses the text "SYN" (case insensitive). In the long syntax, the text "Synonym" (case insensitive) may be used instead.
BS: fullySpecifiedName = ("f"/"F") ("s"/"S") ("n"/"N") **LS: fullySpecifiedName** = (("f"/"F") ("s"/"S") ("n"/"N")) / (("f"/"F") ("u"/"U") ("l"/"L") ("l"/"L") ("y"/"Y") ("s"/"S") ("p"/"P") ("e"/"E") ("c"/"C") ("i"/"I") ("f"/"F") ("i"/"I") ("e"/"E") ("d"/"D") ("n"/"N") ("a"/"A") ("m"/"M") ("e"/"E"))	
	A 'fully specified name' token uses the text "FSN" (case insensitive). In the long syntax, the text "FullySpecifiedName" (case insensitive) may be used instead.
BS: definition = ("d"/"D") ("e"/"E") ("f"/"F") **LS: definition** = ("d"/"D") ("e"/"E") ("f"/"F") [("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N")]	
	A 'definition' token uses the text "DEF" (case insensitive). In the long syntax, the text "Definition" (case insensitive) may be used instead.
BS/LS: dialectFilter = (dialectIdFilter / dialectAliasFilter) [ws acceptabilitySet]	
	A dialect filter specifies the language reference sets to which a matching description must belong. A dialect filter consists of either a dialectId filter or a dialectAlias filter, optionally followed by a set of acceptability values.
BS/LS: dialectIdFilter = dialectId ws booleanComparisonOperator ws (subExpressionConstraint / dialectIdSet)	
	A dialectId filter starts with the 'dialectId' keyword, followed by a boolean comparison operator, and either a subExpressionConstraint or a set of dialectIds.
BS/LS: dialectId = ("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("d"/"D")	
	A 'dialectId' keyword uses the text "DIALECTID" (case insensitive).
BS/LS: dialectAliasFilter = dialect ws booleanComparisonOperator ws (dialectAlias / dialectAliasSet)	
	A dialectAlias filter starts with the 'dialect' keyword, followed by a boolean comparison operator, and either a single dialect alias or a set of dialect aliases.
BS/LS: dialect = ("d"/"D") ("i"/"I") ("a"/"A") ("l"/"L") ("e"/"E") ("c"/"C") ("t"/"T")	

	A 'dialect' keyword uses the text "DIALECT" (case insensitive).
BS/LS: dialectAlias = alpha *(dash / alpha / integerValue)	
	A dialect alias consists of a single alphanumeric character followed by zero or more alphanumeric characters, integer values or dashes.
BS/LS: dialectAliasSet = "(" ws dialectAlias [ws acceptabilitySet] *(mws dialectAlias [ws acceptabilitySet]) ws ")"	
	A dialect alias set is one or more dialect aliases followed by an optional acceptability set, separated by mandatory white space, and enclosed in brackets.
BS/LS: dialectIdSet = "(" ws eclConceptReference [ws acceptabilitySet] *(mws eclConceptReference [ws acceptabilitySet]) ws ")"	
	A dialect id set is one or more concept references followed by an optional acceptability set, separated by mandatory white space, and enclosed in brackets.
BS/LS: acceptabilitySet = acceptabilityConceptReferenceSet / acceptabilityTokenSet	
	An acceptability set specifies the acceptabilities that a matching description must have in the language reference set specified by the preceding dialect filter. An acceptability set is either a set of one or more concept references or an acceptabilityToken set.
BS/LS: acceptabilityConceptReferenceSet = "(" ws eclConceptReference *(mws eclConceptReference) ws ")"	
	An acceptability concept reference set is a set of one or more references to concepts that are a < 900000000000511003 |Acceptability|.
BS/LS: acceptabilityTokenSet = "(" ws acceptabilityToken *(mws acceptabilityToken) ws ")"	
	An acceptability token set is one or more acceptability tokens, separated by mandatory whitespace, and enclosed in brackets.
BS/LS: acceptabilityToken = acceptable / preferred	
	An acceptability token is either an acceptable token and a preferred token.
BS: acceptable = ("a"/"A") ("c"/"C") ("c"/"C") ("e"/"E") ("p"/"P") ("t"/"T") **LS: acceptable** = ("a"/"A") ("c"/"C") ("c"/"C") ("e"/"E") ("p"/"P") ("t"/"T") [("a"/"A") ("b"/"B") ("l"/"L") ("e"/"E")]	

	An acceptable token uses the text "ACCEPT" (case insensitive). In the long syntax, the text "Acceptable" (case insensitive) may be used instead.
BS: preferred = ("p"/"P") ("r"/"R") ("e"/"E") ("f"/"F") ("e"/"E") ("r"/"R") **LS: preferred** = ("p"/"P") ("r"/"R") ("e"/"E") ("f"/"F") ("e"/"E") ("r"/"R") [("r"/"R") ("e"/"E") ("d"/"D")]	
	A preferred token uses the text "PREFER" (case insensitive). In the long syntax, the text "Preferred" (case insensitive) may be used instead.
BS/LS: conceptFilterConstraint = "{{" ws ("c" / "C") ws conceptFilter *(ws "," ws conceptFilter) ws "}}"	
	A concept filter constraint is a constraint used to filter the concepts in the result set, according to whether or not the concept matches the given conditions. A concept filter constraint is always enclosed in double curly braces. Within these braces, it starts with the letter 'C' followed by one or more constraint filters.
BS/LS: conceptFilter = definitionStatusFilter / moduleFilter / effectiveTimeFilter / activeFilter	
	A concept filter is either a definition status filter, a module filter, an effective time filter or an active filter.
BS/LS: definitionStatusFilter = definitionStatusIdFilter / definitionStatusTokenFilter	
	A definition status filter is constraint that either filters the results of a query, based on each concept's definition status identifier or a token.
BS/LS: definitionStatusIdFilter = definitionStatusIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceset)	
	A definition status filter is a constraint that filters the results of a query, based on whether or not each concept's definition status matches a given identifier. The filter starts with the keyword "definitionStatusId", followed by a boolean comparison operator and either a subexpression constraint or a set of concept references that are a subtype of 900000000000444006 | Definition status[57] .
BS/LS: definitionStatusIdKeyword = ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S") ("i"/"I") ("d"/"D")	
	The definition status id keyword is the text "definitionStatusId" (in any combination of upper or lower case).

57 http://snomed.info/id/900000000000444006

BS/LS: definitionStatusTokenFilter = definitionStatusKeyword ws booleanComparisonOperator ws (definitionStatusToken / definitionStatusTokenSet)	
	A definition status filter is a constraint that filters the results of a query, based on whether or not each concept's definition status matches a given token.
BS/LS: definitionStatusKeyword = ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("i"/"I") ("t"/"T") ("i"/"I") ("o"/"O") ("n"/"N") ("s"/"S") ("t"/"T") ("a"/"A") ("t"/"T") ("u"/"U") ("s"/"S")	
	The definition status keyword is the text "definitionStatus" (in any combination of upper or lower case).
BS/LS: definitionStatusToken = primitiveToken / definedToken	
	A definition status token is either a primitive token or a defined token.
BS/LS: definitionStatusTokenSet = "(" ws definitionStatusToken *(mws definitionStatusToken) ws ")"	
	A definition status token set consists of one or more definition status tokens separated by mandatory white space and enclosed in brackets.
BS/LS: primitiveToken = ("p"/"P") ("r"/"R") ("i"/"I") ("m"/"M") ("i"/"I") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")	
	A primitive token represents the definition status 900000000000074008 | Primitive[58] using the text "primitive" (in any combination of upper and lower case characters).
BS/LS: definedToken = ("d"/"D") ("e"/"E") ("f"/"F") ("i"/"I") ("n"/"N") ("e"/"E") ("d"/"D")	
	A defined token represents the definition status 900000000000073002 | Defined[59] using the text "defined" (in any combination of upper and lower case characters).
BS/LS: moduleFilter =moduleIdKeyword ws booleanComparisonOperator ws (subExpressionConstraint / eclConceptReferenceSet)	
	A module filter is a constraint that filters the results of a query based on the module to which each concept belongs. The filter starts with the keyword "moduleId", followed by a boolean comparison operator and either a subexpression constraint or a set of concept references that are a subtype of 900000000000443000 | Module[60] .
BS/LS: moduleIdKeyword = ("m"/"M") ("o"/"O") ("d"/"D") ("u"/"U") ("l"/"L") ("e"/"E") ("i"/"I") ("d"/"D")	

58 http://snomed.info/id/900000000000074008
59 http://snomed.info/id/900000000000073002
60 http://snomed.info/id/900000000000443000

	The module id keyword is the text "moduleId" (in any combination of upper or lower case).
BS/LS: effectiveTimeFilter = effectiveTimeKeyword ws timeComparisonOperator ws (timeValue / timeValeSet)	
	An effective time filter is a constraint that filters the results of a query based on the effective time assigned to each concept.
BS/LS: effectiveTimeKeyword = ("e"/"E") ("f"/"F") ("f"/"F") ("e"/"E") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E") ("t"/"T") ("i"/"I") ("m"/"M") ("e"/"E")	
	The effective time keyword is the text "effectiveTime" (in any combination of upper or lower case).
BS/LS: timeValue = QM [year month day] QM	
	A time value is a 8 digit string that represents the year, month and day of a specific date.
BS/LS: timeValueSet = "(" ws timeValue *(mws timeValue) ws ")"	
	A time value set consists of one or more time values separated by mandatory white space and enclosed in brackets.
BS/LS: year = digitNonZero digit digit digit	
	A year is a 4 digit string starting with a non-zero digit.
BS/LS: month = "01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12"	
	A month is a 2 digit string from "01" to "12" that represents a specific month of the year (e.g. "01" represents January)
BS/LS: day = "01" / "02" / "03" / "04" / "05" / "06" / "07" / "08" / "09" / "10" / "11" / "12" / "13" / "14" / "15" / "16" / "17" / "18" / "19" / "20" / "21" / "22" / "23" / "24" / "25" / "26" / "27" / "28" / "29" / "30" / "31"	
	A day is a 2 digit string from "01" to "31" that represents a specific day within a month of a year.
BS/LS: activeFilter = activeKeyword ws booleanComparisonOperator ws activeValue	

	An active filter is a constraint that filters the results of a query based on the active status of each concept
BS/LS: activeKeyword = ("a"/"A") ("c"/"C") ("t"/"T") ("i"/"I") ("v"/"V") ("e"/"E")	
	The active keyword is the text "active" (in any combination of upper or lower case).
BS/LS: activeValue = activeTrueValue / activeFalseValue	
	An active value represents the active status of a concept, and is either true (i.e. the concept is active) or false (i.e. the concept is inactive).
BS/LS: activeTrueValue = "1" / "true"	
	An active true value is a value that represents an active concept. This value is either "1" or "true".
BS/LS: activeFalseValue = "0" / "false"	
	An active false value is a value that represents an inactive concept. This value is either "0" or "false".
BS/LS: memberFilterConstraint = "{{" ws ("m" / "M") ws memberFilter *(ws "," ws memberFilter) ws "}}"	
	A member filter constraint is a constraint used to filter the rows in one or more result sets, according to values of particular fields. A member filter constraint is always surrounded by double curly braces. Within these braces, it starts with the letter 'M' followed by one or more member filters.
BS/LS: memberFilter = moduleFilter / effectiveTimeFilter / activeFilter / memberFieldFilter	
	A member filter is either a module filter, an effective time filter, an active filter, or a member field filter.
BS/LS: memberFieldFilter = refsetFieldName ws (expressionComparisonOperator ws subExpressionConstraint / numericComparisonOperator ws "#" numericValue / stringComparisonOperator ws (typedSearchTerm / typedSearchTermSet) / booleanComparisonOperator ws booleanValue / ws timeComparisonOperator ws (timeValue / timeValueSet))	

	A member field filter always has three parts - (1) the reference set field name, (2) a comparison operator, and (3) the criteria on which to match the field's value. If the refset field is of type SNOMED CT concept, then an expression comparison operator is used, followed by a subexpression constraint. If the refset field is a numeric type, then a numeric comparison operator is used, followed by a hash symbol ("#") and a numeric value. If the refset field is of type string, then a string comparison operator is used, followed by a typed search term or a typed search term set. If the refset field is of type boolean, then a boolean comparison operator is used, followed by a boolean value. And if the refset field is of type dateTime, then a time comparison operator is used, followed by a time value or time value set.
BS/LS: historySupplement = "{{" ws "+" ws historyKeyword [historyProfileSuffix / ws historySubset] ws "}}"	
	A history supplement augments the results of the expression constraint with relevant inactive concepts. A history supplement is always surrounded by double curly braces. Within these braces, it starts with a plus symbol (i.e. "+"), followed by the history keyword. The history keyword is optionally followed by either a profile suffix, or a history subset.
BS/LS: historyKeyword = ("h"/"H") ("i"/"I") ("s"/"S") ("t"/"T") ("o"/"O") ("r"/"R") ("y"/"Y")	
	The history keyword is the word "HISTORY" (case insensitive).
BS/LS: historyProfileSuffix = historyMinimumSuffix / historyModerateSuffix / historyMaximumSuffix	
	A history profile suffix is either the suffix for history minimum, history moderate or history maximum.
BS/LS: historyMinimumSuffix = ("-"/"_")("m"/"M") ("i"/"I") ("n"/"N")	
	The history minimum suffix is "-MIN" (case insensitive). The suffix may start with either a hyphen (i.e. "-") or an underscore (i.e. "_").
BS/LS: historyModerateSuffix = ("-"/"_") ("m"/"M") ("o"/"O") ("d"/"D")	
	The history moderate suffix is "-MOD" (case insensitive). The suffix may start with either a hyphen (i.e. "-") or an underscore (i.e. "_").
BS/LS: historyMaximumSuffix = ("-"/"_") ("m"/"M") ("a"/"A") ("x"/"X")	
	The history maximum suffix is "-MAX" (case insensitive). The suffix may start with either a hyphen (i.e. "-") or an underscore (i.e. "_").
BS/LS: historySubset = "(" ws expressionConstraint ws ")"	

	A history subset is an expression constraint that defines a set of historical association reference sets, surrounded by round brackets. Only descendants of 900000000000522004 | Historical association reference set |[61] may be included in a history subset.
BS/LS: numericValue = ["-"/"+"] (decimalValue / integerValue)	
	A numeric value is either an integer or a decimal. Positive numbers optionally start with a plus sign ("+"), while negative integers begin with a minus sign ("-").
BS/LS: stringValue = 1*(anyNonEscapedChar / escapedChar)	
	A string value includes one or more of any printable ASCII characters enclosed in quotation marks. Quotes and backslash characters within the string must be preceded by the escape character ("\").
BS/LS: integerValue = digitNonZero *digit / zero	
	An integer value is either starts with a non-zero digit followed by zero to many additional digits, or is the integer zero itself.
BS/LS: decimalValue = integerValue "." 1*digit	
	A decimal value starts with an integer. This is followed by a decimal point and one to many digits.
BS/LS: booleanValue = true / false	
	A boolean value is either true or false.
BS/LS: true = ("t"/"T") ("r"/"R") ("u"/"U") ("e"/"E")	
	A boolean value of true is represented by the word "true" (case insensitive).
BS/LS: false = ("f"/"F") ("a"/"A") ("l"/"L") ("s"/"S") ("e"/"E")	
	A boolean value of false is represented by the word "false" (case insensitive).
BS/LS: nonNegativeIntegerValue = (digitNonZero *digit) / zero	
	A non-negative integer value (i.e. positive integers or zero), without a preceding plus sign ("+").

61 http://snomed.info/id/900000000000522004

BS/LS: sctId = digitNonZero 5*17(digit)	
	A SNOMED CT id is used to represent an attribute id or a concept[62] id. The initial digit may not be zero. The smallest number of digits is six, and the maximum is 18.
BS/LS: ws = *(SP / HTAB / CR / LF / comment)	
	Optional whitespace characters (space, tab, carriage return, linefeed or a comment) are ignored everywhere in the expression[63] except: 1. Whitespace within a conceptId is an error. **Note:** Whitespace before or after the last digit of a valid Identifier[64] is ignored. 2. Non-consecutive spaces within a term are treated as a significant character of the term. **Note:** Whitespace before the first or after the last non-whitespace character of a term[65] is ignored 3. Whitespace within the quotation marks of a concrete value is treated as a significant character.
BS/LS: mws = 1*(SP / HTAB / CR / LF / comment)	
	Mandatory whitespace (i.e. space, tab, carriage return, linefeed or a comment) is required after certain keywords, including "And" and "Or".
BS/LS: comment = "/*" *(nonStarChar / starWithNonLSlash) "*/"	
	A comment, which provides additional human-readable details about the expression constraint. Comments begin with a forward slash directly followed by a star (i.e. "/*") and end with a star directly followed by a forward slash (i.e. "*/").
BS/LS: nonStarChar = SP / HTAB / CR / LF / %x21-29 / %x2B-7E /UTF8-2 / UTF8-3 / UTF8-4	
	A character that is not a star (i.e. not %x2A).
BS/LS: starWithNonLSlash = %x2A nonLSlash	
	A star (i.e. "*") followed by a character that is not a forward slash (i.e. not "/").
BS/LS: nonLSlash = SP / HTAB / CR / LF / %x21-2E / %x30-7E /UTF8-2 / UTF8-3 / UTF8-4	
	A character that is not a forward slash (i.e. not "/").

62 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept
63 https://confluence.ihtsdotools.org/display/DOCGLOSS/expression
64 https://confluence.ihtsdotools.org/display/DOCGLOSS/Identifier
65 https://confluence.ihtsdotools.org/display/DOCRELFMT/term+(field)

BS/LS: SP = %x20	
	Space character.
BS/LS: HTAB = %x09	
	Tab character.
BS/LS: CR = %x0D	
	Carriage return character.
BS/LS: LF = %x0A	
	Line feed character.
BS/LS: QM = %x22	
	Quotation mark character.
BS/LS: BS = %x5C ; back slash	
	BS represents the backslash character "\".
BS/LS: star = %x2A ; asterisk	
	Star represents an asterisk "*".
BS/LS: digit = %x30-39	
	Any digit 0 through 9.
BS/LS: zero = %x30	
	The digit 0.
BS/LS: digitNonZero = %x31-39	

	Digits 1 through 9, but excluding 0. The first character of a concept identifier[66] is constrained to a digit other than zero.
BS/LS: nonwsnonpipe= %x21-7B / %x7D-7E / UTF8-2 / UTF8-3 / UTF8-4	
	Non whitespace (and non pipe) includes printable ASCII characters (these are also valid UTF8 characters encoded as one octet) and also includes all UTF8 characters encoded as 2- 3- or 4-octet sequences. It excludes space (which is %x20) and the pipe character "
BS/LS: anyNonEscapedChar = SP / HTAB / CR / LF / %x20-21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4	
	anyNonEscapedChar includes any printable ASCII characters which do not need to be preceded by an escape character (i.e. "\"). This includes valid UTF8 characters encoded as one octet and all UTF8 characters encoded as 2, 3 or 4 octet sequences. It does, however, exclude the quotation mark (") and the backslash (). See RFC 3629 (UTF-8[67], a transformation[68] format of ISO[69] 10646 authored by the Network Working Group).
BS/LS: escapedChar = BS QM / BS BS	
	The double quotation mark and the back slash character must both be escaped within a string-based concrete value by preceding them with a back slash.
BS/LS: escapedWildChar = BS QM / BS BS / BS star	
	An escapedWildChar is one of the characters that must be escaped in a wildcard search term (i.e. " or \ or *), preceded by a backslash (i.e. \). The character sequence is therefore either \" or \\ or *.
BS/LS: nonwsNonEscapedChar = %x21 / %x23-5B / %x5D-7E / UTF8-2 / UTF8-3 / UTF8-4	
	A nonwsNonEscapedChar is any printable ASCII, UTF8-2, UTF8-3 or UTF8-4 character, excluding double quotes ("), backslash (\), and space ( ).
BS/LS: alpha = %x41-5A / %x61-7A	
	An alpha is any uppercase or lowercase character from "A" to "Z" (and "a" to "z") inclusive.
BS/LS: dash = %x2D	

66 https://confluence.ihtsdotools.org/display/DOCGLOSS/concept+identifier
67 https://confluence.ihtsdotools.org/display/DOCRELFMT/UTF-8
68 https://confluence.ihtsdotools.org/display/DOCGLOSS/transformation
69 https://confluence.ihtsdotools.org/display/DOCGLOSS/ISO

	A dash is a hyphen (i.e. "-").
BS/LS: UTF8-2 = %xC2-DF UTF8-tail	
	UTF8 characters encoded as 2-octet sequences.
BS/LS: UTF8-3 = %xE0 %xA0-BF UTF8-tail / %xE1-EC 2(UTF8-tail) / %xED %x80-9F UTF8-tail / %xEE-EF 2(UTF8-tail)	
	UTF8 characters encoded as 3-octet sequences.
BS/LS: UTF8-4 = %xF0 %x90-BF 2(UTF8-tail) / %xF1-F3 3(UTF8-tail) / %xF4 %x80-8F 2(UTF8-tail)	
	UTF8 characters encoded as 4-octet sequences.
BS/LS: UTF8-tail = %x80-BF	
	UTF8 characters encoded as 8-octet sequences.

5.4 5.4 Order of Operation

This section explains the correct order of operation for unary operators, binary operators, filters and supplements.

5.4.1 Unary Operators

Unary operators (e.g. descendantOf, descendantOrSelfOf, ancestorOf, ancestorOrSelfOf, memberOf) are applied from inside to out (i.e. from right to left). For example, when the following expression constraint is processed, the memberOf operator is applied first to the Example problem list concepts reference set, and then the descendants of the referenced components are determined.

```
< ^ 700043003 |Example problem list concepts reference set|
```
[70]

5.4.2 Binary Operators

Whenever potential ambiguity in binary operator precedence may occur, round brackets must be used to clearly disambiguate the order in which these operators are applied. For example, the following expression constraint is not valid:

70 http://snomed.info/id/700043003

```
< 19829001 |Disorder of lung|[71] OR ^ 700043003 |Example problem list concepts reference set|[72]
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[73]
```

And must be expressed using brackets, as either:

```
(< 19829001 |Disorder of lung|[74] OR ^ 700043003 |Example problem list concepts reference set|[75] )
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[76]
```

or:

```
< 19829001 |Disorder of lung|[77] OR (^ 700043003 |Example problem list concepts reference set|[78]
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[79] )
```

When multiple exclusion operators (i.e. 'minus') are applied, brackets are similarly required. For example, the following expression constraint is not valid:

```
< 19829001 |Disorder of lung|[80] MINUS ^ 700043003 |Example problem list concepts reference set|[81]
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[82]
```

And must be expressed using brackets, as either:

```
(< 19829001 |Disorder of lung|[83] MINUS ^ 700043003 |Example problem list concepts reference set|[84] )
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[85]
```

or:

71 http://snomed.info/id/19829001
72 http://snomed.info/id/700043003
73 http://snomed.info/id/450976002
74 http://snomed.info/id/19829001
75 http://snomed.info/id/700043003
76 http://snomed.info/id/450976002
77 http://snomed.info/id/19829001
78 http://snomed.info/id/700043003
79 http://snomed.info/id/450976002
80 http://snomed.info/id/19829001
81 http://snomed.info/id/700043003
82 http://snomed.info/id/450976002
83 http://snomed.info/id/19829001
84 http://snomed.info/id/700043003
85 http://snomed.info/id/450976002

```
< 19829001 |Disorder of lung|[86] MINUS (^ 700043003 |Example problem list concepts reference set|[87]
    MINUS ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[88] )
```

However, when only a single binary operator is used, or when all binary operators are either conjunction (i.e. 'and') or disjunction (i.e. 'or'), brackets are not required. For example, all of the following expression constraints are valid without brackets:

```
< 19829001 |Disorder of lung|[89] AND ^ 700043003 |Example problem list concepts reference set|[90]
```

```
< 19829001 |Disorder of lung|[91] OR ^ 700043003 |Example problem list concepts reference set|[92]
```

```
< 19829001 |Disorder of lung|[93] MINUS ^ 700043003 |Example problem list concepts reference set|[94]
```

```
< 19829001 |Disorder of lung|[95] OR ^ 700043003 |Example problem list concepts reference set|[96]
    OR ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[97]
```

```
< 19829001 |Disorder of lung|[98] AND ^ 700043003 |Example problem list concepts reference set|[99]
    AND ^ 450976002 |Disorders and diseases reference set for GP/FP reason for encounter|[100]
```

Please note that unary operators are always applied before binary operators.

---

86 http://snomed.info/id/19829001
87 http://snomed.info/id/700043003
88 http://snomed.info/id/450976002
89 http://snomed.info/id/19829001
90 http://snomed.info/id/700043003
91 http://snomed.info/id/19829001
92 http://snomed.info/id/700043003
93 http://snomed.info/id/19829001
94 http://snomed.info/id/700043003
95 http://snomed.info/id/19829001
96 http://snomed.info/id/700043003
97 http://snomed.info/id/450976002
98 http://snomed.info/id/19829001
99 http://snomed.info/id/700043003
100 http://snomed.info/id/450976002

5.4.3 Filter Constraints

Filter constraints (e.g. concept, description, or member filters) apply only to the sub-expression constraint part that is directly to the left of the filter.

For example, the following expression constraint will apply the term filter to only the descendants or self of 415582006 | Stenosis|[101] . This expression constraint will match descendants of 404684003 | Clinical finding|[102] with a finding site that is a descendant or self of 39057004 | Pulmonary valve structure|[103] , and an associated morphology that is any descendant or self of 415582006 | Stenosis|[104] which has a description matching the term "insufficiency". Therefore, the concept 123801008 | Heart valve stenosis and regurgitation (disorder)|[105] will match this expression constraint because it has the associated morphology 708027006 | Valvular stenosis with valvular insufficiency|[106] .

```
< 404684003 |Clinical finding|[107] :
    363698007 |Finding site|[108] =<< 39057004 |Pulmonary valve structure|[109] ,
    116676008 |Associated morphology|[110] =<< 415582006 |Stenosis|[111] {{ term = "insufficiency" }}
```

To apply a filter to a sub-expression constraint, which includes a refinement or binary operators, the subexpression must be enclosed in brackets. For example, the following expression constraint will find all the descendants of clinical finding, with a finding site that is a descendant or self of 39057004 | Pulmonary valve structure|[112] and an associated morphology that is a descendant or self of 415582006 | Stenosis|[113] , and will then match only those clinical finding concepts that have a description that matches the term "insufficiency". Therefore, the concept 123801008 | Heart valve stenosis and regurgitation (disorder)|[114] will **not** match this expression constraints, as it does not have a description that matches the term "insufficiency".

```
(< 404684003 |Clinical finding|[115] :
    363698007 |Finding site|[116] =<< 39057004 |Pulmonary valve structure|[117] ,
    116676008 |Associated morphology|[118] =<< 415582006 |Stenosis|[119] ) {{ term = "insufficiency" }}
```

101 http://snomed.info/id/415582006
102 http://snomed.info/id/404684003
103 http://snomed.info/id/39057004
104 http://snomed.info/id/415582006
105 http://snomed.info/id/123801008
106 http://snomed.info/id/708027006
107 http://snomed.info/id/404684003
108 http://snomed.info/id/363698007
109 http://snomed.info/id/39057004
110 http://snomed.info/id/116676008
111 http://snomed.info/id/415582006
112 http://snomed.info/id/39057004
113 http://snomed.info/id/415582006
114 http://snomed.info/id/123801008
115 http://snomed.info/id/404684003
116 http://snomed.info/id/363698007
117 http://snomed.info/id/39057004
118 http://snomed.info/id/116676008
119 http://snomed.info/id/415582006

5.4.4 History Supplements

History supplements are applied only to the sub-expression constraint part that is directly to its left, after any filter constraints on this sub-expression constraint part have been applied.

For example, the following expression constraint will match all concepts that are **both** an active member of the 734139008 | Anatomy structure and part association reference set|[120] **and** also either an active member of the 734138000 | Anatomy structure and entire association reference set|[121] or an inactive concept associated with an active member of the 734138000 | Anatomy structure and entire association reference set|[122] via the 900000000000527005 | SAME AS association reference set|[123] . Because all active members of the 734139008 | Anatomy structure and part association reference set|[124] are active, there will be no inactive concepts in the result set.

```
^ 734139008 |Anatomy structure and part association reference set|[125]
  AND ^ 734138000 |Anatomy structure and entire association reference set|[126]
    {{ + HISTORY ( 900000000000527005 |SAME AS association reference set|[127] ) }}
```

To apply the history supplement to the entire sub-expression constraint above, the sub-expression constraint must be enclosed in round brackets. For example, the following expression constraint will match concepts that are **both** members of the 734139008 | Anatomy structure and part association reference set|[128] **and** also members of the 734138000 | Anatomy structure and entire association reference set|[129] ; and it will also match on any inactive concept that is associated via a 900000000000527005 | SAME AS association reference set|[130] to a member of both reference sets.

```
( ^ 734139008 |Anatomy structure and part association reference set|[131]
  AND ^ 734138000 |Anatomy structure and entire association reference set|[132] )
    {{ + HISTORY ( 900000000000527005 |SAME AS association reference set|[133] ) }}
```

5.5 5.5 Character Collation for Term Filters

⚠ This page is published as **Draft for Trial Use**. The recommendations on this page will be reviewed and may be updated following feedback from implementation experiences.

120 http://snomed.info/id/734139008
121 http://snomed.info/id/734138000
122 http://snomed.info/id/734138000
123 http://snomed.info/id/900000000000527005
124 http://snomed.info/id/734139008
125 http://snomed.info/id/734139008
126 http://snomed.info/id/734138000
127 http://snomed.info/id/900000000000527005
128 http://snomed.info/id/734139008
129 http://snomed.info/id/734138000
130 http://snomed.info/id/900000000000527005
131 http://snomed.info/id/734139008
132 http://snomed.info/id/734138000
133 http://snomed.info/id/900000000000527005

To promote consistency between implementations of ECL, the following collation principles are recommended:

- **Search and match** - The default behaviour of a system implementing ECL queries with term filters, is to use locale-specific asymmetric searching at the secondary comparison strength level -as specified in the Unicode Technical Standard #10 - Unicode Collation Algorithm[134]. This means that the search is, by default, case insensitive, with some language-specific character normalization behaviour.
  - *Asymmetric*: Asymmetric searches require characters in the query that are unmarked (i.e. the 'base letters') to match characters in the target that are either *marked* or *unmarked* (with the same base letter). However, a character in the query that is *marked* will only match a character in the target that is *marked* in the same way.
  - *Secondary strength*: Searches with a strength of secondary will only consider level 1 differences (e.g. "d" vs "e") and level 2 differences (e.g. "e" vs "é" in English). However, level 3 differences (e.g. "e" vs "E") are not considered. This provides the same effect as queries being case insensitive. For example, in English, "e" in the query will match both "e" and "E" in the target; and "E" in the query will similarly match both "e" and "E" in the target.
- **Language customizations** - Locale-based customizations of the standard are specified in the Unicode Common Locale Data Repository (CLDR)[135]. The unicode CLDR specifies the characters that are considered to be 'marked' variants of the base letters, identical base letters, and/or contractions in each specified language. The description terms in the substrate should be indexed separately for each language supported.

For example, the following search behaviour is expected in the locales specified below.

- In **English**, **Swedish** and **Danish**, the following search behaviour is expected:
  Note: No customizations are made in these 3 locales for the characters used in these searches. Therefore, the CLDR root collation order[136] is used.

Search Term	Target Matches	Target does NOT Match
resume	resume, Resume, RESUME, résumé, rèsumè, Résumé, RÉSUMÉ, …	-
Resume	resume, Resume, RESUME, résumé, rèsumè, Résumé, RÉSUMÉ, …	-
résumé	résumé, Résumé, RÉSUMÉ, …	resume, Resume, RESUME, ...
Résumé	résumé, Résumé, RÉSUMÉ, …	resume, Resume, RESUME, ...

- In **English**, the following search behaviour is expected (based on the CLDR 'en' locale[137], which uses the CLDR root collation order[138]):

Search Term	Target Matches	Target does NOT Match
sjogren	sjogren, Sjogren, SJOGREN, sjögren, Sjögren, SJÖGREN, sjøgren, Sjøgren, SJØGREN, ...	-

134 http://www.unicode.org/reports/tr10/#Asymmetric_Search_Secondary
135 http://cldr.unicode.org/index/cldr-spec/collation-guidelines
136 https://unicode.org/reports/tr35/tr35-collation.html#Root_Collation
137 https://github.com/unicode-org/cldr/blob/master/common/collation/en.xml
138 https://unicode.org/reports/tr35/tr35-collation.html#Root_Collation

Search Term	Target Matches	Target does NOT Match
sjögren	sjögren, Sjögren, SJÖGREN, ...	sjogren, Sjogren, SJOGREN, sjøgren, Sjøgren, SJØGREN, ...
Angstrom	angstrom, Angstrom, ANGSTROM, ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ...	ångstrœm, Ångstrœm, ÅNGSTRŒM, ...
Ångström	ångström, Ångström, ÅNGSTRÖM, ...	angstrom, Angstrom, ANGSTROM, ångstrøm, Ångstrøm, ÅNGSTRØM, ...
Ångstrøm	ångstrøm, Ångstrøm, ÅNGSTRØM, ...	angstrom, Angstrom, ANGSTROM, ångström, Ångström, ÅNGSTRÖM, ...
aangstrøm	aangstrøm, Aangstrøm, AANGSTRØM, ...	angstrom, Angstrom, ANGSTROM, ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...

- In **Swedish**, the following search behaviour is expected (based on the customizations in the CLDR 'sv' locale[139]):

Search Term	Target Matches	Target does NOT Match
sjogren	sjogren, Sjogren, SJOGREN, ...	sjögren, Sjögren, SJÖGREN, sjøgren, Sjøgren, SJØGREN, ...
sjögren	sjögren, Sjögren, SJÖGREN, sjøgren, Sjøgren, SJØGREN, ...	sjogren, Sjogren, SJOGREN , ...
Angstrom	angstrom, Angstrom, ANGSTROM, ...	ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, aangström, Aangström, AANGSTRÖM, ...
Ångström	ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...	angstrom, Angstrom, ANGSTROM, aangström, Aangström, AANGSTRÖM, ...

139 https://github.com/unicode-org/cldr/blob/master/common/collation/sv.xml

Search Term	Target Matches	Target does NOT Match
Ångstrøm	ångstrøm, Ångstrøm, ÅNGSTRØM, ...	angstrom, Angstrom, ANGSTROM, ångström, Ångström, ÅNGSTRÖM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...
aangstrøm	aangstrøm, Aangstrøm, AANGSTRØM, ...	angstrom, Angstrom, ANGSTROM, ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...

- And in **Danish**, the following search behaviour is expected (based on the customizations in the CLDR 'da' locale[140]):

Search Term	Target Matches	Target does NOT Match
sjogren	sjogren, Sjogren, SJOGREN, ...	sjögren, Sjögren, SJÖGREN, sjøgren, Sjøgren, SJØGREN, ...
sjögren	sjögren, Sjögren, SJÖGREN, ...	sjogren, Sjogren, SJOGREN, sjøgren, Sjøgren, SJØGREN, ...
Angstrom	angstrom, Angstrom, ANGSTROM, ...	ångström, Ångström, ÅNGSTRÖM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, aangstrøm, Aangstrøm, AANGSTRØM ...
Ångström	ångström, Ångström, ÅNGSTRÖM, aangström, Aangström, AANGSTRÖM, ...	angstrom, Angstrom, ANGSTROM, ångstrøm, Ångstrøm, ÅNGSTRØM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...
Ångstrøm	ångstrøm, Ångstrøm, ÅNGSTRØM, ångström, Ångström, ÅNGSTRÖM, aangstrøm, Aangstrøm, AANGSTRØM, aangström, Aangström, AANGSTRÖM, ...	angstrom, Angstrom, ANGSTROM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...
aangstrøm	ångstrøm, Ångstrøm, ÅNGSTRØM, ångström, Ångström, ÅNGSTRÖM, aangstrøm, Aangstrøm, AANGSTRØM, aangström, Aangström, AANGSTRÖM, ...	angstrom, Angstrom, ANGSTROM, ångstrœm, Ångstrœm, ÅNGSTRŒM, ...

140 https://github.com/unicode-org/cldr/blob/master/common/collation/da.xml

6 6. Examples

The examples in this section illustrate the syntaxes proposed in Section 5(see page 21).

- 6.1 Simple Expression Constraints(see page 61)
- 6.2 Refinements(see page 69)
- 6.3 Cardinality(see page 78)
- 6.4 Conjunction and Disjunction(see page 87)
- 6.5 Exclusion and Not Equals(see page 93)
- 6.6 Constraint Comments(see page 96)
- 6.7 Nested Expression Constraints(see page 97)
- 6.8 Description Filters(see page 102)
- 6.9 Concept Filters(see page 113)
- 6.10 Member Filters(see page 118)
- 6.11 History Supplements(see page 121)

6.1 6.1 Simple Expression Constraints

The simplest type of expression constraint contains a single concept optionally preceded by an expression constraint operator and/or membership function. Expression constraint operators (e.g. descendant of) traverse the hierarchical relationships in SNOMED CT to return the set of concepts that are directly or transitively connected to the focus concept. Membership functions return the set of concepts referenced by a reference set.

In this section we consider some of these simple examples.

6.1.1 Self

If no expression constraint operator or membership function is applied, the expression constraint is satisfied only by the specified concept. For example, the expression constraint below is satisfied only by the concept 404684003 | Clinical finding|[141] .

```
404684003 |Clinical finding|[142]
```

Please note that this expression constraint is equivalent to an expression that looks the same but is written in SNOMED CT Compositional Grammar[143].

6.1.2 Descendant of

A single 'less than' sign (i.e. "<") indicates that the expression constraint is satisfied by all descendants of the specified concept. The expression constraint below evaluates to the set of all subtypes (both direct children and transitive subtypes) of 404684003 | Clinical finding|[144] , using the brief syntax.

141 http://snomed.info/id/404684003
142 http://snomed.info/id/404684003
143 http://snomed.org/scg
144 http://snomed.info/id/404684003

```
< 404684003 |Clinical finding|[145]
```

Using the long syntax, the above expression constraint may be represented as:

```
descendantOf 404684003 |Clinical finding|[146]
```

The descendantOf function is primarily used on concepts, which serve as the 'grouper' of a set of values (e.g. | Clinical finding (finding)|[147] , | Severities (qualifier value)|[148] , | Unit (qualifier value)|[149]). The descendantOf function may also be applied to other concepts, or to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

6.1.3 Descendant or Self of

Two consecutive 'less than' signs (i.e. "<<") indicates that the expression constraint is satisfied by all descendants of the specified concept plus the specified concept itself. The expression constraint below evaluates to the set of descendants of 73211009 | Diabetes mellitus|[150] , plus the concept 73211009 | Diabetes mellitus|[151] itself.

```
<< 73211009 |Diabetes mellitus|[152]
```

Using the long syntax, the above expression constraint may be represented as:

```
descendantOrSelfOf 73211009 |Diabetes mellitus|[153]
```

The descendantOrSelfOf function is primarily used for attribute values, which refer to a specific clinical value (e.g. 73211009 | Diabetes mellitus|[154] , 73761001 | Colonoscopy|[155] , 385055001 | Tablet dose form|[156]), but any specialization of this value is also acceptable. The descendantOrSelfOf function may also be applied to other concepts, or to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

145 http://snomed.info/id/404684003
146 http://snomed.info/id/404684003
147 http://snomed.info/id/404684003
148 http://snomed.info/id/272141005
149 http://snomed.info/id/258666001
150 http://snomed.info/id/73211009
151 http://snomed.info/id/73211009
152 http://snomed.info/id/73211009
153 http://snomed.info/id/73211009
154 http://snomed.info/id/73211009
155 http://snomed.info/id/73761001
156 http://snomed.info/id/385055001

6.1.4 Child of

A 'less than' sign directly followed by an exclamation mark (i.e. "<!") indicates that the expression constraint is satisfied by the set of proximal children of the specified concept. The children of a concept are those concepts that are the source of a non-redundant 116680003 | is a|[157] relationship whose target is the given concept. The expression constraint below, represented using the brief syntax, evaluates to the set of immediate children of the concept 404684003 | Clinical finding|[158] .

```
<! 404684003 |Clinical finding|[159]
```

Using the long syntax, the above expression constraint may be represented as:

```
childOf 404684003 |Clinical finding|[160]
```

Please note that the childOf function may only be executed against a finite and pre-classified substrate, and that the results of this function are specific to the substrate used. The childOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

6.1.5 Child or Self of

Two consecutive 'less than' signs directly followed by an exclamation mark (i.e. "<<!") indicates that the expression constraint is satisfied by the set of proximal children of the specified concept plus the specified concept itself. The children of a concept are those concepts that are the source of a non-redundant 116680003 | is a|[161] relationship whose target is the given concept. The expression constraint below, represented using the brief syntax, evaluates to the set of immediate children of the concept 404684003 | Clinical finding|[162] , plus the concept 404684003 | Clinical finding|[163] itself.

```
<<! 404684003 |Clinical finding|[164]
```

Using the long syntax, the above expression constraint may be represented as:

```
childOrSelfOf 404684003 |Clinical finding|[165]
```

Please note that the childOrSelfOf function may only be executed against a finite and pre-classified substrate, and that the results of this function are specific to the substrate used. The childOrSelfOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

---

157 http://snomed.info/id/116680003
158 http://snomed.info/id/404684003
159 http://snomed.info/id/404684003
160 http://snomed.info/id/404684003
161 http://snomed.info/id/116680003
162 http://snomed.info/id/404684003
163 http://snomed.info/id/404684003
164 http://snomed.info/id/404684003
165 http://snomed.info/id/404684003

6.1.6 Ancestor of

A single 'greater than' sign (i.e. ">") indicates that the expression constraint is satisfied by all ancestors of the specified concept. The expression constraint below, using the brief syntax, evaluates to the set of all supertypes (both direct parents and transitive supertypes) of 40541001 | Acute pulmonary edema|[166] :

```
> 40541001 |Acute pulmonary edema|[167]
```

Using the long syntax, the above expression constraint may be represented as:

```
ancestorOf 40541001 |Acute pulmonary edema|[168]
```

Please note that the ancestorOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

6.1.7 Ancestor or Self of

Two consecutive 'greater than' signs (i.e. ">>") indicates that the expression constraint is satisfied by all ancestors of the specified concept plus the specified concept itself. The expression constraint below evaluates to the set of ancestors of 40541001 | Acute pulmonary edema|[169] , plus the concept 40541001 | Acute pulmonary edema|[170] .

```
>> 40541001 |Acute pulmonary edema|[171]
```

Using the long syntax, the above expression constraint may be represented as:

```
ancestorOrSelfOf 40541001 |Acute pulmonary edema|[172]
```

Please note that the ancestorOrSelfOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

6.1.8 Parent of

A 'greater than' sign directly followed by an exclamation mark (i.e. ">!") indicates that the expression constraint is satisfied by the set of proximal parents of the specified concept. The parents of a concept are those concepts that

166 http://snomed.info/id/40541001
167 http://snomed.info/id/40541001
168 http://snomed.info/id/40541001
169 http://snomed.info/id/40541001
170 http://snomed.info/id/40541001
171 http://snomed.info/id/40541001
172 http://snomed.info/id/40541001

are the target of a non-redundant | is a|[173] relationship whose source is the given concept. The expression constraint below, represented using the brief syntax, evaluates to the set of immediate parents of the concept 40541001 | Acute pulmonary edema|[174] .

```
>! 40541001 |Acute pulmonary edema|[175]
```

Using the long syntax, the above expression constraint may be represented as:

```
parentOf 40541001 |Acute pulmonary edema|[176]
```

Please note that the parentOf function should only be executed against a finite and pre-classified substrate, and that the results of this function are specific to the substrate used. The parentOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

6.1.9 Parent or Self of

Two consecutive 'greater than' signs directly followed by an exclamation mark (i.e. ">>!") indicates that the expression constraint is satisfied by the set of proximal parents of the specified concept plus the specified concept itself. The parents of a concept are those concepts that are the target of a non-redundant | is a|[177] relationship whose source is the given concept. The expression constraint below, represented using the brief syntax, evaluates to the set of immediate parents of the concept 40541001 | Acute pulmonary edema|[178] , plus the concept 40541001 | Acute pulmonary edema|[179] itself.

```
>>! 40541001 |Acute pulmonary edema|[180]
```

Using the long syntax, the above expression constraint may be represented as:

```
parentOrSelfOf 40541001 |Acute pulmonary edema|[181]
```

Please note that the parentOrSelfOf function should only be executed against a finite and pre-classified substrate, and that the results of this function are specific to the substrate used. The parentOrSelfOf function may also be applied to nested expression constraints (as discussed in 6.7 Nested Expression Constraints(see page 97)).

173 http://snomed.info/id/116680003
174 http://snomed.info/id/40541001
175 http://snomed.info/id/40541001
176 http://snomed.info/id/40541001
177 http://snomed.info/id/116680003
178 http://snomed.info/id/40541001
179 http://snomed.info/id/40541001
180 http://snomed.info/id/40541001
181 http://snomed.info/id/40541001

6.1.10 Member of

The memberOf function (by default) evaluates to the set of concepts that are referenced by the given reference set (i.e. the set of referencedComponentIds). Please note that this function may be applied only to reference sets whose referenced components are concepts. The SNOMED CT Expression Constraint Language does not support use of the memberOf function on reference sets whose referencedComponents are not concepts (i.e. descriptions or relationships).

The memberOf function is represented in the brief syntax using a 'caret' character (i.e. "^") and is usually followed by a single concept id for a concept-based reference set. For example, the following expression constraint is satisfied by the set of concepts which are members of 700043003 |Example problem list concepts reference set|[182] :

```
^ 700043003 |Example problem list concepts reference set|[183]
```

Using the long syntax the expression constraint is represented as:

```
memberOf 700043003 |Example problem list concepts reference set|[184]
```

The expression constraints above both return the values in the referencedComponentId field of the given reference sets. However, it is also possible to specify one or more fields, whose values will be returned, by including the relevant field names is square brackets after the memberOf operator ("^" or "memberOf"). For example, the following expression constraint is equivalent to the brief syntax example above.

```
^ [referencedComponentId] 700043003 |Example problem list concepts reference set|[185]
```

The value of other fields can also be returned by an expression constraint[1](see page 0) . For example, the following expression constraint will return the targetComponentId values (i.e. the 'Entire' anatomy concepts) from the 734138000 |Anatomy structure and entire association reference set|[186] .

```
^ [targetComponentId] 734138000 |Anatomy structure and entire association reference set|[187]
```

It is also possible to return the values of more than one field in a reference set (e.g. a pair or tuple of values).[2](see page 0)[3](see page 0)[4](see page 0) For example, to return both the source and target of the 816210007 |SNOMED CT to MedDRA simple map reference set|[188] , the following expression constraint could be used:

```
^ [referencedComponentId, mapTarget] 816210007 |SNOMED CT to MedDRA simple map reference set|[189]
```

182 http://snomed.info/id/700043003
183 http://snomed.info/id/700043003
184 http://snomed.info/id/700043003
185 http://snomed.info/id/700043003
186 http://snomed.info/id/734138000
187 http://snomed.info/id/734138000
188 http://snomed.info/id/816210007
189 http://snomed.info/id/816210007

To return all the non-metadata fields of a referenceSet (i.e. the values of the referencedComponentId and additional fields), a wildcard (i.e. "*" in the brief syntax, and "*" or "Any" in the long syntax) can be used. For example, the following expression constraint will return the referencedComponentId, mapGroup, mapPriority, mapRule, mapAdvice, mapTarget and correlationId for each row of the 447562003 | ICD-10 complex map reference set|[190] .

```
^ [*] 447562003 |ICD-10 complex map reference set|[191]
```

For more information on the use of reference set field names in ECL, please refer to Appendix E - Reference Set Fields(see page 199).

Please note that it is also possible to apply the memberOf function to an expression constraint that returns a set of concept-based reference set concepts. For more information, please refer to 6.7 Nested Expression Constraints(see page 97).

And for information about applying filter constraints to reference set members, please refer to 6.10 Member Filters(see page 118).

6.1.11 Any

A single 'star' (i.e. "*") may be used in the place of a concept reference to represent any concept in the substrate. The expression constraint below evaluates to the set of all concepts in the given substrate.

```
*
```

Using the long syntax, the above expression constraint may also be represented as:

```
ANY
```

This wildcard character (or 'ANY' keyword) may be used anywhere within an expression constraint that a concept reference may be used. In many situations, the wildcard is equivalent to the following expression constraint:

```
<< 138875005 |SNOMED CT concept|[192]
```

However, some situations exist in which the concept 138875005 | SNOMED CT concept|[193] is not included in the substrate, and therefore cannot be used to determine the full set of concepts available. In other cases, the single character wildcard may serve as a convenient shortcut for the longer expression constraint above.

Please note that the following three expression constraints evaluate to the same set of concepts:

190 http://snomed.info/id/447562003
191 http://snomed.info/id/447562003
192 http://snomed.info/id/138875005
193 http://snomed.info/id/138875005

```
*
```

```
<< *
```

```
>> *
```

The two expression constraints below evaluate to all concepts in the substrate minus the root concept:

```
< *
```

```
<! *
```

And the two expression constraints below evaluate to all non-leaf concepts in the substrate:

```
> *
```

```
>! *
```

Finally, the expression constraint below evaluates to all concepts that are referenced by any reference set in the substrate:

```
^ *
```

---

1 (see page 66) **Note**: *If a reference set field is selected that does not exist in any of the identified reference sets, then the expression constraint should be considered erroneous.*

2 (see page 66) ***Note**: Returning the values of more than one reference set field may only be done as the final operation of an expression constraint.*

3 (see page 66) ***Note:** Attempts to select more than one reference set field on an inner subquery should result in an execution error.*

4 (see page 66) ***Note:** In some implementation contexts, the memberOf function may be restricted to return only a single field.*

6.2 6.2 Refinements

In this section, we illustrate how the set of matching concepts can be filtered using one or more simple attribute refinements. For more information on applying refinements to nested expression constraints, using nested attribute names and using nested attribute values, please refer to 6.7 Nested Expression Constraints(see page 97).

6.2.1 Attributes

Adding an attribute refinement to an expression constraint restricts the set of valid clinical meanings to only those whose defining attributes satisfy the given refinement condition. Similarly to SNOMED CT Compositional Grammar[194], attribute refinements are placed after a 'colon' (i.e. ":") in the expression constraint.

The example below is satisfied only by the set of lung disorders, which have an associated morphology that is exactly equal to 79654002 | Edema|[195] .

```
< 19829001 |Disorder of lung|[196] :
   116676008 |Associated morphology|[197] = 79654002 |Edema|[198]
```

Using the long syntax, the above expression is represented as:

```
descendantOf 19829001 |Disorder of lung|[199] :
   116676008 |Associated morphology|[200] = 79654002 |Edema|[201]
```

In many cases, however, the value of the matching attribute is allowed to be either the concept itself, *or* a descendant of that concept. In these cases, the descendantOrSelfOf operator is used prior to the concept representing the attribute value. For example, the expression constraint below (in brief and long syntaxes respectively) is satisfied only by the set of lung disorders, which have an associated morphology of 79654002 | Edema|[202] or any descendant of 79654002 | Edema|[203] .

```
< 19829001 |Disorder of lung|[204] :
   116676008 |Associated morphology|[205] = << 79654002 |Edema|[206]
```

194 http://snomed.org/scg
195 http://snomed.info/id/79654002
196 http://snomed.info/id/19829001
197 http://snomed.info/id/116676008
198 http://snomed.info/id/79654002
199 http://snomed.info/id/19829001
200 http://snomed.info/id/116676008
201 http://snomed.info/id/79654002
202 http://snomed.info/id/79654002
203 http://snomed.info/id/79654002
204 http://snomed.info/id/19829001
205 http://snomed.info/id/116676008
206 http://snomed.info/id/79654002

```
descendantOf 19829001 |Disorder of lung|[207] :
   116676008 |Associated morphology|[208] = descendantOrSelfOf 79654002 |Edema|[209]
```

When more than one attribute is defined in an expression constraint, the attributes are normally separated by a comma. A comma between two attributes indicates a conjunction and implies that both attribute conditions must be true. For example, the expression constraint below, written in brief syntax, is satisfied only by the set of clinical findings, which have both a finding site of 39057004 | Pulmonary valve structure|[210] (or a subtype of 39057004 | Pulmonary valve structure|[211]) and an associated morphology of 'stenosis' (or a subtype of 'stenosis').

```
< 404684003 |Clinical finding|[212] :
   363698007 |Finding site|[213] =<< 39057004 |Pulmonary valve structure|[214] ,
   116676008 |Associated morphology|[215] =<< 415582006 |Stenosis|[216]
```

Please note that attribute refinements may also be used when the focus concept is '*' (or ANY). The following expression constraint represents any concept that has a 246075003 | Causative agent|[217] attribute whose value is 387517004 | Paracetamol|[218] .

```
* : 246075003 |Causative agent|[219] = 387517004 |Paracetamol|[220]
```

Using the long syntax, the above expression may also be represented as:

```
ANY : 246075003 |Causative agent|[221] = 387517004 |Paracetamol|[222]
```

6.2.2 Attribute Groups

Similarly to SNOMED CT compositional grammar, expression constraints use curly braces (i.e. "{..}") to indicate that a set of attributes should be grouped together in an attribute group. For example, the expression constraint below is satisfied only by the set of clinical findings with an associated morphology of 'stenosis' (or descendant) at the

207 http://snomed.info/id/19829001
208 http://snomed.info/id/116676008
209 http://snomed.info/id/79654002
210 http://snomed.info/id/39057004
211 http://snomed.info/id/39057004
212 http://snomed.info/id/404684003
213 http://snomed.info/id/363698007
214 http://snomed.info/id/39057004
215 http://snomed.info/id/116676008
216 http://snomed.info/id/415582006
217 http://snomed.info/id/246075003
218 http://snomed.info/id/387517004
219 http://snomed.info/id/246075003
220 http://snomed.info/id/387517004
221 http://snomed.info/id/246075003
222 http://snomed.info/id/387517004

finding site 'pulmonary valve structure' (or descendant), and also with an associated morphology of 'hypertrophy' (or descendant) at the finding site 'right ventricular structure' (or descendant).

```
< 404684003 |Clinical finding|[223] :
  { 363698007 |Finding site|[224] = << 39057004 |Pulmonary valve structure|[225] ,
    116676008 |Associated morphology|[226] = << 415582006 |Stenosis|[227] },
  { 363698007 |Finding site|[228] = << 53085002 |Right ventricular structure|[229] ,
    116676008 |Associated morphology|[230] = << 56246009 |Hypertrophy|[231] }
```

Using the 'long syntax', the above expression constraint is represented as:

```
descendantOf 404684003 |Clinical finding|[232] :
  { 363698007 |Finding site|[233] = descendantOrSelfOf 39057004 |Pulmonary valve structure|[234] ,
    116676008 |Associated morphology|[235] = descendantOrSelfOf 415582006 |Stenosis|[236] },
  { 363698007 |Finding site|[237] = descendantOrSelfOf 53085002 |Right ventricular structure|[238] ,
    116676008 |Associated morphology|[239] = descendantOrSelfOf 56246009 |Hypertrophy|[240] }
```

6.2.3 Attribute Constraint Operators

In some cases, an attribute concept has subtypes or supertypes in the | Concept model attribute|[241] hierarchy. Where this occurs, it is possible to indicate that an attribute condition may be satisfied by matching one of the subtypes or supertypes of the given attribute. This is done adding a constraint operator directly before the attribute name concept. For example, the expression constraint below will not only match clinical findings that are |

223 http://snomed.info/id/404684003
224 http://snomed.info/id/363698007
225 http://snomed.info/id/39057004
226 http://snomed.info/id/116676008
227 http://snomed.info/id/415582006
228 http://snomed.info/id/363698007
229 http://snomed.info/id/53085002
230 http://snomed.info/id/116676008
231 http://snomed.info/id/56246009
232 http://snomed.info/id/404684003
233 http://snomed.info/id/363698007
234 http://snomed.info/id/39057004
235 http://snomed.info/id/116676008
236 http://snomed.info/id/415582006
237 http://snomed.info/id/363698007
238 http://snomed.info/id/53085002
239 http://snomed.info/id/116676008
240 http://snomed.info/id/56246009
241 http://snomed.info/id/410662002

Associated with|242| a type of | Edema|243| , but also those that are | Due to|244| , | After|245| or the | Causative agent|246| of a type of | Edema|247| . This result occurs because the 47429007 | Associated with|248| attribute concept has three subtypes: 255234002 | After|249| , 246075003 | Causative agent|250| and 42752001 | Due to|251| .

```
<< 404684003 |Clinical finding|252 :
  << 47429007 |Associated with|253 = << 267038008 |Edema|254
```

This expression constraint is represented in the long syntax as:

```
descendantOrSelfOf 404684003 |Clinical finding|255 :
  descendantOrSelfOf 47429007 |Associated with|256 = descendantOrSelfOf 267038008 |Edema|257
```

Similarly, the expression constraint below will not only match clinical findings that are | Due to|258| a type of | Edema|259| , but also those that have an | Associated with|260| relationship whose value is a type of | Edema|261| .

```
<< 404684003 |Clinical finding|262 :
  >> 246075003 |Causative agent|263 = << 267038008 |Edema|264
```

This expression constraint is represented in the long syntax as:

```
descendantOrSelfOf 404684003 |Clinical finding|265 :
  ancestorOrSelfOf 246075003 |Causative agent|266 = descendantOrSelfOf 267038008 |Edema|267
```

---

242 http://snomed.info/id/47429007
243 http://snomed.info/id/267038008
244 http://snomed.info/id/42752001
245 http://snomed.info/id/255234002
246 http://snomed.info/id/246075003
247 http://snomed.info/id/267038008
248 http://snomed.info/id/47429007
249 http://snomed.info/id/255234002
250 http://snomed.info/id/246075003
251 http://snomed.info/id/42752001
252 http://snomed.info/id/404684003
253 http://snomed.info/id/47429007
254 http://snomed.info/id/267038008
255 http://snomed.info/id/404684003
256 http://snomed.info/id/47429007
257 http://snomed.info/id/267038008
258 http://snomed.info/id/42752001
259 http://snomed.info/id/267038008
260 http://snomed.info/id/47429007
261 http://snomed.info/id/267038008
262 http://snomed.info/id/404684003
263 http://snomed.info/id/246075003
264 http://snomed.info/id/267038008
265 http://snomed.info/id/404684003
266 http://snomed.info/id/246075003
267 http://snomed.info/id/267038008

6.2.4 Concrete Values

The revised SNOMED CT Compositional Grammar[268] allows attributes to be given concrete values (e.g. Strings, Integers, Decimal, Boolean). The SNOMED CT Expression Constraint Language[269] supports the ability to compare these attribute values with a given concrete value.

When numeric concrete values (i.e. Integers and Decimals) are compared, a set of standard mathematical operators may be used. These mathematical operators are:

Operator	Name
=	Equals
!=	Not equals
<	Less than
<=	Less than or equals
>	Greater than
>=	Greater than or equals

Please note that the 'not equals' operator may alternatively be represented as "<>" and "not =" (case insensitive) in the long syntax.

The following expression constraint is satisfied by oral medicinal products, which contain amoxicillin and have a presentation strength greater than or equal to 250 mg.

```
< 763158003 |Medicinal product (product)|[270] :
   411116001 |Has manufactured dose form (attribute)|[271] = << 385268001 |Oral dose form (dose form)|[272] ,
  {  << 127489000 |Has active ingredient (attribute)|[273] = << 372687004 |Amoxicillin (substance)|[274] ,
     1142135004 |Has presentation strength numerator value (attribute)|[275] >= #250,
     732945000 |Has presentation strength numerator unit (attribute)|[276] = 258684004 |milligram (qualifier
value)|[277] }
```

268 http://snomed.org/scg
269 http://snomed.org/ecl
270 http://snomed.info/id/763158003
271 http://snomed.info/id/411116001
272 http://snomed.info/id/385268001
273 http://snomed.info/id/127489000
274 http://snomed.info/id/372687004
275 http://snomed.info/id/1142135004
276 http://snomed.info/id/732945000
277 http://snomed.info/id/258684004

Please note that, as per SNOMED CT Compositional Grammar, integer and decimal values are preceded by a hash character (e.g. "#500"), while string values are surrounded by double quotes (e.g. "PANADOL").

To find those oral amoxicillin products that have a strength between 250 and 800 mg (inclusive), the following expression constraint may be used:

```
< 763158003 |Medicinal product (product)|[278] :
   411116001 |Has manufactured dose form (attribute)|[279] = << 385268001 |Oral dose form (dose form)|[280] ,
  {  << 127489000 |Has active ingredient (attribute)|[281] = << 372687004 |Amoxicillin (substance)|[282] ,
      1142135004 |Has presentation strength numerator value (attribute)|[283] >= #250,
     1142135004 |Has presentation strength numerator value (attribute)|[284] <= #800,
     732945000 |Has presentation strength numerator unit (attribute)|[285] = 258684004 |milligram (qualifier
value)|[286] }
```

Concrete values of type string and boolean may also be included in an expression constraint, and compared using an 'equal to' (i.e. "=") or 'not equal to' (i.e. "!=") operator. The following expression constraint is satisfied only by products with a product name equal to "PANADOL" 1(see page 0) .

```
< 373873005 |Pharmaceutical / biologic product|[287] :
   3460481009 |Has product name|[288] = "PANADOL"
```

The following expression constraint is satisfied only by products that are in the national benefit scheme (of the given country) 2(see page 0) .

```
< 373873005 |Pharmaceutical / biologic product|[289] :
   859999999102 |Is in national benefit scheme|[290] = TRUE
```

6.2.5 Reverse Attributes

In most cases, an attribute refinement is satisfied by those concepts, which are the source concept of a defining relationship whose destination concept matches the attribute value. In some cases, however, it may be necessary to select the destination concept of a relationship and constrain the source concept to a given attribute value. To achieve this, an expression constraint indicates that an attribute is to be constrained in the reverse order using a

278 http://snomed.info/id/763158003
279 http://snomed.info/id/411116001
280 http://snomed.info/id/385268001
281 http://snomed.info/id/127489000
282 http://snomed.info/id/372687004
283 http://snomed.info/id/1142135004
284 http://snomed.info/id/1142135004
285 http://snomed.info/id/732945000
286 http://snomed.info/id/258684004
287 http://snomed.info/id/373873005
288 http://snomed.info/id/3460481009
289 http://snomed.info/id/373873005
290 http://snomed.org/fictid#859999999102

'reverse flag' 3(see page 0) . In the brief syntax, the reverse flag is represented by preceding the name of the attribute with a capital letter 'R'.

For example, the expression constraint below finds the set of anatomical structures, which are the finding site of a type of bone fracture (e.g. 85050009 | Humerus|[291] , 71341001 | Femur|[292]).

```
< 91723000 |Anatomical structure|[293] :
  R 363698007 |Finding site|[294] = < 125605004 |Fracture of bone|[295]
```

The above expression constraint is represented in the long syntax as:

```
descendantOf 91723000 |Anatomical structure|[296] :
  reverseOf 363698007 |Finding site|[297] = descendantOf 125605004 |Fracture of bone|[298]
```

6.2.6 Dotted Attributes

An alternative way of representing 'reversed attributes' is by applying the *dot notation* to represented them as *dotted attributes*. Using this alternative notation, " < 123456 123456 |X|[299] .234567 234567 |Y|[300] " represents the set of attribute values (i.e. destination concepts) of the attribute "Y" for descendants or self of concept "X". This is therefore equivalent to " * : R 234567 234567 |Y|[301] = < 123456 123456 |X|[302] " using the reverse flag.

The previous expression constraint (which finds the set of body sites for any subtype of bone fracture) has an equivalent representation using the 'dot notation' of:

```
< 91723000 |Anatomical structure|[303] AND (< 125605004 |Fracture of bone|[304] . 363698007 |Finding site|[305] )
```

Because all values of 363698007 | Finding site|[306] must be < 91723000 | Anatomical structure|[307] (according to the SNOMED CT concept model[308]), this expression constraint can be further simplified to:

---

291 http://snomed.info/id/85050009
292 http://snomed.info/id/71341001
293 http://snomed.info/id/91723000
294 http://snomed.info/id/363698007
295 http://snomed.info/id/125605004
296 http://snomed.info/id/91723000
297 http://snomed.info/id/363698007
298 http://snomed.info/id/125605004
299 http://snomed.info/id/123456
300 http://snomed.info/id/234567
301 http://snomed.info/id/234567
302 http://snomed.info/id/123456
303 http://snomed.info/id/91723000
304 http://snomed.info/id/125605004
305 http://snomed.info/id/363698007
306 http://snomed.info/id/363698007
307 http://snomed.info/id/91723000
308 https://confluence.ihtsdotools.org/display/DOCGLOSS/SNOMED+CT+concept+model

```
< 125605004 |Fracture of bone|[309] . 363698007 |Finding site|[310]
```

The next example finds the set of substances, which are an active ingredient in any product containing amoxicillin.

```
< 105590001 |Substance|[311] :
  R << 127489000 |Has active ingredient|[312] = < 27658006 |Product containing amoxicillin|[313]
```

This expression constraint is represented in the long syntax as:

```
descendantOf 105590001 |Substance|[314] :
   ReverseOf descendantOrSelfOf 127489000 |Has active ingredient|[315] = descendantOf 27658006 |Product
containing amoxicillin|[316]
```

An equivalent way of representing this constraint, using the 'dot notation' is:

```
< 105590001 |Substance|[317] AND ( < 27658006 |Product containing amoxicillin|[318] . << 127489000 |Has
active ingredient|[319] )
```

or (using the SNOMED CT concept model[320] to simplify):

```
< 27658006 |Product containing amoxicillin|[321] . << 127489000 |Has active ingredient|[322]
```

When more than one dot attribute is used in sequence, the dot notation is evaluated sequentially from left to right. For example, the following expression constraint represents the set of | Finding sites|[323] of any concept that is | Associated with|[324] a subtype of | Disorder of lung|[325] .

309 http://snomed.info/id/125605004
310 http://snomed.info/id/363698007
311 http://snomed.info/id/105590001
312 http://snomed.info/id/127489000
313 http://snomed.info/id/27658006
314 http://snomed.info/id/105590001
315 http://snomed.info/id/127489000
316 http://snomed.info/id/27658006
317 http://snomed.info/id/105590001
318 http://snomed.info/id/27658006
319 http://snomed.info/id/127489000
320 https://confluence.ihtsdotools.org/display/DOCGLOSS/SNOMED+CT+concept+model
321 http://snomed.info/id/27658006
322 http://snomed.info/id/127489000
323 http://snomed.info/id/363698007
324 http://snomed.info/id/47429007
325 http://snomed.info/id/19829001

```
< 19829001 |Disorder of lung|[326] . < 47429007 |Associated with|[327] . 363698007 |Finding site|[328]
```

This expression constraint is evaluated by first finding the descendants of | Disorder of lung|[329] , then finding the set of attribute values for these concepts (with an attribute type that is any subtype of | Associated with|[330]), and then from these attribute value concepts, finding the value of any | Finding sites|[331] attribute. Please note that the expression constraint above (with no brackets) is equivalent to the one below (with brackets added).

```
((< 19829001 |Disorder of lung|[332] ) . < 47429007 |Associated with|[333] ) . 363698007 |Finding site|[334]
```

6.2.7 Any Attribute Name and Value

A single 'star' (i.e. "*") may be used in the place of an attribute name to represent any attribute in the substrate. The expression constraint below evaluates to the set of clinical findings which have any attribute with a value of 79654002 | Edema|[335] .

```
< 404684003 |Clinical finding|[336] : * = 79654002 |Edema|[337]
```

Using the long syntax, the above expression constraint may also be represented as:

```
descendantOf 404684003 |Clinical finding|[338] : ANY = 79654002 |Edema|[339]
```

The 'star' symbol (i.e. "*") may also be used to represent any attribute value (either with or without refinement). The following expression constraint evaluates to the set of clinical findings which have an associated morphology (with any value).

```
< 404684003 |Clinical finding|[340] : 116676008 |Associated morphology|[341] = *
```

Using the long syntax, the above expression constraint may also be represented as:

---

326 http://snomed.info/id/19829001
327 http://snomed.info/id/47429007
328 http://snomed.info/id/363698007
329 http://snomed.info/id/19829001
330 http://snomed.info/id/47429007
331 http://snomed.info/id/363698007
332 http://snomed.info/id/19829001
333 http://snomed.info/id/47429007
334 http://snomed.info/id/363698007
335 http://snomed.info/id/79654002
336 http://snomed.info/id/404684003
337 http://snomed.info/id/79654002
338 http://snomed.info/id/404684003
339 http://snomed.info/id/79654002
340 http://snomed.info/id/404684003
341 http://snomed.info/id/116676008

```
descendantOf 404684003 |Clinical finding|[342] : 116676008 |Associated morphology|[343] = ANY
```

---

[1](see page 74) Concrete values of type string are case sensitive and compared using the Unicode Collation Algorithm (http://www.unicode.org/reports/tr10/).

[2](see page 74) Please note that the concept 859999999102 |Is in national benefit scheme| is a fictitious attribute used here to illustrate boolean values.

[3](see page 75) It should be noted that using a reversed attribute joined by conjunction with a non-reversed attribute may lead to a nonsensical constraint (e.g. "<<a: {b=c, Rd=e}"). This is because the target concept of the reversed attribute must be matched with the source concept of the non-reversed attribute, which in turn must be the same as the source concept of the reversed attribute (being in the same attribute group). This would require the reversed attribute to be reflexive (i.e. the source and target concept to be the same).

6.3 6.3 Cardinality

6.3.1 Attribute cardinality

6.3.1.1 Overview

To support use cases such as the SNOMED CT concept model and terminology binding, expression constraints may constrain the number of times an attribute can be included in an expression or concept definition represented in the SNOMED CT distribution view [1](see page 0) . This is done using a cardinality constraint, which consists of a minimum cardinality and a maximum cardinality (written "[X..Y]"). A minimum cardinality of X constrains the valid clinical meanings to those which have at least (i.e. >=) X non-redundant [2](see page 0) attributes that match the given attribute criteria. A maximum cardinality of Y constrains the valid clinical meanings to those which have at most (i.e. <=) Y non-redundant [2](see page 0) attributes that match the given attribute criteria. For example, a cardinality of "[1..5]" indicates that all clinical meanings that satisfy the given expression constraint must have at least one and at most five attributes that match the given attribute criteria.

The expression constraint below is satisfied only by products with one, two or three active ingredients.

```
< 373873005 |Pharmaceutical / biologic product|[344] :
  [1..3] 127489000 |Has active ingredient|[345] = < 105590001 |Substance|[346]
```

Using the long syntax, this expression constraint may be represented as:

---

342 http://snomed.info/id/404684003
343 http://snomed.info/id/116676008
344 http://snomed.info/id/373873005
345 http://snomed.info/id/127489000
346 http://snomed.info/id/105590001

```
descendantOf 373873005 |Pharmaceutical / biologic product|[347] :
  [1 to 3] 127489000 |Has active ingredient|[348] = descendantOf 105590001 |Substance|[349]
```

The following expression constraint is satisfied only by products which have exactly one active ingredient:

```
< 373873005 |Pharmaceutical / biologic product|[350] :
  [1..1] 127489000 |Has active ingredient|[351] =< 105590001 |Substance|[352]
```

6.3.1.2 Unconstrained Cardinalities

A minimum cardinality of '0' indicates that there is *no* constraint on the minimum number of attributes that may match the given attribute criteria. For example, the following expression constraint is satisfied only by products with at most one active ingredient (i.e. the maximum cardinality is '1' and the minimum cardinality is unconstrained).

```
< 373873005 |Pharmaceutical / biologic product|[353] :
  [0..1] 127489000 |Has active ingredient|[354] =< 105590001 |Substance|[355]
```

Using the long syntax, this may be represented as:

```
descendantOf 373873005 |Pharmaceutical / biologic product|[356] :
  [0 to 1] 127489000 |Has active ingredient|[357] = descendantOf 105590001 |Substance|[358]
```

A maximum cardinality of '*' (or 'many') indicates that there is *no* constraint on the maximum number of attributes that may match the given attribute criteria. For example, the following expression constraint is satisfied only by products that have at least one active ingredient (i.e. the minimum cardinality is '1' and the maximum cardinality is unconstrained).

---

347 http://snomed.info/id/373873005
348 http://snomed.info/id/127489000
349 http://snomed.info/id/105590001
350 http://snomed.info/id/373873005
351 http://snomed.info/id/127489000
352 http://snomed.info/id/105590001
353 http://snomed.info/id/373873005
354 http://snomed.info/id/127489000
355 http://snomed.info/id/105590001
356 http://snomed.info/id/373873005
357 http://snomed.info/id/127489000
358 http://snomed.info/id/105590001

```
< 373873005 |Pharmaceutical / biologic product|[359] :
  [1..*] 127489000 |Has active ingredient|[360] = < 105590001 |Substance|[361]
```

Using the long syntax, this may be represented as:

```
descendantOf 373873005 |Pharmaceutical / biologic product|[362] :
  [1 to many] 127489000 |Has active ingredient|[363] = descendantOf 105590001 |Substance|[364]
```

A cardinality of [0..*] should therefore never be used as this indicates that the given attribute is not being constrained in any way, and is therefore a redundant part of the expression constraint.

6.3.1.3 Default Cardinalities

The default cardinality of each attribute, where not explicitly stated, is [1..*]. Therefore, the following two expression constraints are equivalent.

```
< 373873005 |Pharmaceutical / biologic product|[365] :
  [1..*] 127489000 |Has active ingredient|[366] = < 105590001 |Substance|[367]
```

```
< 373873005 |Pharmaceutical / biologic product|[368] :
  127489000 |Has active ingredient|[369] = < 105590001 |Substance|[370]
```

6.3.1.4 Non-redundant Attributes

As mentioned above, only non-redundant defining attributes are included in the cardinality count. Therefore, the following postcoordinated expression:

359 http://snomed.info/id/373873005
360 http://snomed.info/id/127489000
361 http://snomed.info/id/105590001
362 http://snomed.info/id/373873005
363 http://snomed.info/id/127489000
364 http://snomed.info/id/105590001
365 http://snomed.info/id/373873005
366 http://snomed.info/id/127489000
367 http://snomed.info/id/105590001
368 http://snomed.info/id/373873005
369 http://snomed.info/id/127489000
370 http://snomed.info/id/105590001

```
404684003 |Clinical finding|[371] :
  { 116676008 |Associated morphology|[372] = 72704001 |Fracture|[373] ,
    363698007 |Finding site|[374] = 299701004 |Bone of forearm|[375] ,
    363698007 |Finding site|[376] = 62413002 |Bone structure of radius|[377] }
```

will successfully satisfy the expression constraint:

```
< 404684003 |Clinical finding|[378] :
  [1..1] 363698007 |Finding site|[379] =< 91723000 |Anatomical structure|[380]
```

This is because 299701004 | Bone of forearm|[381] is a supertype of 62413002 | Bone structure of radius|[382] and therefore the attribute " 363698007 |Finding site|[383] = 299701004 |Bone of forearm|[384] " is redundant.

6.3.1.5 Attribute Cardinality in Groups

When the attributes to which cardinality are applied can be grouped, but braces are not used in the expression constraint, the cardinality constrains the number of times the attribute may be included in *any* attribute group. For example, the following expression constraint is satisfied by any clinical finding whose definition has two or more non-redundant finding sites, irrespective of which attribute group they are contained in.

```
< 404684003 |Clinical finding|[385] :
  [2..*] 363698007 |Finding site|[386] =< 91723000 |Anatomical structure|[387]
```

In contrast, when braces are placed around an attribute with a given cardinality, there must exist at least one attribute group for which the given cardinality is satisfied by attributes in that group. For example, the following expression constraint is satisfied by any clinical finding whose definition contains an attribute group with two or more non-redundant finding sites.

---

371 http://snomed.info/id/404684003
372 http://snomed.info/id/116676008
373 http://snomed.info/id/72704001
374 http://snomed.info/id/363698007
375 http://snomed.info/id/299701004
376 http://snomed.info/id/363698007
377 http://snomed.info/id/62413002
378 http://snomed.info/id/404684003
379 http://snomed.info/id/363698007
380 http://snomed.info/id/91723000
381 http://snomed.info/id/299701004
382 http://snomed.info/id/62413002
383 http://snomed.info/id/363698007
384 http://snomed.info/id/299701004
385 http://snomed.info/id/404684003
386 http://snomed.info/id/363698007
387 http://snomed.info/id/91723000

```
< 404684003 |Clinical finding|[388] :
  { [2..*] 363698007 |Finding site|[389] =< 91723000 |Anatomical structure|[390] }
```

6.3.2 Attribute Group Cardinality

Minimum and maximum cardinalities may also be applied to attribute groups. A minimum attribute group cardinality of X constrains the valid clinical meanings to those which have at least (i.e. >=) X non-redundant attribute groups that match the given attribute group criteria. A maximum cardinality of Y constrains the valid clinical meanings to those which have at most (i.e. <=) Y non-redundant attribute groups that match the given attribute group criteria. For example, a cardinality of "[1..2]" indicates that all clinical meanings that satisfy the given expression constraint must have at least one and at most two attribute groups that match the given attribute group criteria.

The expression constraint below is satisfied only by products with one, two or three attribute groups, which each contain at least one active ingredient relationship.

```
< 373873005 |Pharmaceutical / biologic product|[391] :
  [1..3] { [1..*] 127489000 |Has active ingredient|[392] =< 105590001 |Substance|[393] }
```

Please note that the above expression constraint is equivalent to:

```
< 373873005 |Pharmaceutical / biologic product|[394] :
  [1..3] { 127489000 |Has active ingredient|[395] =< 105590001 |Substance|[396] }
```

And may be written using the long syntax as:

```
descendantOf 373873005 |Pharmaceutical / biologic product|[397] :
  [1 to 3] { [1 to many] 127489000 |Has active ingredient|[398] =
    descendantOf 105590001 |Substance|[399] }
```

388 http://snomed.info/id/404684003
389 http://snomed.info/id/363698007
390 http://snomed.info/id/91723000
391 http://snomed.info/id/373873005
392 http://snomed.info/id/127489000
393 http://snomed.info/id/105590001
394 http://snomed.info/id/373873005
395 http://snomed.info/id/127489000
396 http://snomed.info/id/105590001
397 http://snomed.info/id/373873005
398 http://snomed.info/id/127489000
399 http://snomed.info/id/105590001

6.3.2.1 Unconstrained Cardinalities

As with attribute cardinalities, a minimum cardinality of '0' indicates that there is *no* constraint on the minimum number of attribute groups that may match the given attribute group criteria. For example, the following expression constraint is satisfied only by products with at most one attribute group containing an active ingredient relationship (i.e. the maximum attribute group cardinality is '1' and the minimum attribute group cardinality is unconstrained).

```
< 373873005 |Pharmaceutical / biologic product|[400] :
  [0..1] { 127489000 |Has active ingredient|[401] = < 105590001 |Substance|[402] }
```

Using the long syntax, this may be represented as:

```
descendantOf 373873005 |Pharmaceutical / biologic product|[403] :
  [0 to 1] { 127489000 |Has active ingredient|[404] = descendantOf 105590001 |Substance|[405] }
```

A maximum cardinality of '*' (or 'many') indicates that there is *no* constraint on the maximum number of attribute groups that may match the given attribute group criteria. For example, the following expression constraint is satisfied only by products that have at least one attribute group containing an active ingredient relationship (i.e. the minimum attribute group cardinality is '1' and the maximum attribute group cardinality is unconstrained).

```
< 373873005 |Pharmaceutical / biologic product|[406] :
  [1..*] { 127489000 |Has active ingredient|[407] = < 105590001 |Substance|[408] }
```

Using the long syntax, this may be represented as:

```
descendantOf 373873005 |Pharmaceutical / biologic product|[409] :
  [1 to *] { 127489000 |Has active ingredient|[410] = descendantOf 105590001 |Substance|[411] }
```

A cardinality of [0..*] should therefore never be used as this indicates that the given attribute group is not being constrained in any way, and is therefore a redundant part of the expression constraint.

---

400 http://snomed.info/id/373873005
401 http://snomed.info/id/127489000
402 http://snomed.info/id/105590001
403 http://snomed.info/id/373873005
404 http://snomed.info/id/127489000
405 http://snomed.info/id/105590001
406 http://snomed.info/id/373873005
407 http://snomed.info/id/127489000
408 http://snomed.info/id/105590001
409 http://snomed.info/id/373873005
410 http://snomed.info/id/127489000
411 http://snomed.info/id/105590001

6.3.2.2 Default Cardinalities

As with attribute cardinality, the default attribute group cardinality, where not explicitly stated, is [1..*]. Therefore, the following four expression constraints are equivalent.

```
< 373873005 |Pharmaceutical / biologic product|[412] :
  { 127489000 |Has active ingredient|[413] =< 105590001 |Substance|[414] }
```

```
< 373873005 |Pharmaceutical / biologic product|[415] :
  { [1..*] 127489000 |Has active ingredient|[416] =< 105590001 |Substance|[417] }
```

```
< 373873005 |Pharmaceutical / biologic product|[418] :
  [1..*] { 127489000 |Has active ingredient|[419] =< 105590001 |Substance|[420] }
```

```
< 373873005 |Pharmaceutical / biologic product|[421] :
  [1..*] { [1..*] 127489000 |Has active ingredient|[422] =< 105590001 |Substance|[423] }
```

6.3.2.3 Non-redundant Attribute Groups

As mentioned above, only non-redundant defining attributes are included in the cardinality count. Therefore, the following postcoordinated expression:

```
< 404684003 |Clinical finding|[424] :
  { 363698007 |Finding site|[425] = 299701004 |Bone of forearm|[426] },
  { 363698007 |Finding site|[427] = 62413002 |Bone structure of radius|[428] }
```

412 http://snomed.info/id/373873005
413 http://snomed.info/id/127489000
414 http://snomed.info/id/105590001
415 http://snomed.info/id/373873005
416 http://snomed.info/id/127489000
417 http://snomed.info/id/105590001
418 http://snomed.info/id/373873005
419 http://snomed.info/id/127489000
420 http://snomed.info/id/105590001
421 http://snomed.info/id/373873005
422 http://snomed.info/id/127489000
423 http://snomed.info/id/105590001
424 http://snomed.info/id/404684003
425 http://snomed.info/id/363698007
426 http://snomed.info/id/299701004
427 http://snomed.info/id/363698007
428 http://snomed.info/id/62413002

will successfully satisfy the expression constraint:

```
< 404684003 |Clinical finding|[429] :
  [1..1] { 363698007 |Finding site|[430] =< 91723000 |Anatomical structure|[431] }
```

This is because 299701004 | Bone of forearm|[432] is a supertype of 62413002 | Bone structure of radius|[433] and therefore the attribute group " { 363698007 |Finding site|[434] = 299701004 |Bone of forearm|[435] } " is redundant.

6.3.2.4 Attribute and Attribute Group Cardinalities

Attribute cardinalities and attribute group cardinalities can be used together to achieve a combined effect. For example, to represent the set of clinical findings which have *no* attribute groups that contain two or more finding site attributes (in the same attribute group), the following expression constraint can be used:

```
< 404684003 |Clinical finding|[436] :
  [0..0] { [2..*] 363698007 |Finding site|[437] =< 91723000 |Anatomical structure|[438] }
```

6.3.3 Reverse Cardinalities

When a cardinality constraint is applied to a reversed refinement, it constrains the number of source concepts (matching the given criteria) for which each destination concept may be relevant attribute value.

For example, the following expression constraint represents the substances, which are the active ingredient of exactly three products.

```
< 105590001 |Substance|[439] : [3..3] R 127489000 |Has active ingredient|[440] = *
```

If this expression constraint was executed against a simplified substrate containing the following seven relationships:

429 http://snomed.info/id/404684003
430 http://snomed.info/id/363698007
431 http://snomed.info/id/91723000
432 http://snomed.info/id/299701004
433 http://snomed.info/id/62413002
434 http://snomed.info/id/363698007
435 http://snomed.info/id/299701004
436 http://snomed.info/id/404684003
437 http://snomed.info/id/363698007
438 http://snomed.info/id/91723000
439 http://snomed.info/id/105590001
440 http://snomed.info/id/127489000

Source concept	Attribute	Destination concept
412458007 | Orphenadrine + aspirin + caffeine[441]	127489000 | Has active ingredient [442]	372714007 | Orphenadrine[443]
412458007 | Orphenadrine + aspirin + caffeine[444]	127489000 | Has active ingredient [445]	387458008 | Aspirin[446]
412458007 | Orphenadrine + aspirin + caffeine[447]	127489000 | Has active ingredient [448]	255641001 | Caffeine[449]
412096001 | Aspirin + codeine[450]	127489000 | Has active ingredient [451]	387458008 | Aspirin[452]
412096001 | Aspirin + codeine[453]	127489000 | Has active ingredient [454]	387494007 | Codeine[455]
424102008 | Acetaminophen+aspirin [456]	127489000 | Has active ingredient [457]	387517004 | Acetaminophen[458]
424102008 | Acetaminophen+aspirin [459]	127489000 | Has active ingredient [460]	387458008 | Aspirin[461]

then the result would include only the concept 387458008 | Aspirin[462] .

(see page 78) For more information about the SNOMED CT distribution view, please refer to the SNOMED CT Technical Implementation Guide[463]. Please note that full normalization of expressions (as would be performed by a Description Logic classifier) is required prior to evaluation.

441 http://snomed.info/id/412458007
442 http://snomed.info/id/127489000
443 http://snomed.info/id/372714007
444 http://snomed.info/id/412458007
445 http://snomed.info/id/127489000
446 http://snomed.info/id/387458008
447 http://snomed.info/id/412458007
448 http://snomed.info/id/127489000
449 http://snomed.info/id/255641001
450 http://snomed.info/id/412096001
451 http://snomed.info/id/127489000
452 http://snomed.info/id/387458008
453 http://snomed.info/id/412096001
454 http://snomed.info/id/127489000
455 http://snomed.info/id/387494007
456 http://snomed.info/id/424102008
457 http://snomed.info/id/127489000
458 http://snomed.info/id/387517004
459 http://snomed.info/id/424102008
460 http://snomed.info/id/127489000
461 http://snomed.info/id/387458008
462 http://snomed.info/id/387458008
463 http://snomed.org/tig

2(see page 78) As defined in the SNOMED CT Technical Implementation Guide[464]. [a(see page 78) b(see page 78)]

6.4 6.4 Conjunction and Disjunction

6.4.1 Compound Expression Constraints

Expression constraints can be built up from smaller parts using conjunction (i.e. AND) and disjunction (i.e. OR). The simplest example of this is where the conjunction or disjunction is used between two simple expressions. For example, the following expression constraint is satisfied only by clinical findings which are *both* a disorder of the lung *and* an edema of the trunk. This gives the same result as a mathematical *intersection* between the set of 19829001 | Disorder of lung|[465] descendants and the set of 301867009 | Edema of trunk|[466] descendants.

```
< 19829001 |Disorder of lung|[467] AND < 301867009 |Edema of trunk|[468]
```

Please note that all keywords are case insensitive, so the following two expression constraints are equivalent to the above:

```
< 19829001 |Disorder of lung|[469] and < 301867009 |Edema of trunk|[470]
```

```
< 19829001 |Disorder of lung|[471] And < 301867009 |Edema of trunk|[472]
```

The next expression constraint is satisfied only by clinical findings which are *either* a disorder of the lung *or* an edema of the trunk. This gives the same result as a mathematical *union* of the set of 19829001 | Disorder of lung|[473] descendants and the set of 301867009 | Edema of trunk|[474] descendants. For this reason, an *OR* operator will usually allow more valid clinical meanings than an *AND* operator.

```
< 19829001 |Disorder of lung|[475] OR < 301867009 |Edema of trunk|[476]
```

464 http://snomed.org/tig
465 http://snomed.info/id/19829001
466 http://snomed.info/id/301867009
467 http://snomed.info/id/19829001
468 http://snomed.info/id/301867009
469 http://snomed.info/id/19829001
470 http://snomed.info/id/301867009
471 http://snomed.info/id/19829001
472 http://snomed.info/id/301867009
473 http://snomed.info/id/19829001
474 http://snomed.info/id/301867009
475 http://snomed.info/id/19829001
476 http://snomed.info/id/301867009

Conjunction and disjunction operators may also be combined with the use of the 'member of' function, as shown below:

```
< 19829001 |Disorder of lung|[477] AND ^ 700043003 |Example problem list concepts reference set|[478]
```

This expression constraint is satisfied only by concepts that belong to the 19829001 | Disorder of lung|[479] hierarchy *and* are also members of the 700043003 | Example problem list concepts reference set|[480] .

When more than one conjunction or more than one disjunction is used, round brackets can be optionally applied. For example, the following expression constraints are all valid and equivalent to each other:

```
< 19829001 |Disorder of lung|[481] AND < 301867009 |Edema of trunk|[482] AND
  ^ 700043003 |Example problem list concepts reference set|[483]
```

```
(< 19829001 |Disorder of lung|[484] AND < 301867009 |Edema of trunk|[485] ) AND
   ^ 700043003 |Example problem list concepts reference set|[486]
```

```
< 19829001 |Disorder of lung|[487] AND (< 301867009 |Edema of trunk|[488] AND
   ^ 700043003 |Example problem list concepts reference set|[489] )
```

However, where a conjunction and disjunction are both used together, it is mandatory to use round brackets to disambiguate the meaning of the expression constraint. For example, the following expression constraint is ***not*** valid:

477 http://snomed.info/id/19829001
478 http://snomed.info/id/700043003
479 http://snomed.info/id/19829001
480 http://snomed.info/id/700043003
481 http://snomed.info/id/19829001
482 http://snomed.info/id/301867009
483 http://snomed.info/id/700043003
484 http://snomed.info/id/19829001
485 http://snomed.info/id/301867009
486 http://snomed.info/id/700043003
487 http://snomed.info/id/19829001
488 http://snomed.info/id/301867009
489 http://snomed.info/id/700043003

```
< 19829001 |Disorder of lung|[490] AND < 301867009 |Edema of trunk|[491] OR
  ^ 700043003 |Example problem list concepts reference set|[492]
```

And must be expressed (depending on the intended meaning) as either:

```
(< 19829001 |Disorder of lung|[493] AND < 301867009 |Edema of trunk|[494] ) OR
  ^ 700043003 |Example problem list concepts reference set|[495]
```

Or as:

```
< 19829001 |Disorder of lung|[496] AND (< 301867009 |Edema of trunk|[497] OR
  ^ 700043003 |Example problem list concepts reference set|[498] )
```

6.4.2 Attribute Conjunction and Disjunction

Conjunction and disjunction may be used within refinements in a variety of ways. The most common way of using these operators in a refinement is to define the conjunction or disjunction of individual attributes.

For example, the expression constraint below, in which the comma between the two attributes represents conjunction, is satisfied only by clinical findings which have *both* a finding site of pulmonary valve structure (or subtype) *and* an associated morphology of stenosis (or subtype).

```
< 404684003 |Clinical finding|[499] :
    363698007 |Finding site|[500] = << 39057004 |Pulmonary valve structure|[501] ,
    116676008 |Associated morphology|[502] = << 415582006 |Stenosis|[503]
```

This expression constraint can equivalently be expressed as:

490 http://snomed.info/id/19829001
491 http://snomed.info/id/301867009
492 http://snomed.info/id/700043003
493 http://snomed.info/id/19829001
494 http://snomed.info/id/301867009
495 http://snomed.info/id/700043003
496 http://snomed.info/id/19829001
497 http://snomed.info/id/301867009
498 http://snomed.info/id/700043003
499 http://snomed.info/id/404684003
500 http://snomed.info/id/363698007
501 http://snomed.info/id/39057004
502 http://snomed.info/id/116676008
503 http://snomed.info/id/415582006

```
< 404684003 |Clinical finding|[504] :
    363698007 |Finding site|[505] =<< 39057004 |Pulmonary valve structure|[506] AND
    116676008 |Associated morphology|[507] =<< 415582006 |Stenosis|[508]
```

The following example uses the disjunction operator (OR) to represent the disjunction of two attributes. This constraint is satisfied only by clinical findings which have *either* an associated morphology of 'infarct' (or subtype) *or* are due to a myocardial infarction (or subtype).

```
< 404684003 |Clinical finding|[509] :
    116676008 |Associated morphology|[510] =<< 55641003 |Infarct|[511] OR
    42752001 |Due to|[512] =<< 22298006 |Myocardial infarction|[513]
```

When more than one conjunction or more than one disjunction is used in a refinement, round brackets can be optionally applied. For example, the following expression constraints are all valid and equivalent to each other:

```
< 404684003 |Clinical finding|[514] :
    363698007 |Finding site|[515] =<< 39057004 |Pulmonary valve structure|[516] AND
    116676008 |Associated morphology|[517] =<< 415582006 |Stenosis|[518] AND
    42752001 |Due to|[519] =<< 445238008 |Malignant carcinoid tumor|[520]
```

504 http://snomed.info/id/404684003
505 http://snomed.info/id/363698007
506 http://snomed.info/id/39057004
507 http://snomed.info/id/116676008
508 http://snomed.info/id/415582006
509 http://snomed.info/id/404684003
510 http://snomed.info/id/116676008
511 http://snomed.info/id/55641003
512 http://snomed.info/id/42752001
513 http://snomed.info/id/22298006
514 http://snomed.info/id/404684003
515 http://snomed.info/id/363698007
516 http://snomed.info/id/39057004
517 http://snomed.info/id/116676008
518 http://snomed.info/id/415582006
519 http://snomed.info/id/42752001
520 http://snomed.info/id/445238008

```
< 404684003 |Clinical finding|[521] :
    ( 363698007 |Finding site|[522] =<< 39057004 |Pulmonary valve structure|[523] AND
      116676008 |Associated morphology|[524] =<< 415582006 |Stenosis|[525] ) AND
      42752001 |Due to|[526] =<< 445238008 |Malignant carcinoid tumor|[527]
```

```
< 404684003 |Clinical finding|[528] :
    363698007 |Finding site|[529] =<< 39057004 |Pulmonary valve structure|[530] AND
    ( 116676008 |Associated morphology|[531] =<< 415582006 |Stenosis|[532] AND
      42752001 |Due to|[533] =<< 445238008 |Malignant carcinoid tumor|[534] )
```

However, where a conjunction and disjunction are both used together in a refinement, it is mandatory to use brackets to disambiguate the meaning of the expression constraint.

For example, the following expression constraint is ***not*** valid:

```
< 404684003 |Clinical finding|[535] :
    363698007 |Finding site|[536] =<< 39057004 |Pulmonary valve structure|[537] AND
    116676008 |Associated morphology|[538] =<< 415582006 |Stenosis|[539] OR
    42752001 |Due to|[540] =<< 445238008 |Malignant carcinoid tumor|[541]
```

And must be expressed (depending on the intended meaning) as either:

521 http://snomed.info/id/404684003
522 http://snomed.info/id/363698007
523 http://snomed.info/id/39057004
524 http://snomed.info/id/116676008
525 http://snomed.info/id/415582006
526 http://snomed.info/id/42752001
527 http://snomed.info/id/445238008
528 http://snomed.info/id/404684003
529 http://snomed.info/id/363698007
530 http://snomed.info/id/39057004
531 http://snomed.info/id/116676008
532 http://snomed.info/id/415582006
533 http://snomed.info/id/42752001
534 http://snomed.info/id/445238008
535 http://snomed.info/id/404684003
536 http://snomed.info/id/363698007
537 http://snomed.info/id/39057004
538 http://snomed.info/id/116676008
539 http://snomed.info/id/415582006
540 http://snomed.info/id/42752001
541 http://snomed.info/id/445238008

```
< 404684003 |Clinical finding|[542] :
    ( 363698007 |Finding site|[543] =<< 39057004 |Pulmonary valve structure|[544] AND
      116676008 |Associated morphology|[545] =<< 415582006 |Stenosis|[546] ) OR
      42752001 |Due to|[547] =<< 445238008 |Malignant carcinoid tumor|[548]
```

Or as:

```
< 404684003 |Clinical finding|[549] :
    363698007 |Finding site|[550] =<< 39057004 |Pulmonary valve structure|[551] AND
    ( 116676008 |Associated morphology|[552] =<< 415582006 |Stenosis|[553] OR
      42752001 |Due to|[554] =<< 445238008 |Malignant carcinoid tumor|[555] )
```

6.4.3 Attribute Group Conjunction and Disjunction

Similarly, conjunction and disjunction may be defined between attribute groups. The following expression constraint is satisfied only by clinical findings which *either* have a finding site of pulmonary valve structure (or subtype) and an associated morphology of stenosis (or subtype), *OR* have a finding site of right ventricular structure (or subtype) and an associated morphology of hypertrophy (or subtype).

```
< 404684003 |Clinical finding|[556] :
    { 363698007 |Finding site|[557] =<< 39057004 |Pulmonary valve structure|[558] ,
      116676008 |Associated morphology|[559] =<< 415582006 |Stenosis|[560] } OR
```

542 http://snomed.info/id/404684003
543 http://snomed.info/id/363698007
544 http://snomed.info/id/39057004
545 http://snomed.info/id/116676008
546 http://snomed.info/id/415582006
547 http://snomed.info/id/42752001
548 http://snomed.info/id/445238008
549 http://snomed.info/id/404684003
550 http://snomed.info/id/363698007
551 http://snomed.info/id/39057004
552 http://snomed.info/id/116676008
553 http://snomed.info/id/415582006
554 http://snomed.info/id/42752001
555 http://snomed.info/id/445238008
556 http://snomed.info/id/404684003
557 http://snomed.info/id/363698007
558 http://snomed.info/id/39057004
559 http://snomed.info/id/116676008
560 http://snomed.info/id/415582006

```
{ 363698007 |Finding site|[561] = << 53085002 |Right ventricular structure|[562] ,
  116676008 |Associated morphology|[563] = << 56246009 |Hypertrophy|[564] }
```

6.4.4 Attribute Value Conjunction and Disjunction

Conjunction and disjunction can also be applied to attribute values. The example below is satisfied only by members of the adverse drug reactions reference set for GP/FP health issue, which have a causative agent that is *either* a subtype of pharmaceutical / biologic product *or* a subtype of substance.

```
^ 450990004 |Adverse drug reactions reference set for GP/FP health issue|[565] :
    246075003 |Causative agent|[566] = (< 373873005 |Pharmaceutical / biologic product|[567] OR < 105590001 |
Substance|[568] )
```

Similarly, attribute values can also use conjunction. The following expression constraint is satisfied only by clinical findings with an associated morphology whose value is *both* a subtype (or self) of ulcer *and* a subtype (or self) of hemorrhage.

```
< 404684003 |Clinical finding|[569] : 116676008 |Associated morphology|[570] =
  (<< 56208002 |Ulcer|[571] AND << 50960005 |Hemorrhage|[572] )
```

For more information about nested attribute values and nested compound expression constraints, please refer to 6.7 Nested Expression Constraints(see page 97).

6.5 6.5 Exclusion and Not Equals

6.5.1 Exclusion of Simple Expressions

Exclusion is supported in the SNOMED CT Expression Constraint Language by the binary operator 'MINUS'. Exclusion works in a similar manner to mathematical subtraction. For example, the following expression constraint returns the set of lung disorders which are not a descendant or self of edema of the trunk.

561 http://snomed.info/id/363698007
562 http://snomed.info/id/53085002
563 http://snomed.info/id/116676008
564 http://snomed.info/id/56246009
565 http://snomed.info/id/450990004
566 http://snomed.info/id/246075003
567 http://snomed.info/id/373873005
568 http://snomed.info/id/105590001
569 http://snomed.info/id/404684003
570 http://snomed.info/id/116676008
571 http://snomed.info/id/56208002
572 http://snomed.info/id/50960005

```
<< 19829001 |Disorder of lung|[573] MINUS << 301867009 |Edema of trunk|[574]
```

Logically, this expression constraint takes the set of descendants of 'disorder of lung' and subtracts the set of descendants of 'edema of trunk'. Please note that the keyword 'MINUS' is case insensitive.

Exclusion can also be applied to the membership of a reference set. For example, the following expression constraint returns the set of lung disorders which are not members of the cardiology reference set. That is, the set of descendants or self of 'disorder of lung' minus the set of members of the 'cardiology reference set'.

```
<< 19829001 |Disorder of lung|[575] MINUS ^ 700043003 |Example problem list concepts reference set|[576]
```

Please note that when more than one exclusion operator is used, or when an exclusion operator is used together with a conjunction or disjunction, round brackets must be used to disambiguate the intended meaning.

6.5.2 Exclusion of Attribute Values

Attribute values, represented by compound expression constraints, may also contain exclusions. When this occurs, the expression constraint is satisfied by any concept or expression which has at least one attribute (of the given type) whose value is satisfied by the compound constraint defined in the attribute value. For example, the expression constraint below represents the set of clinical findings, which have an associated morphology that is a descendant or self of ulcer and a descendant or self of hemorrhage, but not a descendant or self of obstruction.

```
< 404684003 |Clinical finding|[577] : 116676008 |Associated morphology|[578] =
    ((<< 56208002 |Ulcer|[579] AND << 50960005 |Hemorrhage|[580] ) MINUS << 26036001 |Obstruction|[581] )
```

6.5.3 Not Equal to Attribute Value

It is also possible to simply state that an attribute value should not fall in a particular range. The example below is satisfied only by clinical findings which have an associated morphology that is not a descendant (or self) of obstruction.

573 http://snomed.info/id/19829001
574 http://snomed.info/id/301867009
575 http://snomed.info/id/19829001
576 http://snomed.info/id/700043003
577 http://snomed.info/id/404684003
578 http://snomed.info/id/116676008
579 http://snomed.info/id/56208002
580 http://snomed.info/id/50960005
581 http://snomed.info/id/26036001

```
< 404684003 |Clinical finding|[582] :
    116676008 |Associated morphology|[583] != << 26036001 |Obstruction|[584]
```

Using the long syntax, this expression constraint can be represented as:

```
descendantOf 404684003 |Clinical finding|[585] :
    116676008 |Associated morphology|[586] NOT = descendantOrSelfOf 26036001 |Obstruction|[587]
```

To prohibit an attribute from having a value in a particular range, a cardinality of [0..0] must be used. For example, the following expression constraint represents the set of clinical findings which have exactly zero (i.e. they do not have any) associated morphologies that are a descendant or self of obstruction.

```
< 404684003 |Clinical finding|[588] :
    [0..0] 116676008 |Associated morphology|[589] = << 26036001 |Obstruction|[590]
```

To prohibit an attribute from having a value *outside* a particular range, a cardinality of [0..0] is used in conjunction with the 'not equal to' comparison operator. For example, the following expression constraint represents the set of clinical findings which have exactly zero associated morphologies that are *not* a descendant or self of obstruction. In other words, clinical findings for which *all* associated morphologies (if any exist) are descendants (or self) of obstruction.

```
< 404684003 |Clinical finding|[591] :
    [0..0] 116676008 |Associated morphology|[592] != << 26036001 |Obstruction|[593]
```

If we also want to ensure that at least one associated morphology does exist (and all of these have a value which is a descendant or self of obstruction), then the following expression constraint can be used:

582 http://snomed.info/id/404684003
583 http://snomed.info/id/116676008
584 http://snomed.info/id/26036001
585 http://snomed.info/id/404684003
586 http://snomed.info/id/116676008
587 http://snomed.info/id/26036001
588 http://snomed.info/id/404684003
589 http://snomed.info/id/116676008
590 http://snomed.info/id/26036001
591 http://snomed.info/id/404684003
592 http://snomed.info/id/116676008
593 http://snomed.info/id/26036001

```
< 404684003 |Clinical finding|[594] :
    [0..0] 116676008 |Associated morphology|[595] != << 26036001 |Obstruction|[596] and
    [1..*] 116676008 |Associated morphology|[597] = << 26036001 |Obstruction|[598]
```

Note that the cardinality on the second attribute may be omitted, as [1..*] is assumed by default.

6.6 6.6 Constraint Comments

6.6.1 Comments

SNOMED CT Expression Constraints may also include comments inline within the constraint string to explain, describe or document different aspects of the expression constraints. Each comment begins with a forward slash directly followed by a star (i.e. "/*") and ends with a star directly followed by a forward slash (i.e. "*/"). Comments may be placed anywhere in an expression constraint where whitespace (i.e. "ws") or mandatory whitespace (i.e. "mws") is allowed.

Comments have no effect on the machine processable interpretation of an expression constraint, as they should be ignored during evaluation. For example, the following two expression constraints (the first with comments, and the second without), will evaluate to exactly the same set of concepts:

```
/* Disorders of lung with edema */
< 19829001 |Disorder of lung|[599] : /* Descendants of disorder of lung */
    116676008 |Associated morphology|[600] = << 79654002 |Edema|[601]
    /* Where the associated morphology is edema or a subtype */
```

```
< 19829001 |Disorder of lung|[602] :
    116676008 |Associated morphology|[603] = << 79654002 |Edema|[604]
```

A comment may include both stars and forward slashes. However a star may never be directly followed by a forward slash within the middle of a comment, as this combination denotes the end of the comment.

---

594 http://snomed.info/id/404684003
595 http://snomed.info/id/116676008
596 http://snomed.info/id/26036001
597 http://snomed.info/id/116676008
598 http://snomed.info/id/26036001
599 http://snomed.info/id/19829001
600 http://snomed.info/id/116676008
601 http://snomed.info/id/79654002
602 http://snomed.info/id/19829001
603 http://snomed.info/id/116676008
604 http://snomed.info/id/79654002

6.7 6.7 Nested Expression Constraints

Expression constraints can be nested in a variety of ways to form nested expression constraints. These nested expression constraints use subexpressions, enclosed in round brackets, in the place of a simple concept reference.

Nested expression constraints can be created by:

- Applying constraint operators to an expression constraint
- Applying the memberOf function to an expression constraint
- Combining expression constraints using binary operators
- Adding dotted attributes to expression constraints
- Adding refinements to expression constraints
- Using expression constraints to represent valid attribute names
- Using expression constraints to represent valid attribute values

In this section, we describe each of these approaches to creating nested expression constraints.

6.7.1 Constraint Operators

When a constraint operator is applied to an expression constraint, the resulting set of matching expressions is the union of applying the constraint operator to each of its members.

For example, the following expression constraint represents all the members of the | Example problem list concepts reference set|[605] plus the union of the descendants of each of these members.

```
<< (^ 700043003 |Example problem list concepts reference set|[606] )
```

Please note that the brackets in the above expression constraint are optional. In this particular case, removing the brackets does not change the meaning of the constraint.

As another example, the following expression constraint represents the set of all descendants of the | Finding site|[607] of | Fracture of bone|[608] .

```
< ( 125605004 |Fracture of bone|[609] . 363698007 |Finding site|[610] )
```

Because the | Finding site|[611] of | Fracture of bone|[612] is 272673000 | Bone structure|[613] , the above expression constraint is equivalent to:

605 http://snomed.info/id/700043003
606 http://snomed.info/id/700043003
607 http://snomed.info/id/363698007
608 http://snomed.info/id/125605004
609 http://snomed.info/id/125605004
610 http://snomed.info/id/363698007
611 http://snomed.info/id/363698007
612 http://snomed.info/id/125605004
613 http://snomed.info/id/272673000

```
< 272673000 |Bone structure|[614]
```

Please note that this is *not* the same as the expression constraint:

```
< 125605004 |Fracture of bone|[615] . 363698007 |Finding site|[616]
```

which refers to the set of | Finding site|[617] values for any descendant of | Fracture of bone|[618], and is instead equivalent to:

```
(< 125605004 |Fracture of bone|[619] ). 363698007 |Finding site|[620]
```

See the subsection below on Dotted Attributes(see page 100) for more information about expression constraints of this form.

6.7.2 MemberOf Function

The memberOf function may also be applied to an expression constraint that returns a set of concept-based reference set concepts. When this is done, the nested expression constraint (to which the memberOf function is applied) must always be enclosed in round brackets.

For example, the expression constraint below is satisfied by the set of concepts which are members of any subtype of | GP/FP health issue reference set|[621]. In other words, it represents the union of applying the memberOf function to each of the descendants of | GP/FP health issue reference set|[622].

```
^ (< 450973005 |GP/FP health issue reference set|[623] )
```

The expression constraint above evaluates to the same set of concepts as applying the memberOf function to each individual subtype of 450973005 | GP/FP health issue reference set|[624] and then taking the union of these sets. Therefore, when applied to the 20170131 international edition of SNOMED CT, the above expression constraint evaluates to the same set of concepts as the following expression constraint.

614 http://snomed.info/id/272673000
615 http://snomed.info/id/125605004
616 http://snomed.info/id/363698007
617 http://snomed.info/id/363698007
618 http://snomed.info/id/125605004
619 http://snomed.info/id/125605004
620 http://snomed.info/id/363698007
621 http://snomed.info/id/450973005
622 http://snomed.info/id/450973005
623 http://snomed.info/id/450973005
624 http://snomed.info/id/450973005

```
^ 450990004 |Adverse drug reactions reference set for GP/FP health issue|[625]
  OR ^ 450989008 |Allergies reference set for GP/FP health issue|[626]
  OR ^ 450985002 |Disorders and diseases reference set for GP/FP health issue|[627]
  OR ^ 450988000 |Family history reference set for GP/FP health issue|[628]
  OR ^ 450991000 |Processes and procedures reference set for GP/FP health issue|[629]
  OR ^ 450986001 |Results reference set for GP/FP health issue|[630]
  OR ^ 450992007 |Social history reference set for GP/FP health issue|[631]
  OR ^ 450984003 |Symptoms and signs reference set for GP/FP health issue|[632]
```

6.7.3 Compound Expression Constraints

When conjunction (i.e. AND), disjunction (i.e. OR) or exclusion (i.e. MINUS) are applied to one or more complex subexpression constraints, brackets are usually required to nest the subexpression constraints.

For example, the following expression constraint uses brackets around the first complex operand (< 404684003 |Clinical finding|[633] : 363698007 |Finding site|[634] = << 39057004 |Pulmonary valve structure|[635]) to apply the 'AND' operator to two expression constraints.

```
(< 404684003 |Clinical finding|[636] :
   363698007 |Finding site|[637] = << 39057004 |Pulmonary valve structure|[638] )
    AND ^ 700043003 |Example problem list concepts reference set|[639]
```

An equivalent expression constraint can be achieved by swapping the order of the operands, as shown below.

```
^ 700043003 |Example problem list concepts reference set|[640]
  AND (< 404684003 |Clinical finding|[641] :
     363698007 |Finding site|[642] = << 39057004 |Pulmonary valve structure|[643] )
```

---

625 http://snomed.info/id/450990004
626 http://snomed.info/id/450989008
627 http://snomed.info/id/450985002
628 http://snomed.info/id/450988000
629 http://snomed.info/id/450991000
630 http://snomed.info/id/450986001
631 http://snomed.info/id/450992007
632 http://snomed.info/id/450984003
633 http://snomed.info/id/404684003
634 http://snomed.info/id/363698007
635 http://snomed.info/id/39057004
636 http://snomed.info/id/404684003
637 http://snomed.info/id/363698007
638 http://snomed.info/id/39057004
639 http://snomed.info/id/700043003
640 http://snomed.info/id/700043003
641 http://snomed.info/id/404684003
642 http://snomed.info/id/363698007
643 http://snomed.info/id/39057004

Similarly, if both sides of the compound expression are complex expression constraints, then brackets may be required on both sides. For example:

```
(< 404684003 |Clinical finding|[644] : 363698007 |Finding site|[645] =<< 39057004 |Pulmonary valve structure|[646])
  AND (< 64572001 |Disease|[647] : 116676008 |Associated morphology|[648] =<< 415582006 |Stenosis|[649])
```

6.7.4 Dotted Attributes

Dotted attributes can also be applied to a nested subexpression constraint. When this is done, the resulting subexpression represents the union of the values of the given dotted attribute for any expression that matches the given nested subexpression constraint.

For example, the following expression constraint represents the set of all substances that are the | Direct substance|[650] of a | Specimen collection|[651] procedure that is | Using device|[652] equal to a subtype (or self) of | Catheter|[653] .

```
(<< 17636008 |Specimen collection|[654] : 424226004 |Using device|[655] =<< 19923001 |Catheter|[656]) .
363701004 |Direct substance|[657]
```

When executed against the 20170131 international edition of SNOMED CT, the above expression constraint matches the following three concepts:

```
78014005 |Urine|[658]
87612001 |Blood|[659]
4635002 |Arterial blood|[660]
```

644 http://snomed.info/id/404684003
645 http://snomed.info/id/363698007
646 http://snomed.info/id/39057004
647 http://snomed.info/id/64572001
648 http://snomed.info/id/116676008
649 http://snomed.info/id/415582006
650 http://snomed.info/id/363701004
651 http://snomed.info/id/17636008
652 http://snomed.info/id/424226004
653 http://snomed.info/id/19923001
654 http://snomed.info/id/17636008
655 http://snomed.info/id/424226004
656 http://snomed.info/id/19923001
657 http://snomed.info/id/363701004
658 http://snomed.info/id/78014005
659 http://snomed.info/id/87612001
660 http://snomed.info/id/4635002

6.7.5 Refinement

As mentioned in 6.2 Refinements(see page 69), it is possible to apply refinements to nested expression constraints. When a refinement is applied to a complex subexpression constraint, the subexpression constraint must be enclosed in brackets.

For example, the expression constraint below represents the set of all clinical findings and events which occur after some procedure.

```
(<< 404684003 |Clinical finding (finding)|[661] OR << 272379006 |Event (event)|[662] ):
   255234002 |After|[663] = << 71388002 |Procedure (procedure)|[664]
```

Attribute Names

In some cases, the valid set of attribute names can be represented using an expression constraint. For example, the expression constraint below represents the set of bone fractures that have no additional defining attributes (besides | Finding site|[665] and | Associated morphology|[666]).

```
<< 125605004 |Fracture of bone|[667] :
   [0..0] ((<< 410662002 |Concept model attribute|[668] MINUS 363698007 |Finding site|[669] )
      MINUS 116676008 |Associated morphology|[670] ) = *
```

Within this expression constraint, the subexpression:

```
   (<< 410662002 |Concept model attribute|[671] MINUS 363698007 |Finding site|[672] ) MINUS 116676008 |
Associated morphology|[673]
```

represents the set of attributes that must match the given refinement condition (in this case, these attributes must not appear in the concept definition of matching concepts due to the cardinality of [0..0]).

661 http://snomed.info/id/404684003
662 http://snomed.info/id/272379006
663 http://snomed.info/id/255234002
664 http://snomed.info/id/71388002
665 http://snomed.info/id/363698007
666 http://snomed.info/id/116676008
667 http://snomed.info/id/125605004
668 http://snomed.info/id/410662002
669 http://snomed.info/id/363698007
670 http://snomed.info/id/116676008
671 http://snomed.info/id/410662002
672 http://snomed.info/id/363698007
673 http://snomed.info/id/116676008

6.7.6 Attribute Values

Similarly to the SNOMED CT Compositional Grammar, it is also possible to nest expression constraints within an attribute value. Please note that when the attribute value is a simple expression constraint (as per the above examples), brackets are not required around the value. However, when the attribute value is either an expression constraint with a refinement, or a compound expression constraint with a binary operator, then brackets must be placed around the attribute value. For example, the following expression constraint represents the set of clinical findings which are associated with another clinical finding that has an associated morphology of 'infarct' (or subtype).

```
< 404684003 |Clinical finding|[674] :
   47429007 |Associated with|[675] = (< 404684003 |Clinical finding|[676] :
      116676008 |Associated morphology|[677] = << 55641003 |Infarct|[678] )
```

In this example, brackets are required around the nested attribute value " < 404684003 |Clinical finding|[679] : 116676008 |Associated morphology|[680] = << 55641003 |Infarct|[681] ".

6.8 6.8 Description Filters

In this section, we illustrate how description filters can be applied to expression constraints to further restrict the matching concepts.

6.8.1 Overview

Description filter constraints provide the ability to limit the set of concepts, that satisfy a given expression constraint, based on the descriptions associated with each concept. Only concepts that have at least one matching description for each filter criteria will be included in the set of matching concepts. Descriptions can be filtered based on their term, type, language, dialect, acceptability in a given dialect, module, effectiveTime, active status and description identifier. Description filters are specified inside double curly braces, and optionally being with the letter "D". Any filter that does not specify its type is, by default, assumed to be a description filter.

In the following sections, we explain each type of description filter criteria.

6.8.2 Term Filter

Term filters enable an expression constraint to match on only those concepts with an associated description whose term matches the given search term. For example, the following expression constraint is satisfied by SNOMED CT concepts with a description matching the search terms "heart" and "att". This expression constraint works like a term search performed in a SNOMED CT browser. Please note that the "D" (either upper or lower case) at the start of the filter indicates that this is a description filter constraint, rather than a concept filter constraint (see 6.9 Concept

674 http://snomed.info/id/404684003
675 http://snomed.info/id/47429007
676 http://snomed.info/id/404684003
677 http://snomed.info/id/116676008
678 http://snomed.info/id/55641003
679 http://snomed.info/id/404684003
680 http://snomed.info/id/116676008
681 http://snomed.info/id/55641003

Filters(see page 113)). If the type of a filter constraint is not specified (as in most of the examples below), then it is assumed that the constraint is a description constraint.

```
* {{ D term = "heart att" }}
```

By default, term filters match using a word-prefix-any-order match technique. This means that each string value in the search term must match the start of a word in the concept's description term, but that these words may appear in any order. This word-prefix-any-order match technique can be explicitly specified in the term filter, using the keyword "match:" before the search term. For example, the following four expression constraints are equivalent, and are each satisfied only by diseases with a description term that includes both a word starting with "heart" **and** a word starting with "att" (in any order).

```
< 64572001 |Disease|[682] {{ term = "heart att"}}
```

```
< 64572001 |Disease|[683] {{ term = "heart", term = "att"}}
```

```
< 64572001 |Disease|[684] {{ term = match:"heart att"}}
```

```
< 64572001 |Disease|[685] {{ term = "att heart"}}
```

To indicate that a matching description may match either one search term or another, a search term set may be used.

The example below matches only those diseases with a description term containing **either** a word starting with "heart" **or** a word starting with "card" (or both).

```
< 64572001 |Disease|[686] {{ term = ("heart" "card")}}
```

The other technique that may be used is a wildcard search. This technique is specified using the keyword "wild:" and matches the search term in the expression constraint against the entire candidate description term (rather than just individual words). An asterisk ('*') is used as a wildcard to indicate that any (zero to many) characters may appear in the given position.

For example, the expression constraint below will match only diseases with a description term starting with "cardi" and ending with "opathy" with any number of characters between. This term filter would therefore match on terms such as "cardiopathy", "cardiomyopathy" and "cardiac channelopathy", but would **not** match on terms like "atrial cardiopathy" or "Cardiomyopathy (disorder)".

682 http://snomed.info/id/64572001
683 http://snomed.info/id/64572001
684 http://snomed.info/id/64572001
685 http://snomed.info/id/64572001
686 http://snomed.info/id/64572001

```
< 64572001 |Disease|[687] {{ term = wild:"cardi*opathy"}}
```

Please note that to perform an exact string match on an entire term, a wildcard search without a wildcard can be used (e.g. term=wild:"cardiopathy"). For example, the following expression constraint will match only diseases with a description term that exactly matches the full string "cardiopathy". This expression constraint will therefore match the concept 56265001 | Heart disease (disorder)|[688] (with synonym "Cardiopathy"), but will **not** match the concept 870575001 | Disorder of cardiac atrium (disorder)|[689] (with synonym "Atrial cardiopathy")

```
< 64572001 |Disease|[690] {{ term = wild:"cardiopathy"}}
```

It is also possible to mix the match techniques in a search term set. For example, the expression constraint below will match those diseases with a description term that either contains a word starting with "gas", or ending with "itis" - e.g. "gastric flu", "gastritis", or "tonsillitis".

```
< 64572001 |Disease|[691] {{ term = (match:"gas" wild:"*itis")}}
```

If more than one filter is applied, then **all** filters (surrounded in double braces) must match at least one description of a concept, for that concept to satisfy the constraint. The descriptions that match each of the filters can either be the same description, or different descriptions on the same concept.

The expression constraint below matches those diseases which have **both** a description that contains a word starting "eye" **and** a description that ends with "itis". For example, this constraint would match the concept 9826008 | Conjunctivitis (disorder)|[692] (with synonyms "Pink eye disease" and "Conjunctivitis") and the concept 15680481000119104 | Viral conjunctivitis of bilateral eyes (disorder)|[693] (with synonyms "Bilateral viral conjunctivitis" and "Viral conjunctivitis of both eyes"), but would **not** match the concept 45261009 | Viral conjunctivitis (disorder)|[694] (which does not have a synonym matching the word prefix "eye").

```
< 64572001 |Disease|[695] {{ term = "eye"}} {{ term = wild:"*itis"}}
```

6.8.3 Language Filter

Language filters enable an expression constraint to match on only those concepts with a matching description in a specified language. Language filters use the keyword "language", followed by a comparison operator (e.g. "=" or "!="), and the ISO 639-1 two-character language code (in upper or lowercase).

The expression constraint below matches only those diseases with a Swedish description containing the word prefix "hjärt" - e.g. 41884003 | hjärtpolyp|[696] from the Swedish Edition (20200531)

---

687 http://snomed.info/id/64572001
688 http://snomed.info/id/56265001
689 http://snomed.info/id/870575001
690 http://snomed.info/id/64572001
691 http://snomed.info/id/64572001
692 http://snomed.info/id/9826008
693 http://snomed.info/id/15680481000119104
694 http://snomed.info/id/45261009
695 http://snomed.info/id/64572001
696 http://snomed.info/id/41884003

```
< 64572001 |Disease|[697] {{ term = "hjärt", language = sv }}
```

The expression constraint below matches only those diseases with a Swedish description containing the word prefix "hjärt" and an English description containing the word prefix "heart" - e.g. 84114007 | hjärtsvikt|[698] (with English synonym "Heart failure") from the Swedish Edition (20200531).

```
< 64572001 |Disease|[699] {{ term = "hjärt", language = sv }} {{ term = "heart", language = en }}
```

6.8.4 Description Type Filter

Type filters enable an expression constraint to match on only those concepts with a matching description of a specified type. Type filters may either use the keyword "type" with the values "fsn", "syn" or "def", or may use the keyword "typeId" with a concept value that is < 900000000000446008 |Description type|[700] .

The following table lists the valid description type keywords in both the brief and full syntax, and their equivalent concept reference alternatives. Please note that the full syntax accepts both the brief and full syntax keywords. If additional description types are required, these must be specified in a filter using the 'typeId' keyword with the corresponding concept reference.

Type Keyword		**TypeId** **Concept Reference**
Brief Syntax	**Full Syntax**	
fsn	fullySpecifiedName	900000000000003001 |Fully specified name|
syn	synonym	900000000000013009 |Synonym|
def	definition	900000000000550004 |Definition|

For example, the expression constraint below matches all the subtypes of | Heart disease|[701] , that have a fully specified name containing the word prefix "heart".

```
< 56265001 |Heart disease|[702] {{ term = "heart", type = fsn }}
```

The following two expression constraints are equivalent, and both match only the subtypes of | Heart disease|[703] , which have a Swedish synonym containing the word prefix "hjärt".

697 http://snomed.info/id/64572001
698 http://snomed.info/id/84114007
699 http://snomed.info/id/64572001
700 http://snomed.info/id/900000000000446008
701 http://snomed.info/id/56265001
702 http://snomed.info/id/56265001
703 http://snomed.info/id/56265001

```
< 56265001 |Heart disease|[704] {{ term = "hjärt", language = SV, type = syn }}
```

```
< 56265001 |Heart disease|[705] {{ term = "hjärta", language = sv, typeId = 900000000000013009 |synonym|[706] }}
```

The two equivalent expression constraints below match the subtypes of | Heart disease|[707] , which either have a synonym containing the word prefix "heart", or a fully specified name containing the word prefix "heart".

```
< 56265001 |Heart disease|[708] {{ term = "heart", type = (syn fsn) }}
```

```
< 56265001 |Heart disease|[709] {{ term = "heart", typeId = ( 900000000000013009 |Synonym|[710]
900000000000003001 |Fully specified name|[711] ) }}
```

6.8.5 Dialect Filter

Dialect filters enable an expression constraint to match on only those concepts with a matching description in a specified language reference set. Dialect filters may either use the keyword "dialect" with a value that represents a valid alias for a specific language reference set, or may use the keyword "dialectId" with a concept value that is < 900000000000506000 |Language type reference set|[712] . Please refer to Appendix C - Dialect Aliases(see page 187) for a selection of valid dialect aliases for known language reference sets.

For example, the two equivalent expression constraints below will match all subtypes of | Disease|[713] that have a description in the Australian English language reference set.

```
< 64572001 |Disease|[714] {{ dialect = en-au }}
```

```
< 64572001 |Disease|[715] {{ dialectId = 32570271000036106 |Australian English language reference set|[716] }}
```

The expression constraint below matches all diseases with a description in the New Zealand English language reference set that has a word starting with "cardio".

---

704 http://snomed.info/id/56265001
705 http://snomed.info/id/56265001
706 http://snomed.info/id/900000000000013009
707 http://snomed.info/id/56265001
708 http://snomed.info/id/56265001
709 http://snomed.info/id/56265001
710 http://snomed.info/id/900000000000013009
711 http://snomed.info/id/900000000000003001
712 http://snomed.info/id/900000000000506000
713 http://snomed.info/id/64572001
714 http://snomed.info/id/64572001
715 http://snomed.info/id/64572001
716 http://snomed.info/id/32570271000036106

```
< 64572001 |Disease|[717] {{ term = "cardio", dialect = en-nz }}
```

In some situations, multiple language reference sets need to be used together to identify an appropriate set of concepts. A filter constraint may include a list of dialects to specify that a matching description may belong to any of the given language reference sets.

For example, the following expression constraint matches all diseases that have a description in either the en-nhs-clinical or en-nhs-pharmacy language reference sets, where that description contains a word starting with the prefix "card".

```
< 64572001 |Disease|[718] {{ term = "card", dialect = ( en-nhs-clinical en-nhs-pharmacy ) }}
```

6.8.6 Acceptability Filter

Acceptability filters enable an expression constraint to match on only those concepts with a matching description that has the specified acceptability in the specified language reference set. Acceptability filters must always be applied to a specified dialect. As such, they are represented by placing the required acceptability in brackets after the value of the dialect filter. Acceptabilities can be indicated using either one of the keywords below, or using a concept value that is < 900000000000511003 |Acceptability|[719] . The following table lists the valid acceptability keywords in both the brief and full syntax, and their equivalent concept reference alternatives. Please note that the full syntax accepts both the brief and full syntax keywords.

Acceptability Keyword		**AcceptabilityId** **Concept Reference**
Brief Syntax	**Full Syntax**	
prefer	preferred	900000000000548007 |Preferred|
accept	acceptable	900000000000549004 |Acceptable|

For example, the following two expression constraints both match all descendants of disease with a description that matches the word prefix 'box', has the type 'synonym', and has an acceptability of 'preferred' in the en-us language reference set. In other words, this expression constraint matches diseases with a US English preferred term that uses the word prefix 'box'.

```
< 64572001 |Disease|[720] {{ term = "box", type = syn, dialect = en-us (prefer) }}
```

717 http://snomed.info/id/64572001
718 http://snomed.info/id/64572001
719 http://snomed.info/id/900000000000511003
720 http://snomed.info/id/64572001

```
< 64572001 |Disease|[721] {{ term = "box", typeId = 900000000000013009 |Synonym|[722] , dialect = en-us ( 900000000000548007 |Preferred|[723] ) }}
```

Multiple dialect filters may be used with different acceptabilities applied to each. For example, the expression constraint below matches on diseases, which have a synonym with word prefix "box" that is preferred in the en-nhs-clinical language reference set **and** is acceptable in the en-gb language reference set.

```
< 64572001 |Disease|[724] {{ term = "box", type = syn, dialect = en-nhs-clinical (prefer), dialect = en-gb (accept) }}
```

To support alternative acceptabilities in more than one language reference set, a dialect set can be used. For example, the following two equivalent expression constraints match on diseases, which have a synonym with word prefix "box" that is **either** preferred in the en-gb language reference set **or** preferred in the en-nhs-clinical language reference set.

```
< 64572001 |Disease|[725] {{ term = "box", type = syn, dialect = ( en-gb (prefer) en-nhs-clinical (prefer) ) }}
```

```
< 64572001 |Disease|[726] {{ term = "box", type = syn, dialect = ( en-gb en-nhs-clinical ) (prefer) }}
```

6.8.7 Filters with Negation

Filters can use negation in a number of ways. The simplest approach is to use the 'not equal to' comparison operator (e.g. "!=") before the value.

For example, the following expression constraint matches on subtypes of | Fracture of bone|[727] that do not use the word prefix "fracture" in their US English preferred term.

```
< 125605004 |Fracture of bone|[728] {{ term != "fracture", type = syn, dialect = en-us (prefer)}}
```

If we remove the type and acceptability filters, as shown below, the remaining expression constraint matches on those subtypes of | Fracture of bone|[729] which have any US English description that does not contain the word prefix "fracture". Concepts including 263171005 | Fractured nasal bones|[730] (with synonym "Broken nose") will match the constraint below.

---

721 http://snomed.info/id/64572001
722 http://snomed.info/id/900000000000013009
723 http://snomed.info/id/900000000000548007
724 http://snomed.info/id/64572001
725 http://snomed.info/id/64572001
726 http://snomed.info/id/64572001
727 http://snomed.info/id/125605004
728 http://snomed.info/id/125605004
729 http://snomed.info/id/125605004
730 http://snomed.info/id/263171005

```
< 125605004 |Fracture of bone|[731] {{ term != "fracture", dialect = en-us}}
```

To find the set of concepts, for which **all** descriptions match some specified criteria, the expression constraint must use the MINUS operation to exclude concepts that have a non-matching description. For example, the expression constraint below matches all subtypes of | Fracture of bone|[732] , for which **every** description contains the word prefix "fracture". Please note that the filter only applies to the descendants of 125605004 | Fracture of bone|[733] (i.e. the subexpression directly proceeding the filter).

```
< 125605004 |Fracture of bone|[734] MINUS < 125605004 |Fracture of bone|[735] {{ term != "fracture"}}
```

This expression constraint can be simplified to the equivalent one below, using the wildcard character '*' (which represents any concept in the substrate).

```
< 125605004 |Fracture of bone|[736] MINUS * {{ term != "fracture"}}
```

Using a similar principle, the expression constraint below matches all concepts that do not have a preferred term specified in the en-nz language reference set.

```
* MINUS * {{ type = syn, dialect = en-nz (prefer) }}
```

6.8.8 Module Filter

Description module filters enable an expression constraint to match on only those concepts with a matching description that belongs to a specified module. Module filters use the keyword "moduleId" with a concept reference that is < 900000000000443000 |Module|[737] .

For example, the expression constraint below matches all subtypes of 195967001 | Asthma|[738] with a description that belongs to the US National Library of Medicine maintained module.

```
< 195967001 |Asthma|[739] {{ D moduleId = 731000124108 |US National Library of Medicine maintained module|[740] }}
```

And the expression constraint below matches all subtypes of 404684003 | Clinical finding|[741] with a definition that belongs to the international core module.

---

731 http://snomed.info/id/125605004
732 http://snomed.info/id/125605004
733 http://snomed.info/id/125605004
734 http://snomed.info/id/125605004
735 http://snomed.info/id/125605004
736 http://snomed.info/id/125605004
737 http://snomed.info/id/900000000000443000
738 http://snomed.info/id/195967001
739 http://snomed.info/id/195967001
740 http://snomed.info/id/731000124108
741 http://snomed.info/id/404684003

```
< 404684003 |Clinical finding|[742] {{ D type = def, moduleId = 900000000000207008 |SNOMED CT core module|[743] }}
```

6.8.9 Effective Time Filter

Description effective time filters enable an expression constraint to match on only those concepts with a description that has an effectiveTime matching the specified criteria. Effective time filters may use any of the date comparison operators shown below:

Operator	Name
=	Equals
!=	Not equals
<	Before the given date
<=	Before or on the given date
>	After the given date
>=	After or on the given date

Please note that the value of an effective time filter (if present) must be a 8 digit date, formatted according to ISO 8601's basic calendar date format (i.e. YYYYMMDD). If the effectiveTime of the description in the substrate includes a time and/or time zone designator, these should be ignored when performing the comparison.

For example, the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[744] with a description that has an effective time of 31st January 2021.

```
< 125605004 |Fracture of bone|[745] {{ D effectiveTime = "20210131" }}
```

And the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[746] with a description that has any effective time that is *not* 31st January 2021.

```
< 125605004 |Fracture of bone|[747] {{ D effectiveTime != "20210131" }}
```

742 http://snomed.info/id/404684003
743 http://snomed.info/id/900000000000207008
744 http://snomed.info/id/125605004
745 http://snomed.info/id/125605004
746 http://snomed.info/id/125605004
747 http://snomed.info/id/125605004

Similarly, greater than, less than, greater than or equals and less than or equals operators may be used in an effectiveTime filter. For example, the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[748] with a description that has an effectiveTime of 31st July 2019 or later (i.e. more recent).

```
< 125605004 |Fracture of bone|[749] {{ D effectiveTime >= "20190731" }}
```

And the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[750] with a description that has an effective time of 31st July 2019 or earlier.

```
< 125605004 |Fracture of bone|[751] {{ D effectiveTime <= "20190731" }}
```

The effectiveTime filter can also use sets of effective times. For example, the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[752] with a description that has an effectiveTime of either 31st January 2019, 31st July 2019, 31st January 2020, or 31st July 2020.

```
< 125605004 |Fracture of bone|[753] {{ D effectiveTime = ("20190131" "20190731" "20200131" "20200731" }}
```

And the expression constraint below matches all subtypes of 125605004 | Fracture of bone|[754] with a description, which does *not* have any of the following effective times: 31st January 2019, 31st July 2019, 31st January 2020 or 31st July 2020.

```
< 125605004 |Fracture of bone|[755] {{ D effectiveTime != ("20190131" "20190731" "20200131" "20200731" }}
```

To match concepts with unpublished descriptions, to which an effectiveTime has not been assigned, an effectiveTime value of "" can be used. For example, the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[756] with a description to which an effectiveTime has not yet been assigned.

```
< 125605004 |Fracture of bone|[757] {{ D effectiveTime = "" }}
```

Please note that description effectiveTime filters, which use the comparison operators "<" and ">", will **not** match any descriptions with an effectiveTime = "".

748 http://snomed.info/id/125605004
749 http://snomed.info/id/125605004
750 http://snomed.info/id/125605004
751 http://snomed.info/id/125605004
752 http://snomed.info/id/125605004
753 http://snomed.info/id/125605004
754 http://snomed.info/id/125605004
755 http://snomed.info/id/125605004
756 http://snomed.info/id/125605004
757 http://snomed.info/id/125605004

6.8.10 Active Filter

Description active filters enable an expression constraint to match on only those concepts with a description that has a matching active status. Descriptions are either active (i.e. active = 1 or active = "true") or inactive (i.e. active = 0 or active = "false"). By default, only active descriptions are included in the substrate.

For example, the following expression constraints return all concepts in the International Patient Summary reference set, which have an active description.

```
^ 816080008 |International Patient Summary|[758] {{ D active = 1 }}
```

```
^ 816080008 |International Patient Summary|[759] {{ D active = true }}
```

And the following expression constraints return all concepts in the International Patient Summary reference set, which have an inactive description.

```
^ 816080008 |International Patient Summary|[760] {{ D active = 0 }}
```

```
^ 816080008 |International Patient Summary|[761] {{ D active = false }}
```

6.8.11 Description Id Filter

Description id filters enable an expression constraint to match on only those concepts with a description that has a matching description identifier. For example, the following expression constraint matches any concept, which has an associated description with the identifier "3032638017". The only concept that matches this expression constraint is 707444001 | Uncomplicated asthma (disorder)|[762] .

```
* {{ D id = 3032638017 }}
```

Description id filters can also be applied to other expression constraints, to check whether the concept with the matching description id is in a given set of concepts. For example, the following expression constraint will match any descendant of 195967001 | Asthma (disorder)|[763] , which has a description with identifier "3032638017". This can be used to check if the concept with the given description id is a descendant of 195967001 | Asthma (disorder)|[764] .

758 http://snomed.info/id/816080008
759 http://snomed.info/id/816080008
760 http://snomed.info/id/816080008
761 http://snomed.info/id/816080008
762 http://snomed.info/id/707444001
763 http://snomed.info/id/195967001
764 http://snomed.info/id/195967001

```
< 195967001 |Asthma (disorder)|[765] {{ D id = 3032638017 }}
```

Description id filters may also include a set of description identifiers. The following expression constraint will match any descendant of 195967001 | Asthma (disorder)|[766] , with a description whose identifier is either "1208972017", "2674140012" or "3043971012".

```
< 195967001 |Asthma (disorder)|[767] {{ D id = (1208972017 2674140012 3043971012) }}
```

Please note that inactive concepts can have active descriptions, so the description id filter can be applied *after* inactive concepts are added to the query results via a history supplement[768]. For example, the following expression constraint matches any descendant of the concept 195967001 | Asthma (disorder)|[769] , or any inactive concept that is associated with a descendant of 195967001 | Asthma (disorder)|[770] via an historical association, as long as the concept has a description with the identifier "264553015". The only concept that matches this expression constraint is the inactive concept 170644007 | Mild asthma|[771] .

```
(< 195967001 |Asthma (disorder)|[772] {{+HISTORY}}) {{ D id = 264553015 }}
```

For more information on history supplements, please refer to 6.11 History Supplements(see page 121).

6.9 6.9 Concept Filters

In this section, we illustrate how concept filters can be applied to expression constraints to further restrict the matching concepts.

6.9.1 Overview

Concept filter constraints provide the ability to limit the set of concepts that satisfy a given expression constraint, based on the properties of each concept. Only concepts with properties that match the criteria specified in the concept filter constraint will be included in the set of matching concepts. Concepts can be filtered based on their definition status, module, effectiveTime, and active status. In the following sections we explain each of these concept filter criteria.

Definition Status Filter

Definition status filters enable an expression constraint to match on only those concepts with a matching definition status. Definition status filters may either use the keyword 'definitionStatus' with the values "defined" or "primitive", or may use the keyword "definitionStatusId" with a concept value that is < 900000000000444006 | Definition status|[773] .

765 http://snomed.info/id/195967001
766 http://snomed.info/id/195967001
767 http://snomed.info/id/195967001
768 https://confluence.ihtsdotools.org/display/ECL/6.11+History+Supplements
769 http://snomed.info/id/195967001
770 http://snomed.info/id/195967001
771 http://snomed.info/id/170644007
772 http://snomed.info/id/195967001
773 http://snomed.info/id/900000000000444006

The following table lists the valid definitionStatus tokens and their equivalent definitionStatusId concept reference alternatives. If additional definition statuses are required, these must be specified in a filter using the 'definitionStatusId' keyword with the corresponding concept reference.

definitionStatus (token)	definitionStatusId (concept reference)
primitive	900000000000074008 |Not sufficiently defined by necessary conditions definition status|
defined	900000000000073002 |Sufficiently defined by necessary conditions definition status|

For example, the expression constraints below match all the primitive subtypes of | Heart disease|[774] .

```
< 56265001 |Heart disease|[775] {{ C definitionStatus = primitive }}
```

```
< 56265001 |Heart disease|[776] {{ C definitionStatusId = 900000000000074008 |Primitive|[777] }}
```

Similarly, the two expression constraints below match all the fully defined subtypes of | Heart disease|[778] .

```
< 56265001 |Heart disease|[779] {{ C definitionStatus = defined }}
```

```
< 56265001 |Heart disease|[780] {{ C definitionStatusId = 900000000000073002 |Defined|[781] }}
```

Please note that Concept filters and Description Filters(see page 102) can be used together to filter the results of an expression constraint based on both the properties of each concept and the properties of their descriptions. For example the following expression constraint matches all primitive subtypes of 64572001 | Disease|[782] , which have at least one description term that includes a word starting with "heart".

```
< 64572001 |Disease|[783] {{ C definitionStatus = primitive }} {{ D term = "heart"}}
```

774 http://snomed.info/id/56265001
775 http://snomed.info/id/56265001
776 http://snomed.info/id/56265001
777 http://snomed.info/id/900000000000074008
778 http://snomed.info/id/56265001
779 http://snomed.info/id/56265001
780 http://snomed.info/id/56265001
781 http://snomed.info/id/900000000000073002
782 http://snomed.info/id/64572001
783 http://snomed.info/id/64572001

6.9.2 Module Filter

Module filters enable an expression constraint to match on only those concepts that belong to a specified module(see page 0). Module filters use the keyword "moduleId" with a concept reference that is < 900000000000443000 |Module|[784].

For example, the expression constraint below matches all subtypes of 195967001 |Asthma|[785] that belong to the US National Library of Medicine maintained module.

```
< 195967001 |Asthma|[786] {{ C moduleId = 731000124108 |US National Library of Medicine maintained module|[787] }}
```

And the expression constraint below matches all primitive subtypes of 195967001 |Asthma|[788] that belong to the international core module.

```
< 195967001 |Asthma|[789] {{ C definitionStatus = primitive, moduleId = 900000000000207008 |SNOMED CT core module|[790] }}
```

6.9.3 Effective Time Filter

Effective time filters enable an expression constraint to match on only those concepts with an effectiveTime that matches the specified criteria. Effective time filters may use any of the date comparison operators shown below:

Operator	Name
=	Equals
!=	Not equals
<	Before the given date
<=	Before or on the given date
>	After the given date
>=	After or on the given date

784 http://snomed.info/id/900000000000443000
785 http://snomed.info/id/195967001
786 http://snomed.info/id/195967001
787 http://snomed.info/id/731000124108
788 http://snomed.info/id/195967001
789 http://snomed.info/id/195967001
790 http://snomed.info/id/900000000000207008

Please note that the value of an effective time filter (if present) must be a 8 digit date, formatted according to ISO 8601's basic calendar date format (i.e. YYYYMMDD). If the effectiveTime of the concept in the substrate includes a time and/or time zone designator, these should be ignored when performing the comparison.

For example, the following expression constraint matches all subtypes of 125605004 |Fracture of bone|[791] with an effective time of 31st January 2021.

```
< 125605004 |Fracture of bone|[792] {{ C effectiveTime = "20210131" }}
```

And the following expression constraint matches all subtypes of 125605004 |Fracture of bone|[793] with any effective time that is *not* 31st January 2021.

```
< 125605004 |Fracture of bone|[794] {{ C effectiveTime != "20210131" }}
```

Similarly, greater than, less than, greater than or equals and less than or equals operators may be used in an effectiveTime filter. For example, the following expression constraint matches all subtypes of 125605004 |Fracture of bone|[795] with an effectiveTime of 31st July 2019 or later (i.e. more recent).

```
< 125605004 |Fracture of bone|[796] {{ C effectiveTime >= "20190731" }}
```

And the following expression constraint matches all subtypes of 125605004 |Fracture of bone|[797] with an effective time of 31st July 2019 or earlier.

```
< 125605004 |Fracture of bone|[798] {{ C effectiveTime <= "20190731" }}
```

The effectiveTime filter can also use sets of effective times. For example, the following expression constraint matches all subtypes of 125605004 |Fracture of bone|[799] with an effectiveTime of either 31st January 2019, 31st July 2019, 31st January 2020, or 31st July 2020.

```
< 125605004 |Fracture of bone|[800] {{ C effectiveTime = ("20190131" "20190731" "20200131" "20200731" }}
```

And the expression constraint below matches all subtypes of 125605004 |Fracture of bone|[801] which does *not* have any of the following effective times: 31st January 2019, 31st July 2019, 31st January 2020 or 31st July 2020.

---

791 http://snomed.info/id/125605004
792 http://snomed.info/id/125605004
793 http://snomed.info/id/125605004
794 http://snomed.info/id/125605004
795 http://snomed.info/id/125605004
796 http://snomed.info/id/125605004
797 http://snomed.info/id/125605004
798 http://snomed.info/id/125605004
799 http://snomed.info/id/125605004
800 http://snomed.info/id/125605004
801 http://snomed.info/id/125605004

```
< 125605004 |Fracture of bone|[802] {{ C effectiveTime != ("20190131" "20190731" "20200131" "20200731" }}
```

To match unpublished concepts to which an effectiveTime has not been assigned, an effectiveTime value of "" can be used. For example, the following expression constraint matches all subtypes of 125605004 | Fracture of bone|[803] to which an effectiveTime has not yet been assigned.

```
< 125605004 |Fracture of bone|[804] {{ C effectiveTime = "" }}
```

Please note that effectiveTime filters, which use the comparison operators "<" and ">", will **not** match any concepts with an effectiveTime = "".

6.9.4 Active Filter

Active filters enable an expression constraint to match on only those concepts with a matching active status. Concepts are either active (i.e. active = 1 or active = "true") or inactive (i.e. active = 0 or active = "false"). By default, both active and inactive concepts are included in the substrate. This allows inactive members of a reference set to be retrieved (e.g. for historical reference sets, in which the referenced component is intended to be inactive). However, because only active relationships are included in the default substrate, as soon as a refinement or hierarchical operator is used, only active concepts are matched.

For example, the following expression constraints returns only active concepts in the International Patient Summary reference set.

```
^ 816080008 |International Patient Summary|[805] {{ C active = 1 }}
```

```
^ 816080008 |International Patient Summary|[806] {{ C active = true }}
```

And the following expression constraints return only inactive concepts in the International Patient Summary reference set.

```
^ 816080008 |International Patient Summary|[807] {{ C active = 0 }}
```

```
^ 816080008 |International Patient Summary|[808] {{ C active = false }}
```

802 http://snomed.info/id/125605004
803 http://snomed.info/id/125605004
804 http://snomed.info/id/125605004
805 http://snomed.info/id/816080008
806 http://snomed.info/id/816080008
807 http://snomed.info/id/816080008
808 http://snomed.info/id/816080008

1 (see page 115) Please note that module filters are not intended to replace the use of simple reference sets to organize content of a particular type. Module filters are instead intended to be used for purposes related to the management of extensions or editions.

6.10 6.10 Member Filters

In this section, we illustrate how filters can be applied to a set of reference set members to restrict the matching values.

6.10.1 Overview

Member filters provide the ability to filter the rows of a reference set, based on the value of specific fields in the reference set. These filters are specified inside double curly braces, and begin with the letter "M".

6.10.2 Member Field Filters

To apply a member filter to one or more reference sets, the fields of those reference sets are matched against specified criteria. Only reference set members whose field values match the given criteria will be included in the results.

For example, the following expression constraint will match all referencedComponentIds (i.e. SNOMED CT concept id) from the active 447562003 | ICD-10 complex map reference set|[809] rows, which map to the ICD-10 code "J45.9" (as a word prefix). When applied to the July 2021 international edition, this will match 59 concepts, including 195967001 | Asthma|[810], 707447008 | Exacerbation of severe persistent asthma (disorder)|[811] and 401193004 | Asthma confirmed (situation)|[812].

```
^ 447562003 |ICD-10 complex map reference set|[813] {{ M mapTarget = "J45.9" }}
```

Please note that by default, a word-prefix-any-order match is performed. Therefore the following expression constraint will match on rows that have a mapTarget of "J45.0", "J45.1",..., "J45.8", "J45.9" etc.

```
^ 447562003 |ICD-10 complex map reference set|[814] {{ M mapTarget = "J45" }}
```

Alternatively, a wildcard search can be performed, to achieve similar results. For example, the expression constraint below will match on rows that have a mapTarget starting with "J45" followed by zero or more other characters (e.g. "J45.0", "J45.1",...,"J45.8", "J45.9")

```
^ 447562003 |ICD-10 complex map reference set|[815] {{ M mapTarget = wild:"J45*" }}
```

809 http://snomed.info/id/447562003
810 http://snomed.info/id/195967001
811 http://snomed.info/id/707447008
812 http://snomed.info/id/401193004
813 http://snomed.info/id/447562003
814 http://snomed.info/id/447562003
815 http://snomed.info/id/447562003

To achieve an exact string match, a wildcard search (without an '*') can be used. For example, the expression constraint below will match only rows that have a mapTarget of "J45.9".

```
^ 447562003 |ICD-10 complex map reference set|[816] {{ M mapTarget = wild:"J45.9" }}
```

For more information on wildcard and word-prefix-any-order searching, please refer to 6.8 Description Filters(see page 102).

Multiple field constraints can be applied within a reference set member filter. For example, the following expression constraint will return the referencedComponentId from the 447562003 | ICD-10 complex map reference set|[817] rows, which have a mapGroup of "2", a mapPriority of "1" and a mapTarget of "J45.9".

```
^ 447562003 |ICD-10 complex map reference set|[818]
{{ M mapGroup = #2, mapPriority = #1, mapTarget = "J45.9" }}
```

Other comparison operators may also be used, when defining field criteria. The available operators depend on the field's datatype, as shown in the table below.

Data type	Comparison Operators	
	Brief syntax	**Long syntax**
SCTID / Expression	= , !=	= , != , NOT = , <>
Integer / Decimal	= , != , <= , < , >= , >	= , != , NOT = , <> , <= , < , >= , >
String	= , !=	= , != , NOT = , <>
Boolean	= , !=	= , != , NOT = , <>
Time	= , != , <= , < , >= , >	= , != , NOT = , <> , <= , < , >= , >

In addition, reference set fields of type 'string' may be filtered using the same word-prefix-any-order and wildcard techniques used by the description term filters. For example, the following expression constraint will match all referencedComponentId from the active 447562003 | ICD-10 complex map reference set|[819] rows that have a mapGroup not equal to 2, a mapPriority less than 2, and a mapTarget that starts with the letter "J".

```
^ 447562003 |ICD-10 complex map reference set|[820] {{ M mapGroup !
= #2, mapPriority < #2, mapTarget = wild:"J*" }}
```

816 http://snomed.info/id/447562003
817 http://snomed.info/id/447562003
818 http://snomed.info/id/447562003
819 http://snomed.info/id/447562003
820 http://snomed.info/id/447562003

Member filters can also be used in combination with the memberOf function to support the selection of other fields of a reference set (see 6.1 Simple Expression Constraints(see page 61)). For example, the following expression constraint returns the active SNOMED CT concept that is considered to be the same as the inactive concept 67415000 | Hay asthma|[821]

```
  ^ [targetComponentId] 900000000000527005 |SAME AS association reference set|[822]
{{ M referencedComponentId = 67415000 |Hay asthma|[823] }}
```

For more information on the use of reference set field names in ECL, please refer to Appendix E - Reference Set Fields(see page 199).

For additional ways of specifying queries over the historical association reference sets, please refer to 6.11 History Supplements(see page 121).

6.10.3 Module Filter

Module filters enable an expression constraint to match on only those rows of a reference set that belong to a specified module. Module filters use the keyword "moduleId" with a concept reference that is < 900000000000443000 |Module|[824] .

For example, the expression constraint below matches all members of the 900000000000534007 | Module dependency reference set|[825] that belong to an Australian maintained module.

```
^ 900000000000534007 |Module dependency reference set|[826] {{ M moduleId = << 32570231000036109 |
Australian maintained module|[827] }}
```

6.10.4 Effective Time Filter

Effective time filters enable an expression constraint to match on only those rows of a reference set with an effectiveTime that matches the specified criteria.

For example, the following expression constraint matches all rows of the 816080008 | International Patient Summary|[828] which have been updated since 31st July 2021 (inclusive). Note that the referencedComponentId is the only field returned.

```
^ 816080008 |International Patient Summary|[829] {{ M effectiveTime >= "20210731" }}
```

821 http://snomed.info/id/67415000
822 http://snomed.info/id/900000000000527005
823 http://snomed.info/id/67415000
824 http://snomed.info/id/900000000000443000
825 http://snomed.info/id/900000000000534007
826 http://snomed.info/id/900000000000534007
827 http://snomed.info/id/32570231000036109
828 http://snomed.info/id/816080008
829 http://snomed.info/id/816080008

6.10.5 Active Filter

Active filters enable an expression constraint to match on only those members of a reference set with a matching active status. Reference set rows are either active (i.e. active = 1 or active = "true") or inactive (i.e. active = 0 or active = "false"). By default, only active members of a reference set are included in the substrate.

For example, the following expression constraints returns the inactive members of the 816080008 | International Patient Summary|[830] .

```
^ 816080008 |International Patient Summary|[831] {{ M active = 0 }}
```

6.11 6.11 History Supplements

In this section, we illustrate how history supplements can be applied to an expression constraint to supplement the results with relevant inactive concepts. History supplements are specified inside double curly braces and begin with a plus sign (i.e. "+") followed by the word "HISTORY".

6.11.1 Background

When capturing new clinical data in an electronic health record (EHR), it is good practice to only allow active SNOMED CT concept identifiers to be recorded. However, SNOMED CT is a dynamic and evolving terminology that must remain consistent with current clinical practice and our evolving understanding of disease processes and treatments. As a result, content may change, become outdated, or need remodelling. As SNOMED CT evolves, concepts that were previously recorded in the EHR may subsequently be inactivated. For legal reasons, it is important that the concepts used at the time the data was recorded should persist in the health records. For this reason, the number of inactive SNOMED CT identifiers in an EHR may increase over time.

As most ECL queries typically return only active SNOMED CT concept identifiers, it may not be possible to retrieve health records containing inactive identifiers using a standard expression constraint. One solution to this challenge, is to execute the expression constraint over an old SNOMED CT edition, in which all required concepts were active. However, given that the logical definitions in SNOMED CT typically improve over time, it is generally accepted that the best ECL results can be obtained using the most recent edition. Therefore, a query approach utilising the most recent edition of SNOMED CT is preferred in many cases.

When a SNOMED CT concept is inactivated, the author first allocates an appropriate reason for the inactivation, and then links the inactivated concept to one or more replacements using historical association reference sets. These historical associations provide a clear understanding of the level of semantic equivalence between the inactivated concept and its replacements where they exist. Vendors can use these historical associations to supplement the active concepts in their query results, with inactive concepts which are linked via appropriate historical associations to the active query results.

On this page, we describe how 'history supplements' can be added to an ECL query, to augment the query results with relevant inactive concepts, and how the resulting queries can be used to retrieve a more complete set of matching health records.

---

830 http://snomed.info/id/816080008
831 http://snomed.info/id/816080008

6.11.2 History Supplements

6.11.2.1 Overview

The member filter syntax, described in 6.10 Member Filters(see page 118), can be used to augment the results of an expression constraint with a set of inactive concepts that are related via an historical association reference set. For example, the following expression constraint can be used to find all the active descendants (and self) of the concept 195967001 | Asthma|[832] , plus any inactive concept that is linked to an active descendant (or self) of 195967001 | Asthma|[833] via a historical | SAME AS association reference set|[834] member.

```
<< 195967001 |Asthma|[835] OR
^ 900000000000527005 |SAME AS association reference set|[836] {{ M targetComponentId = << 195967001 |
Asthma|[837] }}
```

The ECL **history supplement** syntax can be used to simplify queries with this structure. For example, the above query can be expressed in a a shorter form as:

```
<< 195967001 |Asthma|[838] {{ + HISTORY ( 900000000000527005 |SAME AS association reference set|[839] ) }}
```

6.11.2.2 Template

The general template 1(see page 0) for history supplements is shown below.

```
[[+ecl @ecl_query]] {{ + HISTORY ( [[+ecl @history_refset_query]] ) }}
```

This general template for history supplements is equivalent to the expanded version shown below. Please note that the first and last slot in this template have the same name, which indicates that they must be populated with the same value (which in this case is the ECL query being performed).

```
[[+ecl @ecl_query]] OR
^ [[+ecl @history_refset_query]] {{ M targetComponentId = [[+ecl @ecl_query]] }}
```

832 http://snomed.info/id/195967001
833 http://snomed.info/id/195967001
834 http://snomed.info/id/900000000000527005
835 http://snomed.info/id/195967001
836 http://snomed.info/id/900000000000527005
837 http://snomed.info/id/195967001
838 http://snomed.info/id/195967001
839 http://snomed.info/id/900000000000527005

Please note that this history template does not support the 900000000000525002 | MOVED FROM association reference set[840] , as the referencedComponentId refers to the active concept, while the targetComponentId refers to the inactive concept (which is the opposite of typical historical associations). If supporting | MOVED FROM[841] historical associations, it is recommended that these be added to the 900000000000527005 | SAME AS association reference set[842] , to ensure that the template pattern above can be consistently applied.

Also note that the 900000000000524003 | MOVED TO association reference set[843] can be ignored for the purposes of executing historical ECL queries.

6.11.2.3 Profiles

To help implementers of clinical systems write suitable ECL queries that include an appropriate set of inactive concepts, three history supplement profiles are provided. These profiles are designed to support a range of use cases, depending on the level of precision and recall required for inactive content. The three history supplement profiles are described in the table below.

History Profile	Purpose	Historical Association Reference Sets
HISTORY-MIN	Minimum: To support use cases requiring a high level of precision, only historical associations that have a one-to-one equivalence with their replacement are used. Example use case: Clinical decision support	900000000000527005 | SAME AS association reference set[844]
HISTORY-MOD	*Moderate*: To support use cases that must balance precision with recall, only historical associations that • Have a one-to-one equivalence with their replacement • Have a one-to-many equivalence with their replacement, or • Are replaced by a concept that represents the intended original meaning closely enough to be clinically useful are used. Example use cases: Clinical research, clinical audit	900000000000527005 | SAME AS association reference set[845] 900000000000526001 | REPLACED BY association reference set[846] 900000000000528000 | WAS A association reference set[847] 1186924009 | PARTIALLY EQUIVALENT TO association reference set[848]

840 http://snomed.info/id/900000000000525002
841 http://snomed.info/id/900000000000525002
842 http://snomed.info/id/900000000000527005
843 http://snomed.info/id/900000000000524003
844 http://snomed.info/id/900000000000527005
845 http://snomed.info/id/900000000000527005
846 http://snomed.info/id/900000000000526001
847 http://snomed.info/id/900000000000528000
848 http://snomed.info/id/1186924009

History Profile	Purpose	Historical Association Reference Sets
HISTORY-MAX HISTORY (*)	*Maximum*: To support use cases that require the highest level of recall, where precision is not as important, all possible historical associations are used. Example use case: Identifying patients for manual review.	< 900000000000522004 |Historical association reference set|[849]

For example, if a high level of precision is required, then the HISTORY-MIN profile may be used. The expression constraint below matches descendants or self of 195967001 | Asthma|[850] , plus any inactive concept that is associated with a descendant or self of 195967001 | Asthma|[851] in the 900000000000527005 | SAME AS association reference set|[852] or the 900000000000525002 | MOVED FROM association reference set|[853]

```
<< 195967001 |Asthma|[854] {{ + HISTORY-MIN }}
```

The above expression constraint is equivalent to the one below, with an expanded history supplement.

```
<< 195967001 |Asthma|[855] {{ + HISTORY ( 900000000000527005 |SAME AS association reference set|[856] ) }}
```

Use cases that must balance the precision of associated inactive concepts with the level of recall, may use the HISTORY-MOD supplement. The following two expression constraint, which use the history supplement profile and the expanded history supplement respectively, are equivalent.

```
<< 195967001 |Asthma|[857] {{ + HISTORY-MOD }}
```

```
<< 195967001 |Asthma|[858] {{ + HISTORY ( 900000000000527005 |SAME AS association reference set|[859] OR 900000000000526001 |REPLACED BY association reference set|[860] OR 900000000000528000 |WAS A association reference set|[861] OR 1186924009 |PARTIALLY EQUIVALENT TO association reference set|[862] ) }}
```

849 http://snomed.info/id/900000000000522004
850 http://snomed.info/id/195967001
851 http://snomed.info/id/195967001
852 http://snomed.info/id/900000000000527005
853 http://snomed.info/id/900000000000525002
854 http://snomed.info/id/195967001
855 http://snomed.info/id/195967001
856 http://snomed.info/id/900000000000527005
857 http://snomed.info/id/195967001
858 http://snomed.info/id/195967001
859 http://snomed.info/id/900000000000527005
860 http://snomed.info/id/900000000000526001
861 http://snomed.info/id/900000000000528000
862 http://snomed.info/id/1186924009

And finally, use cases that require the highest level of recall, may use the HISTORY-MAX supplement profile. This profile uses all possible historical association reference sets to find any potentially relevant inactive concept. The following four expression constraints, which use (a) the history supplement profile, (b) the expanded history supplement, (c) the ANY wildcard symbol ('*'), and (d) the 'history' keyword on its own, are all equivalent. Please note that the 900000000000524003 | MOVED TO association reference set|[863] does not need to be included in the execution of this query, because the targetComponentId is assigned a namespace concept

```
<< 195967001 |Asthma|[864] {{ + HISTORY-MAX }}
```

```
<< 195967001 |Asthma|[865] {{ + HISTORY (< 900000000000522004 |Historical association reference set|[866] ) }}
```

```
<< 195967001 |Asthma|[867] {{ + HISTORY (*) }}
```

```
<< 195967001 |Asthma|[868] {{ + HISTORY }}
```

6.11.3 Use Case Examples

Here are two use cases that illustrate how these history supplements may be used in practice:

6.11.3.1 Use Case 1

A clinical system is trying to count the number of patients who have had any type of referral to a service. The system attempts to use the following ECL query to find patient records with a matching procedure.

```
<< 306206005 |Referral to service (procedure)|[869]
```

This query is successfully used to finds patient records containing active referral concepts, such as 308461008 | Referral to radiology service (procedure)|[870] .

However, it is discovered that there are 738,090 patient records coded with the inactive SNOMED CT concept 183598009 | Refer to Radiology department (procedure)|[871] , which should also be included in the patient count. The clinical system, therefore, adjusts its expression constraint query as shown below, to add a history supplement that includes all inactive concepts with the same meaning as one of the active referral concepts.

863 http://snomed.info/id/900000000000524003
864 http://snomed.info/id/195967001
865 http://snomed.info/id/195967001
866 http://snomed.info/id/900000000000522004
867 http://snomed.info/id/195967001
868 http://snomed.info/id/195967001
869 http://snomed.info/id/306206005
870 http://snomed.info/id/308461008
871 http://snomed.info/id/183598009

```
<< 306206005 |Referral to service (procedure)|[872] {{ + HISTORY-MIN }}
```

Because the expression constraint " << 306206005 |Referral to service (procedure)|[873] " matches the active concept 308461008 | Referral to radiology service (procedure)|[874] , and a SAME AS association exists between the inactive concept 183598009 | Refer to Radiology department (procedure)|[875] and the active concept 308461008 | Referral to radiology service (procedure)|[876] , the above expression constraint will include the inactive concept 183598009 | Refer to Radiology department (procedure)|[877] , and therefore successfully find the additional 738,090 patient records in which this inactive referral procedure is recorded.

6.11.3.2 Use Case 2

A clinician is trying to find all patients with any type of breast pain. Knowing that she will be reviewing the patient records prior to acting upon the information, she decides to use a maximal approach to searching historical records. She therefore uses the following ECL query:

```
<< 53430007 |Pain of breast (finding)|[878] {{ + HISTORY-MAX }}
```

She is delighted to see that patient records containing the inactive concept 315251009 | Unilateral mastalgia (situation)|[879] are retrieved, as these are indeed relevant to her query. Behind the scenes, the clinical system was able to identify that this inactive concept may be relevant, because it is linked to the active concepts 1010235008 | Pain of left breast|[880] and 1010237000 | Pain of right breast|[881] (which are both a type of | Pain of breast|[882]) via the | POSSIBLY EQUIVALENT TO association reference set|[883] .

---

1 (see page 122) Note that this template uses the template syntax defined in the SNOMED CT Template Syntax specification[884], with the addition of an 'ECL' replacement type to indicate that the respective slot must be replaced by a valid ECL expression constraint. This extended template slot syntax is then used within an expression constraint to informally illustrate the pattern required when expanding a history supplement.

872 http://snomed.info/id/306206005
873 http://snomed.info/id/306206005
874 http://snomed.info/id/308461008
875 http://snomed.info/id/183598009
876 http://snomed.info/id/308461008
877 http://snomed.info/id/183598009
878 http://snomed.info/id/53430007
879 http://snomed.info/id/315251009
880 http://snomed.info/id/1010235008
881 http://snomed.info/id/1010237000
882 http://snomed.info/id/53430007
883 http://snomed.info/id/900000000000523009
884 http://snomed.org/sts

7 7. Implementation Considerations

When implementing the SNOMED CT Expression Constraint Language, the factors that need to be taken into consideration depend on what tasks are being performed. For example, implementations may require expression constraints to be authored, parsed, validated, executed, stored, displayed or exchanged.

The subsections below look at each of these tasks individually and provide a summary of the factors that should be considered prior to implementation. Please note that the guidance provided below is not a step-by-step how-to manual, but instead provides some general insights that we hope are helpful in implementing this language specification.

- 7.1 Authoring(see page 127)
- 7.2 Parsing(see page 129)
- 7.3 Validating(see page 130)
- 7.4 Executing(see page 130)
- 7.5 Storing(see page 130)
- 7.6 Displaying(see page 131)
- 7.7 Exchanging(see page 131)

7.1 7.1 Authoring

Authoring SNOMED CT Expression Constraints can be performed using two main techniques:

1. *Language-based authoring*: This technique involves the author constructing a SNOMED CT Expression Constraint using one of the syntaxes defined in Chapter 5.
2. *Form-based authoring*: This technique involves the author entering values into separate fields of a form, and the clinical system automatically composing the values together into a syntactically correct SNOMED CT Expression Constraint.

7.1.1 Language-Based Authoring

Language-based authoring is useful for situations in which ad hoc expression constraints must be defined which don't necessarily conform to a consistent structure. For example, some expression constraints (e.g. those that define terminology bindings or predefined queries) may be authored by software developers during the design, development or customization of a clinical application. Other expression constraints (e.g. those used to define intentional reference sets or validation queries) may be defined by terminologists during the process of developing a SNOMED CT extension. Expression constraints may also be authored by users who wish to retrieve or analyse information stored in patient records using SNOMED CT (e.g. for clinical, epidemiological or research queries).

To use language-based authoring, the user must be familiar with the basic features of the Expression Constraint Language syntax. There are, however, a number of ways in which a tool can support the user while creating expression constraints, including:

- Validating the syntactical correctness of the expression constraint as it is authored;
- Checking the expression constraint for conformance against the concept model;
- Automatically populating or correcting the term associated with a concept reference;
- Providing integrated tools to search the SNOMED CT hierarchy for concept references to include in the expression constraint;
- Filtering the concept search to those concepts which are valid to use at the given point in the expression constraint (e.g. only showing attribute concepts, or those within the valid range of the given attribute); and
- Suggesting the set of valid operators or characters that may be used at a given point in the expression constraint;

7.1.2 Form-Based Authoring

Form-based authoring is particularly useful when non-technical users need to create constraints or queries which have a consistent structure. In these situations, it may be useful to either:

- Create an 'expression constraint template' in which the attribute values are populated with the values that the user enters into the associated fields of the form;
- Create a form-driven query tool to support a useful subset of possible query structures.

One scenario in which the first form-based approach may be used is when there is a terminology-based dependency between the values of two fields on a user interface. For example, Figure 4 illustrates a simplified Procedures form in which the coded value entered into the *Procedure Type* field must be a descendant of the coded value entered into the *Procedure Category* field. When a *Procedure Category* of "Surgery" (i.e. 387713003 | Surgical procedure|[885]) is selected, the expression constraint " < 387713003 | Surgical procedure|[886] " is used to populate the value list for the *Procedure Type* field.

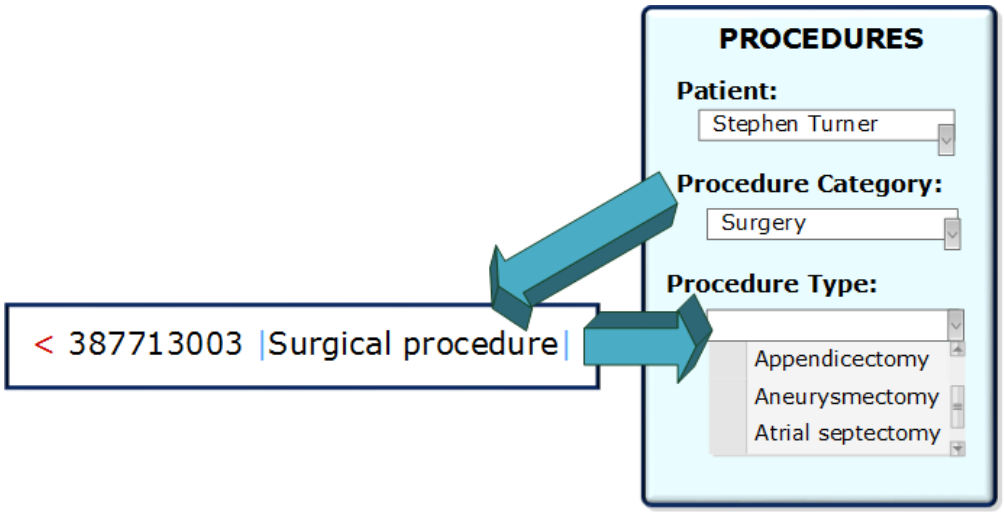

Figure 4: Authoring using expression constraint templates

The second form-based authoring technique mentioned above is a form-driven query tool. Figure 5 below illustrates a very simple form-driven query tool, in which the user selects the required operator (e.g. 'ancestorOf', 'descendantOf', 'memberOf') and operand (e.g. 'Example Problem List') and then defines one or more attribute refinements.

885 http://snomed.info/id/387713003
886 http://snomed.info/id/387713003

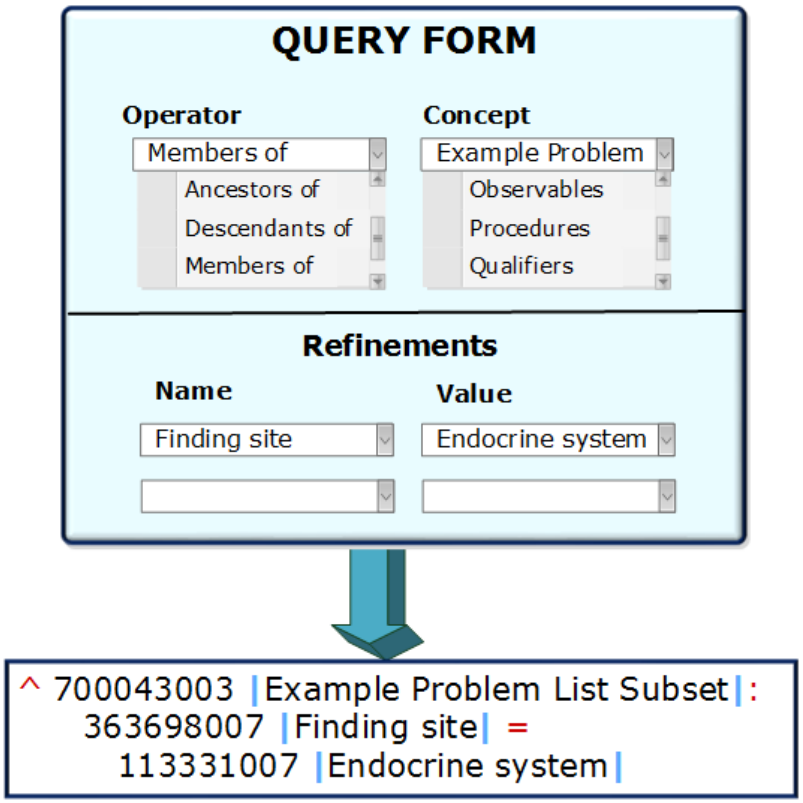

Figure 5: Authoring using a form-driven query tool

7.2 7.2 Parsing

Parsing is the process of analysing a string of characters according to the rules of a formal grammar. Parsing a SNOMED CT Expression Constraint involves processing the expression constraint string using one of the ABNF syntax specifications defined in Chapter 5(see page 21), and breaking it into its constituent parts. This creates a representation of the expression constraint that can be further processed. Parsing an expression constraint is required to perform syntactic validation, concept model validation or execution. It should be noted, when parsing, that all keywords in the language are case insensitive.

A number of parser development tools are available which can generate a parser from a context-free grammar written in ABNF, such as the one defined in this document. These tools include:

- APG
- aParse
- abnfgen

Please note, the ABNF syntax defined in this specification was tested using the APG Parser Generator(see page 0).

Other non-ABNF parser generators are also available which can be used with an alternate syntax representation – for example:

- ANTLR
- XText
- ACE

Some of these tools (e.g. XText and ACE) can also be used to generate authoring environments with features such as syntax highlighting and autocompletion.

Alternatively, an expression constraint parser can be created manually using a programming language such as Perl or C++.

1(see page 129) www.coasttocoastresearch.com[887]

7.3 7.3 Validating

SNOMED CT Expression Constraints can be automatically validated to ensure that they conform to a variety of rules, including:

- Expression constraints must conform to one of the syntaxes defined in Chapter 5(see page 21). Syntactic validation can be performed using an expression parser, as described in Section 7.2(see page 129);
- Expression constraints must conform to the concept model. This validation can be performed by comparing the parsed expression constraint against the rules defined in the SNOMED CT concept model;
- All concept references included in the expression constraint must be valid. In most cases this means that the concept references must refer to active concepts in the given version and edition of SNOMED CT;
- All concept references used to refer to attribute names must be a descendant of 246061005 | Attribute[888] ;
- All concept references to which a memberOf function is applied must be a descendant of 900000000000455006 | Reference set[889] ;
- All concept references to which a memberOf function is applied must contain only referencedComponentIds that refer to concepts.

Please note that some of these rules may not apply in all environments.

7.4 7.4 Executing

SNOMED CT Expression Constraints must be evaluated against a given SNOMED CT substrate in order to instantiate the matching set of concepts or expressions. There are a number of possible implementation strategies for the execution of SNOMED CT Expression Constraints, which depend in part on the storage format of the substrate. For example:

- Store SNOMED CT in a relational database, and translate each SNOMED CT Expression Constraint into one or more SQL statements;
- Store SNOMED CT in an RDF store, and translate each SNOMED CT Expression Constraint into a SPARQL query;
- Store SNOMED CT in an XML database, and translate each SNOMED CT Expression Constraint into one or more XQL statements;
- Write a bespoke query execution engine (e.g. in Java or C++) to return matching concepts or expressions.

Each of these strategies requires that the expression constraints are first parsed (and preferably validated) prior to execution.

7.5 7.5 Storing

Storing SNOMED CT Expression Constraints in an expression constraint library may be done for a variety of purposes, including:

---

887 http://www.coasttocoastresearch.com
888 http://snomed.info/id/246061005
889 http://snomed.info/id/900000000000455006

- To enable expression constraints to be re-executed (without re-authoring) after updates are made to the SNOMED CT substrate or the expression constraint itself;
- To provide a library of terminology binding constraints against which record instances will be validated;
- To provide a library of concept model constraints against which terminology artefacts (e.g. extensions, expressions) will be validated;
- To provide a library of predefined queries that may be shared by multiple users;
- To provide a library of terminology binding constraints that may be shared within a standards community.

A library of SNOMED CT Expression Constraints may be implemented using a number of techniques, including:

- Creating a Query specification reference set that records the expression constraint as the 'query';
- Creating a customized RF2 reference set with one or more new attributes that allow the expression constraint string and relevant metadata to be recorded;
- Creating a table in a relational database to store the SNOMED CT Expression Constraint and associated metadata;
- Creating a text file with a consistent structural format to store the SNOMED CT Expression Constraint and associated metadata;

In many cases it is useful to assign a unique identifier to each expression constraint in the library, so that they can be indexed and referenced for faster retrieval.

7.6 7.6 Displaying

A number of options exist for displaying SNOMED CT Expression Constraints, including:

- Displaying the expression constraint using SNOMED CT Expression Constraint Language in its originally authored and stored form;
- Converting the expression constraint to use either all symbols (as per the Brief Syntax), or all human-readable operators (as per alternate text introduced in the Long Syntax);
- Enhancing the expression constraint by adding in terms that may have been omitted, or replacing the existing terms with either local-dialect Preferred Terms or Fully Specified Names;
- Hiding the SNOMED CT identifiers for each concept and displaying only the Preferred Terms;
- Enhancing the display by using different font colors for each different part of the expression constraint (e.g. identifiers, terms, vertical bars, and operators), and by using whitespace in a way that improves the readability of the expression;
- Automatically transforming the expression constraint into a human-readable string using a predefined algorithm. For example, a simple algorithm may convert the symbols to text and remove the concept identifiers – e.g. "Descendants of fracture of bone: Finding site = Descendants or self of arm". More sophisticated algorithms may use pattern matching and predefined templates to construct a more natural string;
- Representing the operators, operands and attribute values of the expression constraint by populating a structured form. This approach is primarily suited to expression constraints with a consistent template, where the form can be pre-designed.

Which of these options is most appropriate to use when displaying expression constraints, will depend on a number of factors, including the type of users that will be viewing the constraints, the scope of the required constraint functionality, and the capabilities of the system implementation.

7.7 7.7 Exchanging

SNOMED CT Expression Constraints can be shared between systems and users via a number of methods, including:

- Exchanging an expression constraint string which conforms to the Brief Syntax of the Expression Constraint Language[890];
- Exchanging an expression constraint identifier, which can be unambiguously interpreted by the receiving system. If this approach is adopted it is recommended that an expression constraint repository is used to ensure that both the sending and receiving systems have a shared and consistent understanding of the meaning of each expression constraint.

Irrespective of the method used, it is recommended that the Brief Syntax of the SNOMED CT Expression Constraint Language[891] be used as the normative syntax for the interoperable sharing of expression constraints.

890 http://snomed.org/ecl
891 http://snomed.org/ecl

8 Appendix A – Examples Of Valid Expressions

This appendix provides examples of expressions (both precoordinated and postcoordinated) which satisfy each of the expression constraints that were introduced in Chapter 6(see page 61). This list of examples is not intended to be exhaustive, but rather to provide a representative sample to help clarify the meaning of each constraint. It is assumed that each particular usage of an expression constraint will clearly identify whether or not postcoordinated expressions are part of the valid substrate. Please refer to the SNOMED CT Languages Github repository[892] for a set of text files containing each of these examples.

- A.1 Simple Expression Constraints - Valid Expressions(see page 133)
- A.2 Refinements - Valid Expressions(see page 136)
- A.3 Cardinality - Valid Expressions(see page 143)
- A.4 Conjunction and Disjunction - Valid Expressions(see page 149)
- A.5 Exclusion and Not Equals - Valid Expressions(see page 153)
- A.6 Nested Expression Constraints - Valid Expressions(see page 157)

8.1 A.1 Simple Expression Constraints - Valid Expressions

Expression Constraint	**Valid Expression** 1(see page 0)	
	Precoordinated	**Postcoordinated**
404684003 | Clinical finding |[893]	404684003 | Clinical finding |[894]	-
< 404684003 | Clinical finding |[895]	64572001 | Disease |[896]	404684003 | Clinical finding |[897] : 363698007 | Finding site |[898] = 80891009 | Heart structure |[899]
	56265001 | Heart disease |[900]	
<< 73211009 | Diabetes mellitus |[901]	73211009 | Diabetes mellitus |[902]	73211009 | Diabetes mellitus |[903] : 42752001 | Due to |[904] = 61823004 | Injury of pancreas |[905]
	46635009 | Diabetes mellitus type 1 |[906]	

892 https://github.com/IHTSDO/SNOMEDCT-Languages
893 http://snomed.info/id/404684003
894 http://snomed.info/id/404684003
895 http://snomed.info/id/404684003
896 http://snomed.info/id/64572001
897 http://snomed.info/id/404684003
898 http://snomed.info/id/363698007
899 http://snomed.info/id/80891009
900 http://snomed.info/id/56265001
901 http://snomed.info/id/73211009
902 http://snomed.info/id/73211009
903 http://snomed.info/id/73211009
904 http://snomed.info/id/42752001
905 http://snomed.info/id/61823004
906 http://snomed.info/id/46635009

	105401000119101 | Diabetes mellitus due to pancreatic injury|[907]	
<! 404684003 | Clinical finding|[908]	64572001 | Disease|[909]	404684003 | Clinical finding|[910] : 116676008 | Associated morphology|[911] = 79654002 | Edema|[912] 2(see page 0)
	267038008 | Edema|[913]	
> 40541001 | Acute pulmonary edema|[914]	111273006 | Acute respiratory disease|[915]	64572001 | Disease|[916] : 116676008 | Associated morphology|[917] = 79654002 | Edema|[918] , 363698007 | Finding site|[919] = 39607008 | Lung structure|[920]
	404684003 | Clinical finding|[921]	
	138875005 | SNOMED CT concept|[922]	
>> 40541001 | Acute pulmonary edema|[923]	40541001 | Acute pulmonary edema|[924]	64572001 | Disease|[925] : 263502005 | Clinical course|[926] = 424124008 | Sudden onset AND/OR short duration|[927] , { 116676008 | Associated morphology|[928] = 40829002 | Acute edema|[929] , 363698007 | Finding site|[930] = 39607008 | Lung structure|[931] }
	111273006 | Acute respiratory disease|[932]	
	404684003 | Clinical finding|[933]	

907 http://snomed.info/id/105401000119101
908 http://snomed.info/id/404684003
909 http://snomed.info/id/64572001
910 http://snomed.info/id/404684003
911 http://snomed.info/id/116676008
912 http://snomed.info/id/79654002
913 http://snomed.info/id/267038008
914 http://snomed.info/id/40541001
915 http://snomed.info/id/111273006
916 http://snomed.info/id/64572001
917 http://snomed.info/id/116676008
918 http://snomed.info/id/79654002
919 http://snomed.info/id/363698007
920 http://snomed.info/id/39607008
921 http://snomed.info/id/404684003
922 http://snomed.info/id/138875005
923 http://snomed.info/id/40541001
924 http://snomed.info/id/40541001
925 http://snomed.info/id/64572001
926 http://snomed.info/id/263502005
927 http://snomed.info/id/424124008
928 http://snomed.info/id/116676008
929 http://snomed.info/id/40829002
930 http://snomed.info/id/363698007
931 http://snomed.info/id/39607008
932 http://snomed.info/id/111273006
933 http://snomed.info/id/404684003

	138875005 | SNOMED CT concept|[934]	
>! 40541001 | Acute pulmonary edema |[935]	111273006 | Acute respiratory disease|[936]	19829001 | Disorder of lung|[937] : { 116676008 | Associated morphology|[938] = 79654002 | Edema|[939] , 363698007 | Finding site|[940] = 39607008 | Lung structure|[941] } 3(see page 0)
	19242006 | Pulmonary edema|[942]	
^ 700043003 | Example problem list concepts reference set|[943]	394659003 | Acute coronary syndrome|[944]	-
	194828000 | Angina|[945]	
	29857009 | Chest pain|[946]	
*	138875005 | SNOMED CT concept|[947]	404684003 | Clinical finding|[948] : 363698007 | Finding site|[949] = 80891009 | Heart structure|[950]
	404684003 | Clinical finding|[951]	71388002 | Procedure|[952] : 405813007 | Procedure site - Direct|[953] = 66754008 | Appendix structure|[954]

934 http://snomed.info/id/138875005
935 http://snomed.info/id/40541001
936 http://snomed.info/id/111273006
937 http://snomed.info/id/19829001
938 http://snomed.info/id/116676008
939 http://snomed.info/id/79654002
940 http://snomed.info/id/363698007
941 http://snomed.info/id/39607008
942 http://snomed.info/id/19242006
943 http://snomed.info/id/700043003
944 http://snomed.info/id/394659003
945 http://snomed.info/id/194828000
946 http://snomed.info/id/29857009
947 http://snomed.info/id/138875005
948 http://snomed.info/id/404684003
949 http://snomed.info/id/363698007
950 http://snomed.info/id/80891009
951 http://snomed.info/id/404684003
952 http://snomed.info/id/71388002
953 http://snomed.info/id/405813007
954 http://snomed.info/id/66754008

	322236009 | Paracetamol 500mg tablet|[955]	373873005 | Pharmaceutical / biologic product|[956] : { 127489000 | Has active ingredient|[957] = 412031009 | Paracetamol or derivative|[958] }

[1](see page 133) Where necessary, these examples make some assumptions about the membership of the example reference sets.

[2](see page 134) Please note that this makes the assumption that the given expression constraint is executed against a finite set of expressions that has been pre-classified (e.g. in an expression repository), and that after classification there are no intermediate expressions between this expression and 404684003 \|Clinical finding\|[959].

[3](see page 135) Please note that this makes the assumption that the given expression constraint is executed against a finite set of expressions that has been pre-classified (e.g. in an expression repository), and that after classification there are no intermediate expressions between 40541001 \|Acute pulmonary edema\|[960] and this expression.

8.2 A.2 Refinements - Valid Expressions

Expression Constraint	**Valid Expression**[1](see page 0) [2](see page 0)	
	Precoordinated	**Postcoordinated**
< 19829001 |Disorder of lung|[961] : 116676008 |Associated morphology|[962] = 79654002 |Edema|[963]	11468004 | Postoperative pulmonary edema|[964]	210051003 |Injury to heart and lung|[965] : 116676008 |Associated morphology|[966] = 79654002 |Edema|[967]
	276637009 | Hemorrhagic pulmonary edema|[968]	

955 http://snomed.info/id/322236009
956 http://snomed.info/id/373873005
957 http://snomed.info/id/127489000
958 http://snomed.info/id/412031009
959 http://snomed.info/id/404684003
960 http://snomed.info/id/40541001
961 http://snomed.info/id/19829001
962 http://snomed.info/id/116676008
963 http://snomed.info/id/79654002
964 http://snomed.info/id/11468004
965 http://snomed.info/id/210051003
966 http://snomed.info/id/116676008
967 http://snomed.info/id/79654002
968 http://snomed.info/id/276637009

< 19829001 |Disorder of lung|[969] : 116676008 |Associated morphology|[970] = << 79654002 |Edema|[971]	233709006 | Toxic pulmonary edema|[972]	275504005 |Lung cyst|[973] : 116676008 |Associated morphology|[974] = 103619005 |Inflammatory edema|[975]
	233711002 | Oxygen-induced pulmonary edema|[976]	19829001 |Disorder of lung|[977] : 116676008 |Associated morphology|[978] = 40829002 |Acute edema|[979]
< 404684003 |Clinical finding|[980] : 363698007 |Finding site|[981] = << 39057004 |Pulmonary valve structure|[982] , 116676008 |Associated morphology|[983] = << 415582006 |Stenosis|[984]	56786000 | Pulmonic valve stenosis|[985]	56786000 |Pulmonic valve stenosis|[986] : 363698007 |Finding site|[987] = 90318009 | Structure of anulus fibrosus of pulmonary artery|[988] , 116676008 |Associated morphology|[989] = 88015002 |Partial stenosis|[990]
	86299006 | Tetralogy of Fallot|[991]	404684003 |Clinical finding|[992] : 363698007 |Finding site|[993] = 39057004 | Pulmonary valve structure|[994] ,

969 http://snomed.info/id/19829001
970 http://snomed.info/id/116676008
971 http://snomed.info/id/79654002
972 http://snomed.info/id/233709006
973 http://snomed.info/id/275504005
974 http://snomed.info/id/116676008
975 http://snomed.info/id/103619005
976 http://snomed.info/id/233711002
977 http://snomed.info/id/19829001
978 http://snomed.info/id/116676008
979 http://snomed.info/id/40829002
980 http://snomed.info/id/404684003
981 http://snomed.info/id/363698007
982 http://snomed.info/id/39057004
983 http://snomed.info/id/116676008
984 http://snomed.info/id/415582006
985 http://snomed.info/id/56786000
986 http://snomed.info/id/56786000
987 http://snomed.info/id/363698007
988 http://snomed.info/id/90318009
989 http://snomed.info/id/116676008
990 http://snomed.info/id/88015002
991 http://snomed.info/id/86299006
992 http://snomed.info/id/404684003
993 http://snomed.info/id/363698007
994 http://snomed.info/id/39057004

		116676008 |Associated morphology|[995] = 415582006 |Stenosis|[996]
* : 246075003 |Causative agent|[997] = 387517004 |Paracetamol|[998]	295124009 |Paracetamol overdose|[999]	404684003 |Clinical finding|[1000] : 246075003 |Causative agent|[1001] = 387517004 |Paracetamol|[1002]
	292042007 |Adverse reaction to paracetamol|[1003]	
< 404684003 |Clinical finding|[1004] : { 363698007 |Finding site|[1005] = << 39057004 |Pulmonary valve structure|[1006] , 116676008 |Associated morphology|[1007] = << 415582006 |Stenosis|[1008] }, { 363698007 |Finding site|[1009] = << 53085002 |Right ventricular structure|[1010] , 116676008 |Associated morphology|[1011] = << 56246009 |Hypertrophy|[1012] }	86299006 |Tetralogy of Fallot|[1013]	404684003 |Clinical finding|[1014] : { 363698007 |Finding site|[1015] = 31689007 |Structure of cusp of pulmonic valve|[1016] , 116676008 |Associated morphology|[1017] = 415582006 |Stenosis|[1018] }, { 363698007 |Finding site|[1019] = 53085002 |Right ventricular structure|[1020] , 116676008 |Associated morphology|[1021] = 125521000 |Acute hypertrophy|[1022] }
	204351007 |Fallot's trilogy|[1023]	

995 http://snomed.info/id/116676008
996 http://snomed.info/id/415582006
997 http://snomed.info/id/246075003
998 http://snomed.info/id/387517004
999 http://snomed.info/id/295124009
1000 http://snomed.info/id/404684003
1001 http://snomed.info/id/246075003
1002 http://snomed.info/id/387517004
1003 http://snomed.info/id/292042007
1004 http://snomed.info/id/404684003
1005 http://snomed.info/id/363698007
1006 http://snomed.info/id/39057004
1007 http://snomed.info/id/116676008
1008 http://snomed.info/id/415582006
1009 http://snomed.info/id/363698007
1010 http://snomed.info/id/53085002
1011 http://snomed.info/id/116676008
1012 http://snomed.info/id/56246009
1013 http://snomed.info/id/86299006
1014 http://snomed.info/id/404684003
1015 http://snomed.info/id/363698007
1016 http://snomed.info/id/31689007
1017 http://snomed.info/id/116676008
1018 http://snomed.info/id/415582006
1019 http://snomed.info/id/363698007
1020 http://snomed.info/id/53085002
1021 http://snomed.info/id/116676008
1022 http://snomed.info/id/125521000
1023 http://snomed.info/id/204351007

<< 404684003 |Clinical finding|[1024] : << 47429007 |Associated with|[1025] = << 267038008 |Edema|[1026]	230580009 | Myxedema neuropathy|[1027]	95356008 |Mucosal ulcer|[1028] : 42752001 |Due to|[1029] = 19242006 | Pulmonary edema|[1030]
< 27658006 |Amoxicillin|[1031] : 411116001 |Has dose form|[1032] = << 385055001 |Tablet dose form|[1033] , { 179999999100 |Has basis of strength|[1034] = (219999999102 |Amoxicillin only|[1035] : 189999999103 |Has strength magnitude|[1036] >= #200, 199999999101 |Has strength unit|[1037] = 258684004 |mg|[1038])}	374644001 | Amoxicillin trihydrate 200 mg tablet|[1039]	27658006 |Amoxicillin|[1040] : 411116001 |Has dose form|[1041] = 421026006 |Oral tablet|[1042] , { 127489000 |Has active ingredient|[1043] = 96068000 |Amoxicillin trihydrate|[1044] , 179999999100 |Has basis of strength|[1045] = (219999999102 |Amoxicillin only|[1046] : 189999999103 |Has strength magnitude|[1047] = #500, 199999999101 |Has strength unit|[1048] = 258684004 |mg|[1049])}

1024 http://snomed.info/id/404684003
1025 http://snomed.info/id/47429007
1026 http://snomed.info/id/267038008
1027 http://snomed.info/id/230580009
1028 http://snomed.info/id/95356008
1029 http://snomed.info/id/42752001
1030 http://snomed.info/id/19242006
1031 http://snomed.info/id/27658006
1032 http://snomed.info/id/411116001
1033 http://snomed.info/id/385055001
1034 http://snomed.org/fictid#179999999100
1035 http://snomed.org/fictid#219999999102
1036 http://snomed.org/fictid#189999999103
1037 http://snomed.org/fictid#199999999101
1038 http://snomed.info/id/258684004
1039 http://snomed.info/id/374644001
1040 http://snomed.info/id/27658006
1041 http://snomed.info/id/411116001
1042 http://snomed.info/id/421026006
1043 http://snomed.info/id/127489000
1044 http://snomed.info/id/96068000
1045 http://snomed.org/fictid#179999999100
1046 http://snomed.org/fictid#219999999102
1047 http://snomed.org/fictid#189999999103
1048 http://snomed.org/fictid#199999999101
1049 http://snomed.info/id/258684004

< 27658006 |Amoxicillin|[1050] : 411116001 |Has dose form|[1051] = << 385055001 |Tablet dose form|[1052] , { 179999999100 |Has basis of strength|[1053] = (219999999102 |Amoxicillin only|[1054] : 189999999103 |Has strength magnitude|[1055] >= #500, 189999999103 |Has strength magnitude|[1056] <= #800, 199999999101 |Has strength unit|[1057] = 258684004 |mg|[1058])}	374646004 | Amoxicillin 500 mg tablet|[1059]	27658006 |Amoxicillin|[1060] : 411116001 |Has dose form|[1061] = 421026006 |Oral tablet|[1062] , { 179999999100 |Has basis of strength|[1063] = (219999999102 |Amoxicillin only|[1064] : 189999999103 |Has strength magnitude|[1065] = #750, 199999999101 |Has strength unit|[1066] = 258684004 |mg|[1067])}
< 373873005 |Pharmaceutical / biologic product|[1068] : 209999999104 |Has trade name|[1069] = "PANADOL"	259999999103 | PANADOL [paracetamol] tablet|[1070]	373873005 |Pharmaceutical / biologic product|[1071] : { 127489000 |Has active ingredient|[1072] = 412031009 |Paracetamol or derivative|[1073] }, 209999999104 |Has trade name|[1074] = "PANADOL"

1050 http://snomed.info/id/27658006
1051 http://snomed.info/id/411116001
1052 http://snomed.info/id/385055001
1053 http://snomed.org/fictid#179999999100
1054 http://snomed.org/fictid#219999999102
1055 http://snomed.org/fictid#189999999103
1056 http://snomed.org/fictid#189999999103
1057 http://snomed.org/fictid#199999999101
1058 http://snomed.info/id/258684004
1059 http://snomed.info/id/374646004
1060 http://snomed.info/id/27658006
1061 http://snomed.info/id/411116001
1062 http://snomed.info/id/421026006
1063 http://snomed.org/fictid#179999999100
1064 http://snomed.org/fictid#219999999102
1065 http://snomed.org/fictid#189999999103
1066 http://snomed.org/fictid#199999999101
1067 http://snomed.info/id/258684004
1068 http://snomed.info/id/373873005
1069 http://snomed.org/fictid#209999999104
1070 http://snomed.org/fictid#259999999103
1071 http://snomed.info/id/373873005
1072 http://snomed.info/id/127489000
1073 http://snomed.info/id/412031009
1074 http://snomed.org/fictid#209999999104

< 91723000 |Anatomical structure|[1075] : R 363698007 |Finding site|[1076] = < 125605004 |Fracture of bone|[1077]	85050009 | Humerus|[1078]	85050009 |Humerus|[1079] : 272741003 |Laterality|[1080] = 7771000 |Left|[1081]
	71341001 | Femur|[1082]	71341001 |Femur|[1083] : 272741003 |Laterality|[1084] = 24028007 |Right|[1085]
< 125605004 |Fracture of bone|[1086] . 363698007 |Finding site|[1087]	85050009 | Humerus|[1088]	85050009 |Humerus|[1089] : 272741003 |Laterality|[1090] = 7771000 |Left|[1091]
	71341001 | Femur|[1092]	71341001 |Femur|[1093] : 272741003 |Laterality|[1094] = 24028007 |Right|[1095]
< 105590001 |Substance|[1096] : R << 127489000 |Has active ingredient|[1097] = < 27658006 |Product containing amoxicillin|[1098]	395938000 | Clavulanate potassium|[1099]	-

1075 http://snomed.info/id/91723000
1076 http://snomed.info/id/363698007
1077 http://snomed.info/id/125605004
1078 http://snomed.info/id/85050009
1079 http://snomed.info/id/85050009
1080 http://snomed.info/id/272741003
1081 http://snomed.info/id/7771000
1082 http://snomed.info/id/71341001
1083 http://snomed.info/id/71341001
1084 http://snomed.info/id/272741003
1085 http://snomed.info/id/24028007
1086 http://snomed.info/id/125605004
1087 http://snomed.info/id/363698007
1088 http://snomed.info/id/85050009
1089 http://snomed.info/id/85050009
1090 http://snomed.info/id/272741003
1091 http://snomed.info/id/7771000
1092 http://snomed.info/id/71341001
1093 http://snomed.info/id/71341001
1094 http://snomed.info/id/272741003
1095 http://snomed.info/id/24028007
1096 http://snomed.info/id/105590001
1097 http://snomed.info/id/127489000
1098 http://snomed.info/id/27658006
1099 http://snomed.info/id/395938000

	387137007 | Omeprazole |[1100]	
< 27658006 |Product containing amoxicillin|[1101] . << 127489000 |Has active ingredient|[1102]	395938000 | Clavulanate potassium |[1103]	-
	387137007 | Omeprazole |[1104]	
< 404684003 |Clinical finding|[1105] : * = 79654002 |Edema|[1106]	19242006 | Pulmonary edema |[1107]	404684003 |Clinical finding|[1108] : 116676008 |Associated morphology|[1109] = 79654002 |Edema|[1110]
	97341000119105 Proliferative retinopathy with retinal edema due to type	
< 404684003 |Clinical finding|[1111] : 116676008 |Associated morphology|[1112] = *	19242006 | Pulmonary edema |[1113]	404684003 |Clinical finding|[1114] : 116676008 |Associated morphology|[1115] = 79654002 |Edema|[1116]
	263225007 | Hip fracture |[1117]	404684003 |Clinical finding|[1118] : 116676008 |Associated morphology|[1119] = 72704001 |Fracture|[1120]

1100 http://snomed.info/id/387137007
1101 http://snomed.info/id/27658006
1102 http://snomed.info/id/127489000
1103 http://snomed.info/id/395938000
1104 http://snomed.info/id/387137007
1105 http://snomed.info/id/404684003
1106 http://snomed.info/id/79654002
1107 http://snomed.info/id/19242006
1108 http://snomed.info/id/404684003
1109 http://snomed.info/id/116676008
1110 http://snomed.info/id/79654002
1111 http://snomed.info/id/404684003
1112 http://snomed.info/id/116676008
1113 http://snomed.info/id/19242006
1114 http://snomed.info/id/404684003
1115 http://snomed.info/id/116676008
1116 http://snomed.info/id/79654002
1117 http://snomed.info/id/263225007
1118 http://snomed.info/id/404684003
1119 http://snomed.info/id/116676008
1120 http://snomed.info/id/72704001

1 (see page 136) Please note that some of these examples are based on a hypothetical drug concept model. These examples are not intended to reflect any specific drug model.
2 (see page 136) SNOMED CT identifiers with the '9999999' namespace were created for example only, and should not be used in a production environment.

8.3 A.3 Cardinality - Valid Expressions

Expression Constraint	**Valid Expression** 1 (see page 0)	
	Precoordinated	**Postcoordinated**
< 373873005 |Pharmaceutical / biologic product|[1121] : [1..3] 127489000 |Has active ingredient|[1122] = < 105590001 |Substance|[1123]	322236009 | Paracetamol 500mg tablet|[1124]	373873005 | Pharmaceutical / biologic product|[1125] : { 127489000 | Has active ingredient|[1126] = 412031009 | Paracetamol or derivative|[1127] }
	404826002 | Benzocaine + butamben + tetracaine hydrochloride|[1128]	373873005 | Pharmaceutical / biologic product|[1129] : { 127489000 | Has active ingredient|[1130] = 412031009 | Paracetamol or derivative|[1131] }, { 127489000 | Has active ingredient|[1132] = 387494007 | Codeine|[1133] }
< 373873005 |Pharmaceutical / biologic product|[1134] : [1..1]	370166004 | Aspirin 325mg tablet|[1137]	373873005 | Pharmaceutical / biologic product|[1138] : { 127489000 | Has active ingredient|

1121 http://snomed.info/id/373873005
1122 http://snomed.info/id/127489000
1123 http://snomed.info/id/105590001
1124 http://snomed.info/id/322236009
1125 http://snomed.info/id/373873005
1126 http://snomed.info/id/127489000
1127 http://snomed.info/id/412031009
1128 http://snomed.info/id/404826002
1129 http://snomed.info/id/373873005
1130 http://snomed.info/id/127489000
1131 http://snomed.info/id/412031009
1132 http://snomed.info/id/127489000
1133 http://snomed.info/id/387494007
1134 http://snomed.info/id/373873005
1137 http://snomed.info/id/370166004
1138 http://snomed.info/id/373873005

127489000 |Has active ingredient| [1135] = < 105590001 |Substance| [1136]		[1139] = 412031009 | Paracetamol or derivative| [1140] }
< 373873005 |Pharmaceutical / biologic product| [1141] : [0..1] 127489000 |Has active ingredient| [1142] = < 105590001 |Substance| [1143]	279999999108 | Inert tablet| [1144] 370166004 | Aspirin 325mg tablet| [1148]	373873005 | Pharmaceutical / biologic product| [1145] : { 127489000 | Has active ingredient| [1146] = 412031009 | Paracetamol or derivative| [1147] }
< 373873005 |Pharmaceutical / biologic product| [1149] : [1..*] 127489000 |Has active ingredient| [1150] = < 105590001 |Substance| [1151]	7947003 | Aspirin| [1152] 437867004 | Chlorphenamine + dextromethorphan + paracetamol + pseudoephedrine| [1160]	373873005 | Pharmaceutical / biologic product| [1153] : { 127489000 | Has active ingredient| [1154] = 412031009 | Paracetamol or derivative| [1155] }, { 127489000 | Has active ingredient| [1156] = 255641001 | Caffeine| [1157] }, { 127489000 | Has active ingredient| [1158] = 387458008 | Aspirin| [1159] }

1135 http://snomed.info/id/127489000
1136 http://snomed.info/id/105590001
1139 http://snomed.info/id/127489000
1140 http://snomed.info/id/412031009
1141 http://snomed.info/id/373873005
1142 http://snomed.info/id/127489000
1143 http://snomed.info/id/105590001
1144 http://snomed.org/fictid#279999999108
1145 http://snomed.info/id/373873005
1146 http://snomed.info/id/127489000
1147 http://snomed.info/id/412031009
1148 http://snomed.info/id/370166004
1149 http://snomed.info/id/373873005
1150 http://snomed.info/id/127489000
1151 http://snomed.info/id/105590001
1152 http://snomed.info/id/7947003
1153 http://snomed.info/id/373873005
1154 http://snomed.info/id/127489000
1155 http://snomed.info/id/412031009
1156 http://snomed.info/id/127489000
1157 http://snomed.info/id/255641001
1158 http://snomed.info/id/127489000
1159 http://snomed.info/id/387458008
1160 http://snomed.info/id/437867004

< 404684003 | Clinical finding |[1161] : [1..1] 363698007 | Finding site |[1162] = < 91723000 | Anatomical structure |[1163]	125596004 | Injury of elbow |[1164]	404684003 | Clinical finding |[1165] : { 116676008 | Associated morphology |[1166] = 72704001 | Fracture |[1167] , 363698007 | Finding site |[1168] = 299701004 | Bone of forearm |[1169] , 363698007 | Finding site |[1170] = 62413002 | Bone structure of radius |[1171] } 2(see page 0)
< 404684003 | Clinical finding |[1172] : [2..*] 363698007 | Finding site |[1173] = < 91723000 | Anatomical structure |[1174]	86299006 | Tetralogy of Fallot |[1175]	404684003 | Clinical finding |[1176] : { 116676008 | Associated morphology |[1177] = 72704001 | Fracture |[1178] , 363698007 | Finding site |[1179] = 299701004 | Bone of forearm |[1180] }, { 116676008 | Associated morphology |[1181] = 72704001 | Fracture |[1182] , 363698007 | Finding site |[1183] = 702468001 | Bone structure of lower leg |[1184] }

1161 http://snomed.info/id/404684003
1162 http://snomed.info/id/363698007
1163 http://snomed.info/id/91723000
1164 http://snomed.info/id/125596004
1165 http://snomed.info/id/404684003
1166 http://snomed.info/id/116676008
1167 http://snomed.info/id/72704001
1168 http://snomed.info/id/363698007
1169 http://snomed.info/id/299701004
1170 http://snomed.info/id/363698007
1171 http://snomed.info/id/62413002
1172 http://snomed.info/id/404684003
1173 http://snomed.info/id/363698007
1174 http://snomed.info/id/91723000
1175 http://snomed.info/id/86299006
1176 http://snomed.info/id/404684003
1177 http://snomed.info/id/116676008
1178 http://snomed.info/id/72704001
1179 http://snomed.info/id/363698007
1180 http://snomed.info/id/299701004
1181 http://snomed.info/id/116676008
1182 http://snomed.info/id/72704001
1183 http://snomed.info/id/363698007
1184 http://snomed.info/id/702468001

< 404684003 | Clinical finding |[1185] : { [2..*] 363698007 | finding site |[1186] = < 91723000 | Anatomical structure |[1187] }	-	64572001 | Disease |[1188] : { 116676008 | Associated morphology |[1189] = 396351009 | Congenital septal defect |[1190] , 363698007 | Finding site |[1191] = 25943004 | Structure of atrioventricular node |[1192] , 363698007 | Finding site |[1193] = 113262008 | Thoracic aorta structure |[1194] } { 116676008 | Associated morphology |[1195] = 90141005 | Congenital hypertrophy |[1196] , 363698007 | Finding site |[1197] = 244384009 | Entire right ventricle |[1198] }
< 373873005 |Pharmaceutical / biologic product |[1199] : [1..3] { [1..*] 127489000 |Has active ingredient |[1200] = < 105590001 |Substance |[1201] }	322236009 | Paracetamol 500mg tablet |[1202]	373873005 | Pharmaceutical / biologic product |[1203] : { 127489000 | Has active ingredient |[1204] = 412031009 | Paracetamol or derivative |[1205] }
	404826002 | Benzocaine + butamben + tetracaine hydrochloride |[1206]	373873005 | Pharmaceutical / biologic product |[1207] : { 127489000 | Has active ingredient |

1185 http://snomed.info/id/404684003
1186 http://snomed.info/id/363698007
1187 http://snomed.info/id/91723000
1188 http://snomed.info/id/64572001
1189 http://snomed.info/id/116676008
1190 http://snomed.info/id/396351009
1191 http://snomed.info/id/363698007
1192 http://snomed.info/id/25943004
1193 http://snomed.info/id/363698007
1194 http://snomed.info/id/113262008
1195 http://snomed.info/id/116676008
1196 http://snomed.info/id/90141005
1197 http://snomed.info/id/363698007
1198 http://snomed.info/id/244384009
1199 http://snomed.info/id/373873005
1200 http://snomed.info/id/127489000
1201 http://snomed.info/id/105590001
1202 http://snomed.info/id/322236009
1203 http://snomed.info/id/373873005
1204 http://snomed.info/id/127489000
1205 http://snomed.info/id/412031009
1206 http://snomed.info/id/404826002
1207 http://snomed.info/id/373873005

		1208 = 412031009 | Paracetamol or derivative|[1209] }, { 127489000 | Has active ingredient|[1210] = 387494007 | Codeine|[1211] }
< 373873005 |Pharmaceutical / biologic product|[1212] : [0..1] { 127489000 |Has active ingredient|[1213] = < 105590001 |Substance|[1214] }	111115279999999108 | Inert tablet|[1215] 370166004 | Aspirin 325mg tablet|[1219]	373873005 | Pharmaceutical / biologic product|[1216] : { 127489000 | Has active ingredient|[1217] = 412031009 | Paracetamol or derivative|[1218] }
< 373873005 |Pharmaceutical / biologic product|[1220] : [1..*] { 127489000 |Has active ingredient|[1221] = < 105590001 |Substance|[1222] }	370166004 | Aspirin 325mg tablet|[1223]	373873005 | Pharmaceutical / biologic product|[1224] : { 127489000 | Has active ingredient|[1225] = 412031009 | Paracetamol or derivative|[1226] }, { 127489000 | Has active ingredient|[1227] = 387494007 | Codeine|[1228] }

1208 http://snomed.info/id/127489000
1209 http://snomed.info/id/412031009
1210 http://snomed.info/id/127489000
1211 http://snomed.info/id/387494007
1212 http://snomed.info/id/373873005
1213 http://snomed.info/id/127489000
1214 http://snomed.info/id/105590001
1215 http://snomed.org/fictid#111115279999999108
1216 http://snomed.info/id/373873005
1217 http://snomed.info/id/127489000
1218 http://snomed.info/id/412031009
1219 http://snomed.info/id/370166004
1220 http://snomed.info/id/373873005
1221 http://snomed.info/id/127489000
1222 http://snomed.info/id/105590001
1223 http://snomed.info/id/370166004
1224 http://snomed.info/id/373873005
1225 http://snomed.info/id/127489000
1226 http://snomed.info/id/412031009
1227 http://snomed.info/id/127489000
1228 http://snomed.info/id/387494007

< 404684003 | Clinical finding |[1229] : [1..1] { 363698007 | Finding site |[1230] = < 91723000 | Anatomical structure |[1231] }	125596004 | Injury of elbow |[1232]	404684003 | Clinical finding |[1233] : { 363698007 | Finding site |[1234] = 299701004 | Bone of forearm |[1235] }, { 363698007 | Finding site |[1236] = 62413002 | Bone structure of radius |[1237] }
< 404684003 |Clinical finding |[1238] : [0..0] { [2..*] 363698007 |Finding site |[1239] = < 91723000 |Anatomical structure |[1240] }	86299006 | Tetralogy of Fallot |[1241]	404684003 | Clinical finding |[1242] : 363698007 | Finding site |[1243] = 39057004 | Pulmonary valve structure |[1244] , 116676008 | Associated morphology |[1245] = 415582006 | Stenosis |[1246]

1 (see page 143) The SNOMED CT identifiers created with the '9999999' namespace are for example only, and should not be used in a production environment.

2 (see page 145) As mentioned earlier, only non-redundant defining attributes are included in the cardinality count. Because 62413002 | Bone structure of radius| is a subtype of 299701004 | Bone of forearm| , the refinement " 363698007 | Finding site| = 299701004 | Bone of forearm| " is redundant.

1229 http://snomed.info/id/404684003
1230 http://snomed.info/id/363698007
1231 http://snomed.info/id/91723000
1232 http://snomed.info/id/125596004
1233 http://snomed.info/id/404684003
1234 http://snomed.info/id/363698007
1235 http://snomed.info/id/299701004
1236 http://snomed.info/id/363698007
1237 http://snomed.info/id/62413002
1238 http://snomed.info/id/404684003
1239 http://snomed.info/id/363698007
1240 http://snomed.info/id/91723000
1241 http://snomed.info/id/86299006
1242 http://snomed.info/id/404684003
1243 http://snomed.info/id/363698007
1244 http://snomed.info/id/39057004
1245 http://snomed.info/id/116676008
1246 http://snomed.info/id/415582006

8.4 A.4 Conjunction and Disjunction - Valid Expressions

Expression Constraint	Valid Expression (see page 0)	
	Precoordinated	Postcoordinated
< 19829001 | Disorder of lung |[1247] AND < 301867009 | Edema of trunk |[1248]	233709006 | Toxic pulmonary edema |[1249]	233709006 | Toxic pulmonary edema |[1250] : 116676008 | Associated morphology |[1251] = 40829002 | Acute edema |[1252] , 363698007 | Finding site |[1253] = 278985004 | Fissure of right lung |[1254]
	61233003 | Silo-fillers' disease |[1255]	
< 19829001 | Disorder of lung |[1256] OR < 301867009 | Edema of trunk |[1257]	363358000 | Malignant tumour of lung |[1258]	233709006 | Toxic pulmonary edema |[1259] : 116676008 | Associated morphology |[1260] = 40829002 | Acute edema |[1261]
	19242006 | Pulmonary edema |[1262]	
< 19829001 | Disorder of lung |[1263] AND ^ 700043003 | Example	1001000119102 | Pulmonary embolism with	

1247 http://snomed.info/id/19829001
1248 http://snomed.info/id/301867009
1249 http://snomed.info/id/233709006
1250 http://snomed.info/id/233709006
1251 http://snomed.info/id/116676008
1252 http://snomed.info/id/40829002
1253 http://snomed.info/id/363698007
1254 http://snomed.info/id/278985004
1255 http://snomed.info/id/61233003
1256 http://snomed.info/id/19829001
1257 http://snomed.info/id/301867009
1258 http://snomed.info/id/363358000
1259 http://snomed.info/id/233709006
1260 http://snomed.info/id/116676008
1261 http://snomed.info/id/40829002
1262 http://snomed.info/id/19242006
1263 http://snomed.info/id/19829001

problem list concepts reference set|[1264]	pulmonary infarction|[1265]	
< 404684003 | Clinical finding|[1266] : 363698007 | Finding site|[1267] = << 39057004 | Pulmonary valve structure|[1268] AND 116676008 | Associated morphology|[1269] = << 415582006 | Stenosis|[1270]	91442002 | Rheumatic pulmonary valve stenosis|[1271]	56786000 | Pulmonic valve stenosis|[1272] : 363698007 | Finding site|[1273] = 90318009 | Structure of anulus fibrosus of pulmonary artery|[1274] , 116676008 | Associated morphology|[1275] = 88015002 | Partial stenosis|[1276]
	86299006 | Tetralogy of Fallot|[1277]	

1264 http://snomed.info/id/700043003
1265 http://snomed.info/id/1001000119102
1266 http://snomed.info/id/404684003
1267 http://snomed.info/id/363698007
1268 http://snomed.info/id/39057004
1269 http://snomed.info/id/116676008
1270 http://snomed.info/id/415582006
1271 http://snomed.info/id/91442002
1272 http://snomed.info/id/56786000
1273 http://snomed.info/id/363698007
1274 http://snomed.info/id/90318009
1275 http://snomed.info/id/116676008
1276 http://snomed.info/id/88015002
1277 http://snomed.info/id/86299006

< 404684003 | Clinical finding |[1278] : 116676008 | Associated morphology |[1279] = << 55641003 | Infarct |[1280] OR 42752001 | Due to |[1281] = << 22298006 | Myocardial infarction |[1282]	45456005 | Renal infarct |[1283]	95281009 | Sudden cardiac death |[1284] : 42752001 | Due to |[1285] = 22298006 | Myocardial infarction |[1286]
	703326006 | Mitral regurgitation due to acute myocardial infarction |[1287]	

1278 http://snomed.info/id/404684003
1279 http://snomed.info/id/116676008
1280 http://snomed.info/id/55641003
1281 http://snomed.info/id/42752001
1282 http://snomed.info/id/22298006
1283 http://snomed.info/id/45456005
1284 http://snomed.info/id/95281009
1285 http://snomed.info/id/42752001
1286 http://snomed.info/id/22298006
1287 http://snomed.info/id/703326006

< 404684003 | Clinical finding |[1288] : { 363698007 | Finding site |[1289] =<< 39057004 | Pulmonary valve structure |[1290] , 116676008 | Associated morphology |[1291] =<< 415582006 |Stenosis|[1292] } OR { 363698007 | Finding site |[1293] =<< 53085002 | Right ventricular structure |[1294] , 116676008 | Associated morphology |[1295] =<< 56246009 | Hypertrophy |[1296] }	85971001 | Rheumatic pulmonary valve stenosis with insufficiency |[1297] 86299006 | Tetralogy of Fallot |[1303]	56786000 | Pulmonic valve stenosis |[1298] : 363698007 | Finding site |[1299] = 90318009 | Structure of anulus fibrosus of pulmonary artery |[1300] , 116676008 | Associated morphology |[1301] = 88015002 | Partial stenosis |[1302]
^ 450990004 | Adverse drug reactions reference set for GP/FP health	294811002 | Corticotrophic hormone allergy |[1308]	-

1288 http://snomed.info/id/404684003
1289 http://snomed.info/id/363698007
1290 http://snomed.info/id/39057004
1291 http://snomed.info/id/116676008
1292 http://snomed.info/id/415582006
1293 http://snomed.info/id/363698007
1294 http://snomed.info/id/53085002
1295 http://snomed.info/id/116676008
1296 http://snomed.info/id/56246009
1297 http://snomed.info/id/85971001
1298 http://snomed.info/id/56786000
1299 http://snomed.info/id/363698007
1300 http://snomed.info/id/90318009
1301 http://snomed.info/id/116676008
1302 http://snomed.info/id/88015002
1303 http://snomed.info/id/86299006
1308 http://snomed.info/id/294811002

issue[1304] : 246075003 |Causative agent|[1305] = (< 373873005 |Pharmaceutical / biologic product|[1306] OR < 105590001 |Substance|[1307])	293584003 |Paracetamol allergy|[1309] 293585002 |Salicylate allergy|[1310]	
< 404684003 |Clinical finding|[1311] : 116676008 |Associated morphology|[1312] = (<< 56208002 |Ulcer|[1313] AND << 50960005 |Hemorrhage|[1314])	12847006 |Acute duodenal ulcer with hemorrhage|[1315]	64572001 |Disease|[1316] : { 116676008 |Associated morphology|[1317] = 55075001 |Bleeding ulcer|[1318] , 363698007 |Finding site|[1319] = 14374004 |Structure of lymphatic vessel of oesophagus|[1320] }

1 (see page 149) Where necessary, these examples make some assumptions about the membership of the example reference sets.

8.5 A.5 Exclusion and Not Equals - Valid Expressions

Expression Constraint	**Valid Expression** 1 (see page 0)	
	Precoordinated	**Postcoordinated**

1304 http://snomed.info/id/450990004
1305 http://snomed.info/id/246075003
1306 http://snomed.info/id/373873005
1307 http://snomed.info/id/105590001
1309 http://snomed.info/id/293584003
1310 http://snomed.info/id/293585002
1311 http://snomed.info/id/404684003
1312 http://snomed.info/id/116676008
1313 http://snomed.info/id/56208002
1314 http://snomed.info/id/50960005
1315 http://snomed.info/id/12847006
1316 http://snomed.info/id/64572001
1317 http://snomed.info/id/116676008
1318 http://snomed.info/id/55075001
1319 http://snomed.info/id/363698007
1320 http://snomed.info/id/14374004

<< 19829001 | Disorder of lung |[1321]
MINUS
  << 301867009 | Edema of trunk |[1322]
	372146004 | Acute chest syndrome |[1323]
	
	413839001 | Chronic lung disease |[1329]
		27819004 | Pulmonary ossification |[1324] :
		  { 116676008 | Associated morphology |[1325] =
		  18115005 | Pathologic calcification |[1326] ,
		  363698007 | Finding site |[1327] =
		  31094006 | Structure of lobe of lung |[1328] }

<< 19829001 | Disorder of lung |[1330]
MINUS
  ^ 700043003 | Example problem list concepts reference set |[1331]
	233613009 | Fungal pneumonia |[1332]	27819004 | Pulmonary ossification |[1333] :
		  { 116676008 | Associated morphology |[1334] =
		  18115005 | Pathologic calcification |[1335] ,
		  363698007 | Finding site |[1336] =
		  31094006 | Structure of lobe of lung |[1337] }

< 404684003 | Clinical finding |[1338] :
  116676008 | Associated morphology |[1339] =
  ((<< 56208002 | Ulcer |[1340] AND
  << 50960005 | Hemorrhage |[1341]
) MINUS
  << 26036001 | Obstruction |[1342])
	15902003 | Gastric ulcer with hemorrhage |[1343]	64572001 | Disease |[1344] :
		  { 116676008 | Associated morphology |[1345] =
		  55075001 | Bleeding ulcer |[1346] ,
		  363698007 | Finding site |[1347] =
		  14374004 | Structure of lymphatic vessel of esophagus |[1348] }

1321 http://snomed.info/id/19829001
1322 http://snomed.info/id/301867009
1323 http://snomed.info/id/372146004
1324 http://snomed.info/id/27819004
1325 http://snomed.info/id/116676008
1326 http://snomed.info/id/18115005
1327 http://snomed.info/id/363698007
1328 http://snomed.info/id/31094006
1329 http://snomed.info/id/413839001
1330 http://snomed.info/id/19829001
1331 http://snomed.info/id/700043003
1332 http://snomed.info/id/233613009
1333 http://snomed.info/id/27819004
1334 http://snomed.info/id/116676008
1335 http://snomed.info/id/18115005
1336 http://snomed.info/id/363698007
1337 http://snomed.info/id/31094006
1338 http://snomed.info/id/404684003
1339 http://snomed.info/id/116676008
1340 http://snomed.info/id/56208002
1341 http://snomed.info/id/50960005
1342 http://snomed.info/id/26036001
1343 http://snomed.info/id/15902003
1344 http://snomed.info/id/64572001
1345 http://snomed.info/id/116676008
1346 http://snomed.info/id/55075001
1347 http://snomed.info/id/363698007
1348 http://snomed.info/id/14374004

< 404684003 | Clinical finding |[1349] : 116676008 | Associated morphology |[1350] != << 26036001 | Obstruction |[1351]	233613009 | Fungal pneumonia |[1352]	64572001 | Disease |[1353] : { 116676008 | Associated morphology |[1354] = 26036001 | Obstruction |[1355] , 363698007 | Finding site |[1356] = 422897007 | Vascular structure of stomach |[1357] } { 116676008 | Associated morphology |[1358] = 45771005 | Acute bleeding ulcer |[1359] , 363698007 | Finding site |[1360] = 422897007 | Vascular structure of stomach |[1361] }
	46708007 | Acute gastric ulcer with hemorrhage AND obstruction |[1362]	
< 404684003 | Clinical finding |[1363] : [0..0] 116676008 | Associated morphology |[1364] = << 26036001 | Obstruction |[1365]	233613009 | Fungal pneumonia |[1366]	64572001 | Disease |[1367] : { 116676008 | Associated morphology |[1368] = 55075001 | Bleeding ulcer |[1369] , 363698007 | Finding site |[1370] = 14374004 | Structure of lymphatic vessel of oesophagus |[1371] }
	15902003 | Gastric ulcer with hemorrhage |[1372]	

1349 http://snomed.info/id/404684003
1350 http://snomed.info/id/116676008
1351 http://snomed.info/id/26036001
1352 http://snomed.info/id/233613009
1353 http://snomed.info/id/64572001
1354 http://snomed.info/id/116676008
1355 http://snomed.info/id/26036001
1356 http://snomed.info/id/363698007
1357 http://snomed.info/id/422897007
1358 http://snomed.info/id/116676008
1359 http://snomed.info/id/45771005
1360 http://snomed.info/id/363698007
1361 http://snomed.info/id/422897007
1362 http://snomed.info/id/46708007
1363 http://snomed.info/id/404684003
1364 http://snomed.info/id/116676008
1365 http://snomed.info/id/26036001
1366 http://snomed.info/id/233613009
1367 http://snomed.info/id/64572001
1368 http://snomed.info/id/116676008
1369 http://snomed.info/id/55075001
1370 http://snomed.info/id/363698007
1371 http://snomed.info/id/14374004
1372 http://snomed.info/id/15902003

< 404684003 | Clinical finding|[1373] : [0..0] 116676008 | Associated morphology|[1374] != << 26036001 | Obstruction|[1375]	244815007 | Pyloric obstruction|[1376]	64572001 | Disease|[1377] : { 116676008 | Associated morphology|[1378] = 26036001 | Obstruction|[1379] , 363698007 | Finding site|[1380] = 314600001 | Choledochoenterostomy stoma|[1381] }
	84906002 | Local cyanosis|[1382]	
< 404684003 | Clinical finding|[1383] : [0..0] 116676008 | Associated morphology|[1384] != << 26036001 | Obstruction|[1385] AND [1..*] 116676008 | Associated morphology|[1386] = << 26036001 | Obstruction|[1387]	244815007 | Pyloric obstruction|[1388]	64572001 | Disease|[1389] : { 116676008 | Associated morphology|[1390] = 26036001 | Obstruction|[1391] , 363698007 | Finding site|[1392] = 314600001 | Choledochoenterostomy stoma|[1393] }

[1] (see page 153) Where necessary, these examples make some assumptions about the membership of the example reference sets.

1373 http://snomed.info/id/404684003
1374 http://snomed.info/id/116676008
1375 http://snomed.info/id/26036001
1376 http://snomed.info/id/244815007
1377 http://snomed.info/id/64572001
1378 http://snomed.info/id/116676008
1379 http://snomed.info/id/26036001
1380 http://snomed.info/id/363698007
1381 http://snomed.info/id/314600001
1382 http://snomed.info/id/84906002
1383 http://snomed.info/id/404684003
1384 http://snomed.info/id/116676008
1385 http://snomed.info/id/26036001
1386 http://snomed.info/id/116676008
1387 http://snomed.info/id/26036001
1388 http://snomed.info/id/244815007
1389 http://snomed.info/id/64572001
1390 http://snomed.info/id/116676008
1391 http://snomed.info/id/26036001
1392 http://snomed.info/id/363698007
1393 http://snomed.info/id/314600001

8.6 A.6 Nested Expression Constraints - Valid Expressions

Expression Constraint	Valid Expression (see page 0)	
	Precoordinated	**Postcoordinated**
<< (^ 700043003 | Example problem list concepts reference set|[1394])	394659003 | Acute coronary syndrome |[1395]	194828000 |Angina|[1396] : 255234002 |After|[1397] = 22298006 |Myocardial infarction|[1398]
	194828000 | Angina|[1399]	
	371807002 | Atypical angina|[1400]	
^ (< 450973005 | GP/FP health issue reference set|[1401])	140004 | Chronic pharyngitis|[1402]	-
	297009 | Acute myringitis|[1403]	
(< 404684003 |Clinical finding|[1404] : 363698007 |Finding site|[1405] = << 39057004 |Pulmonary valve structure|[1406]) AND ^ 700043003 |Example problem list concepts reference set|[1407]	204351007 | Fallot's trilogy|[1408]	-
	457652006 | Calcification of pulmonary valve|[1409]	

1394 http://snomed.info/id/700043003
1395 http://snomed.info/id/394659003
1396 http://snomed.info/id/194828000
1397 http://snomed.info/id/255234002
1398 http://snomed.info/id/22298006
1399 http://snomed.info/id/194828000
1400 http://snomed.info/id/371807002
1401 http://snomed.info/id/450973005
1402 http://snomed.info/id/140004
1403 http://snomed.info/id/297009
1404 http://snomed.info/id/404684003
1405 http://snomed.info/id/363698007
1406 http://snomed.info/id/39057004
1407 http://snomed.info/id/700043003
1408 http://snomed.info/id/204351007
1409 http://snomed.info/id/457652006

(< 404684003 |Clinical finding|[1410] : 363698007 |Finding site|[1411] =<< 39057004 |Pulmonary valve structure|[1412]) AND (< 64572001 |Disease|[1413] : 116676008 |Associated morphology|[1414] =<< 415582006 |Stenosis|[1415])	204351007 | Fallot's trilogy|[1416] 56786000 | Pulmonic valve stenosis|[1422]	19036004 |Rheumatic heart valve stenosis|[1417] : { 363698007 |Finding site|[1418] = 39057004 |Pulmonary valve structure|[1419] , 116676008 |Associated morphology|[1420] = 415582006 |Stenosis|[1421] }
(<< 17636008 |Specimen collection|[1423] : 424226004 |Using device|[1424] =<< 19923001 |Catheter|[1425]) . 363701004 |Direct substance|[1426]	78014005 | Urine|[1427] 87612001 | Blood|[1428]	-
(<< 404684003 |Clinical finding (finding)|[1429] OR << 272379006 | Event (event)|[1430]): 255234002 |After|[1431] =<< 71388002 |Procedure (procedure)|[1432]	235948002 | Postoperative acute pancreatitis|[1433]	64572001 |Disease|[1434] : { 370135005 |Pathological process|[1435] = 441862004 | Infectious process|[1436] , 255234002 |After|[1437] = 387713003 |Surgical procedure|

1410 http://snomed.info/id/404684003
1411 http://snomed.info/id/363698007
1412 http://snomed.info/id/39057004
1413 http://snomed.info/id/64572001
1414 http://snomed.info/id/116676008
1415 http://snomed.info/id/415582006
1416 http://snomed.info/id/204351007
1417 http://snomed.info/id/19036004
1418 http://snomed.info/id/363698007
1419 http://snomed.info/id/39057004
1420 http://snomed.info/id/116676008
1421 http://snomed.info/id/415582006
1422 http://snomed.info/id/56786000
1423 http://snomed.info/id/17636008
1424 http://snomed.info/id/424226004
1425 http://snomed.info/id/19923001
1426 http://snomed.info/id/363701004
1427 http://snomed.info/id/78014005
1428 http://snomed.info/id/87612001
1429 http://snomed.info/id/404684003
1430 http://snomed.info/id/272379006
1431 http://snomed.info/id/255234002
1432 http://snomed.info/id/71388002
1433 http://snomed.info/id/235948002
1434 http://snomed.info/id/64572001
1435 http://snomed.info/id/370135005
1436 http://snomed.info/id/441862004
1437 http://snomed.info/id/255234002

	441795000 | Infected seroma after surgical procedure|[1441]	[1438] , 116676008 |Associated morphology|[1439] = 112633009 | Surgical would|[1440] }
<< 125605004 |Fracture of bone|[1442] : [0..0] ((<< 410662002 |Concept model attribute|[1443] MINUS 363698007 |Finding site|[1444]) MINUS 116676008 |Associated morphology|[1445]) = *	125605004 | Fracture of bone|[1446] 439987009 | Open fracture of bone|[1452]	64572001 | Disease|[1447] : { 363698007 | Finding site|[1448] = 71341001 | Bone structure of femur|[1449] , 116676008 | Associated morphology|[1450] = 20946005 | Fracture, closed|[1451] }
< 404684003 |Clinical finding|[1453] : 47429007 |Associated with|[1454] = (< 404684003 |Clinical finding|[1455] : 116676008 |Associated morphology|[1456] = << 55641003 |Infarct|[1457])	71023004 | Pericarditis secondary to acute myocardial infarction|[1458]	3238004 | Pericarditis (disorder)|[1459] : 47429007 | Associated with|[1460] = 57054005 | Acute myocardial infarction|[1461]

[1] (see page 157) Where necessary, these examples make some assumptions about the membership of the example reference sets.

1441 http://snomed.info/id/441795000
1438 http://snomed.info/id/387713003
1439 http://snomed.info/id/116676008
1440 http://snomed.info/id/112633009
1442 http://snomed.info/id/125605004
1443 http://snomed.info/id/410662002
1444 http://snomed.info/id/363698007
1445 http://snomed.info/id/116676008
1446 http://snomed.info/id/125605004
1447 http://snomed.info/id/64572001
1448 http://snomed.info/id/363698007
1449 http://snomed.info/id/71341001
1450 http://snomed.info/id/116676008
1451 http://snomed.info/id/20946005
1452 http://snomed.info/id/439987009
1453 http://snomed.info/id/404684003
1454 http://snomed.info/id/47429007
1455 http://snomed.info/id/404684003
1456 http://snomed.info/id/116676008
1457 http://snomed.info/id/55641003
1458 http://snomed.info/id/71023004
1459 http://snomed.info/id/3238004
1460 http://snomed.info/id/47429007
1461 http://snomed.info/id/57054005

9 Appendix B – Examples Of Invalid Expressions

This appendix provides examples of expressions (both precoordinated and postcoordinated) which **do not** satisfy the given expression constraints from Chapter 6(see page 61). This list of examples is not intended to be exhaustive, but rather to provide a useful sample to help clarify the meaning of these constraint. Please refer to the SNOMED CT Languages Github repository[1462] for a set of text files containing each of these examples.

- B.1 Simple Expression Constraints - Invalid Expressions(see page 160)
- B.2 Refinements - Invalid Expressions(see page 162)
- B.3 Cardinality - Invalid Expressions(see page 171)
- B.4 Conjunction and Disjunction - Invalid Expressions(see page 177)
- B.5 Exclusion and Not Equals - Invalid Expressions(see page 180)
- B.6 Nested Expression Constraints - Invalid Expressions(see page 184)

9.1 B.1 Simple Expression Constraints - Invalid Expressions

Expression Constraint	**INVALID Expression** 1(see page 0)	
	Precoordinated	**Postcoordinated**
404684003 | Clinical finding |[1463]	56265001 | Heart disease |[1464]	404684003 | Clinical finding |[1465] : 363698007 | Finding site |[1466] = 80891009 | Heart structure |[1467]
	71388002 | Procedure |[1468]	
< 404684003 | Clinical finding |[1469]	404684003 | Clinical finding |[1470]	71388002 | Procedure |[1471] : 405813007 | Procedure site - Direct |[1472] = 80891009 | Heart structure |[1473]
	71388002 | Procedure |[1474]	
<< 73211009 | Diabetes mellitus |[1475]	71388002 | Procedure |[1476]	404684003 | Clinical finding |[1477] : 363698007 | Finding site |[1478] =

1462 https://github.com/IHTSDO/SNOMEDCT-Languages
1463 http://snomed.info/id/404684003
1464 http://snomed.info/id/56265001
1465 http://snomed.info/id/404684003
1466 http://snomed.info/id/363698007
1467 http://snomed.info/id/80891009
1468 http://snomed.info/id/71388002
1469 http://snomed.info/id/404684003
1470 http://snomed.info/id/404684003
1471 http://snomed.info/id/71388002
1472 http://snomed.info/id/405813007
1473 http://snomed.info/id/80891009
1474 http://snomed.info/id/71388002
1475 http://snomed.info/id/73211009
1476 http://snomed.info/id/71388002
1477 http://snomed.info/id/404684003
1478 http://snomed.info/id/363698007

	362969004 | Disorder of endocrine system|[1480]	113331007 | Structure of endocrine system|[1479]
<! 404684003 | Clinical finding|[1481]	404684003 | Clinical finding|[1482] 233709006 | Toxic pulmonary edema|[1488]	404684003 | Clinical finding|[1483] : 116676008 | Associated morphology|[1484] = 79654002 | Edema|[1485] , 363698007 | Finding site|[1486] = 80891009 | Heart structure|[1487] 2(see page 0)
> 40541001 | Acute pulmonary edema|[1489]	40541001 | Acute pulmonary edema|[1490] 233709006 | Toxic pulmonary edema|[1494] 304527002 | Acute asthma|[1495]	40541001 | Acute pulmonary edema|[1491] : 246112005 | Severity|[1492] = 24484000 | Severe|[1493]
>> 40541001 | Acute pulmonary edema|[1496]	233709006 | Toxic pulmonary edema|[1497] 304527002 | Acute asthma|[1501]	40541001 | Acute pulmonary edema|[1498] : 246112005 | Severity|[1499] = 24484000 | Severe|[1500]

1480 http://snomed.info/id/362969004
1479 http://snomed.info/id/113331007
1481 http://snomed.info/id/404684003
1482 http://snomed.info/id/404684003
1483 http://snomed.info/id/404684003
1484 http://snomed.info/id/116676008
1485 http://snomed.info/id/79654002
1486 http://snomed.info/id/363698007
1487 http://snomed.info/id/80891009
1488 http://snomed.info/id/233709006
1489 http://snomed.info/id/40541001
1490 http://snomed.info/id/40541001
1491 http://snomed.info/id/40541001
1492 http://snomed.info/id/246112005
1493 http://snomed.info/id/24484000
1494 http://snomed.info/id/233709006
1495 http://snomed.info/id/304527002
1496 http://snomed.info/id/40541001
1497 http://snomed.info/id/233709006
1498 http://snomed.info/id/40541001
1499 http://snomed.info/id/246112005
1500 http://snomed.info/id/24484000
1501 http://snomed.info/id/304527002

>! 40541001 | Acute pulmonary edema |[1502]	404684003 | Clinical finding |[1503]	64572001 | Disease |[1504] : 263502005 | Clinical course |[1505] = 424124008 | Sudden onset AND/ OR short duration |[1506] [3](see page 0)
	267038008 | Edema |[1507]	
^ 700043003 | Example problem list concepts reference set |[1508]	6143009 | Diabetic education |[1509]	71388002 | Procedure |[1510] : 405813007 | Procedure site - Direct |[1511] = 80891009 | Heart structure |[1512]
	75367002 | Blood pressure |[1513]	
*	-	-
	-	-
	-	-

[1](see page 160) Where necessary, these examples make some assumptions about the membership of the example reference sets.

[2](see page 161) Please note that this makes the assumption that the given expression constraint is executed against a finite set of expressions that has been pre-classified (e.g. in an expression repository), and that after classification there is at least one intermediate expression between this expression and 404684003 \| Clinical finding \|[1514].

[3](see page 162) Please note that this makes the assumption that the given expression constraint is executed against a finite set of expressions that has been pre-classified (e.g. in an expression repository), and that after classification there is at least one intermediate expression between 40541001 \|Acute pulmonary edema\| [1515] and this expression.

9.2 B.2 Refinements - Invalid Expressions

Expression Constraint	**INVALID Expression** [1](see page 0) [2](see page 0)

1502 http://snomed.info/id/40541001
1503 http://snomed.info/id/404684003
1504 http://snomed.info/id/64572001
1505 http://snomed.info/id/263502005
1506 http://snomed.info/id/424124008
1507 http://snomed.info/id/267038008
1508 http://snomed.info/id/700043003
1509 http://snomed.info/id/6143009
1510 http://snomed.info/id/71388002
1511 http://snomed.info/id/405813007
1512 http://snomed.info/id/80891009
1513 http://snomed.info/id/75367002
1514 http://snomed.info/id/404684003
1515 http://snomed.info/id/40541001

	Precoordinated	Postcoordinated
< 19829001 | Disorder of lung |[1516] : 116676008 | Associated morphology |[1517] = 79654002 | Edema |[1518]	19829001 | Disorder of lung |[1519]	19829001 | Disorder of lung |[1520] : 116676008 | Associated morphology |[1521] = 44132006 | Abscess |[1522]
	73452002 | Abscess of lung |[1523]	19829001 | Disorder of lung |[1524] : 116676008 | Associated morphology |[1525] = 40829002 | Acute edema |[1526]
	233711002 | Oxygen-induced pulmonary edema |[1527]	
< 19829001 | Disorder of lung |[1528] : 116676008 | Associated morphology |[1529] = << 79654002 | Edema |[1530]	19829001 | Disorder of lung |[1531]	6141006 | Retinal edema |[1532] : 116676008 | Associated morphology |[1533] = 103619005 | Inflammatory edema |[1534]
	73452002 | Abscess of lung |[1535]	19829001 | Disorder of lung |[1536] : 116676008 | Associated morphology |[1537] = 44132006 | Abscess |[1538]
	6141006 | Retinal edema |[1539]	

1516 http://snomed.info/id/19829001
1517 http://snomed.info/id/116676008
1518 http://snomed.info/id/79654002
1519 http://snomed.info/id/19829001
1520 http://snomed.info/id/19829001
1521 http://snomed.info/id/116676008
1522 http://snomed.info/id/44132006
1523 http://snomed.info/id/73452002
1524 http://snomed.info/id/19829001
1525 http://snomed.info/id/116676008
1526 http://snomed.info/id/40829002
1527 http://snomed.info/id/233711002
1528 http://snomed.info/id/19829001
1529 http://snomed.info/id/116676008
1530 http://snomed.info/id/79654002
1531 http://snomed.info/id/19829001
1532 http://snomed.info/id/6141006
1533 http://snomed.info/id/116676008
1534 http://snomed.info/id/103619005
1535 http://snomed.info/id/73452002
1536 http://snomed.info/id/19829001
1537 http://snomed.info/id/116676008
1538 http://snomed.info/id/44132006
1539 http://snomed.info/id/6141006

< 404684003 | Clinical finding|[1540] : 363698007 | Finding site|[1541] = << 39057004 | Pulmonary valve structure|[1542] , 116676008 | Associated morphology|[1543] = << 415582006 | Stenosis|[1544]	404684003 | Clinical finding|[1545]	448643005 | Abnormality of pulmonary valve|[1546] : 116676008 | Associated morphology|[1547] = 44132006 | Abscess|[1548]
	448643005 | Abnormality of pulmonary valve|[1549]	404684003 | Clinical finding|[1550] : 363698007 | Finding site|[1551] = 61853006 | Spinal canal structure|[1552] , 116676008 | Associated morphology|[1553] = 415582006 | Stenosis|[1554]
	431238002 | Abscess of pulmonary valve|[1555]	
* : 246075003 |Causative agent|[1556] = 387517004 | Paracetamol|[1557]	46093004 | Paracetamol measurement|[1558]	404684003 | Clinical finding|[1559] : 246075003 | Causative agent|[1560] = 372687004 | Amoxicillin|[1561]

1540 http://snomed.info/id/404684003
1541 http://snomed.info/id/363698007
1542 http://snomed.info/id/39057004
1543 http://snomed.info/id/116676008
1544 http://snomed.info/id/415582006
1545 http://snomed.info/id/404684003
1546 http://snomed.info/id/448643005
1547 http://snomed.info/id/116676008
1548 http://snomed.info/id/44132006
1549 http://snomed.info/id/448643005
1550 http://snomed.info/id/404684003
1551 http://snomed.info/id/363698007
1552 http://snomed.info/id/61853006
1553 http://snomed.info/id/116676008
1554 http://snomed.info/id/415582006
1555 http://snomed.info/id/431238002
1556 http://snomed.info/id/246075003
1557 http://snomed.info/id/387517004
1558 http://snomed.info/id/46093004
1559 http://snomed.info/id/404684003
1560 http://snomed.info/id/246075003
1561 http://snomed.info/id/372687004

< 404684003 | Clinical finding|[1562] : { 363698007 | Finding site|[1563] = << 39057004 | Pulmonary valve structure|[1564] , 116676008 | Associated morphology|[1565] = << 415582006 | Stenosis|[1566] }, { 363698007 | Finding site|[1567] = << 53085002 | Right ventricular structure|[1568] , 116676008 | Associated morphology|[1569] = << 56246009 | Hypertrophy|[1570] }	404684003 | Clinical finding|[1571] 56786000 | Pulmonary valve stenosis|[1581]	404684003 | Clinical finding|[1572] : { 363698007 | Finding site|[1573] = 39057004 | Pulmonary valve structure|[1574] , 116676008 | Associated morphology|[1575] = 56246009 | Hypertrophy|[1576] }, { 363698007 | Finding site|[1577] = 53085002 | Right ventricular structure|[1578] , 116676008 | Associated morphology|[1579] = 415582006 | Stenosis|[1580] }

1562 http://snomed.info/id/404684003
1563 http://snomed.info/id/363698007
1564 http://snomed.info/id/39057004
1565 http://snomed.info/id/116676008
1566 http://snomed.info/id/415582006
1567 http://snomed.info/id/363698007
1568 http://snomed.info/id/53085002
1569 http://snomed.info/id/116676008
1570 http://snomed.info/id/56246009
1571 http://snomed.info/id/404684003
1572 http://snomed.info/id/404684003
1573 http://snomed.info/id/363698007
1574 http://snomed.info/id/39057004
1575 http://snomed.info/id/116676008
1576 http://snomed.info/id/56246009
1577 http://snomed.info/id/363698007
1578 http://snomed.info/id/53085002
1579 http://snomed.info/id/116676008
1580 http://snomed.info/id/415582006
1581 http://snomed.info/id/56786000

<< 404684003 | Clinical finding|[1582] : << 47429007 |Associated with|[1583] = << 267038008 | Edema|[1584]	404684003 | Clinical finding|[1585]	95356008 | Mucosal ulcer|[1586] : 42752001 | Due to|[1587] = 59901004 | Cheek biting|[1588]

1582 http://snomed.info/id/404684003
1583 http://snomed.info/id/47429007
1584 http://snomed.info/id/267038008
1585 http://snomed.info/id/404684003
1586 http://snomed.info/id/95356008
1587 http://snomed.info/id/42752001
1588 http://snomed.info/id/59901004

< 27658006 | Amoxicillin |[1589] : 411116001 | Has dose form |[1590] = << 385055001 | Tablet dose form |[1591] , { 179999999100 |Has basis of strength |[1592] = (219999999102 |Amoxicillin only |[1593] : 189999999103 |Has strength magnitude |[1594] >= #200, 199999999101 |Has strength unit |[1595] = 258684004 | mg |[1596])}	269999999100 | Amoxicillin capsule |[1597] 374233002 | Amoxicillin trihydrate 125 mg chewable tablet |[1606]	27658006 | Amoxicillin |[1598] : 411116001 | Has dose form |[1599] = 421026006 | Oral tablet |[1600] , { 179999999100 | Has basis of strength |[1601] = (219999999102 | Amoxicillin only |[1602] : 189999999103 | Has strength magnitude |[1603] = 175, 199999999101 | Has strength unit |[1604] = 258684004 | mg |[1605])}

1589 http://snomed.info/id/27658006
1590 http://snomed.info/id/411116001
1591 http://snomed.info/id/385055001
1592 http://snomed.org/fictid#179999999100
1593 http://snomed.org/fictid#219999999102
1594 http://snomed.org/fictid#189999999103
1595 http://snomed.org/fictid#199999999101
1596 http://snomed.info/id/258684004
1597 http://snomed.org/fictid#269999999100
1598 http://snomed.info/id/27658006
1599 http://snomed.info/id/411116001
1600 http://snomed.info/id/421026006
1601 http://snomed.org/fictid#179999999100
1602 http://snomed.org/fictid#219999999102
1603 http://snomed.org/fictid#189999999103
1604 http://snomed.org/fictid#199999999101
1605 http://snomed.info/id/258684004
1606 http://snomed.info/id/374233002

```
< 27658006 | Amoxicillin |[1607] :
  411116001 | Has dose form |[1608] = <<
385055001 | Tablet dose form |[1609] ,
 { 179999999100 |Has basis of strength |[1610] = (
219999999102 |Amoxicillin only |[1611] :

189999999103 |Has strength magnitude |[1612] >= #500,

189999999103 |Has strength magnitude |[1613] <= #800,

199999999101 |Has strength unit |[1614] =
258684004 | mg |[1615] )}
```

```
269999999100 | Amoxicillin capsule |[1616]
```

```
27658006 | Amoxicillin |[1617] :
  411116001 | Has dose form |[1618] =
  421026006 | Oral tablet |[1619] ,
 { 179999999100 | Has basis of strength |[1620] =
 ( 219999999102 | Amoxicillin only |[1621] :
  189999999103 | Has strength magnitude |[1622]
 = #850,
  199999999101 | Has strength unit |[1623] =
  258684004 | mg |[1624] )}
```

1607 http://snomed.info/id/27658006
1608 http://snomed.info/id/411116001
1609 http://snomed.info/id/385055001
1610 http://snomed.org/fictid#179999999100
1611 http://snomed.org/fictid#219999999102
1612 http://snomed.org/fictid#189999999103
1613 http://snomed.org/fictid#189999999103
1614 http://snomed.org/fictid#199999999101
1615 http://snomed.info/id/258684004
1616 http://snomed.org/fictid#269999999100
1617 http://snomed.info/id/27658006
1618 http://snomed.info/id/411116001
1619 http://snomed.info/id/421026006
1620 http://snomed.org/fictid#179999999100
1621 http://snomed.org/fictid#219999999102
1622 http://snomed.org/fictid#189999999103
1623 http://snomed.org/fictid#199999999101
1624 http://snomed.info/id/258684004

	374647008 | Amoxicillin 875 mg tablet|[1625]	
< 373873005 | Pharmaceutical / biologic product|[1626] : 209999999104 |Has trade name|[1627] = "PANADOL"	373873005 | Pharmaceutical / biologic product|[1628]	373873005 | Pharmaceutical / biologic product|[1629] : { 127489000 | Has active ingredient|[1630] = 412031009 | Paracetamol or derivative|[1631] , 209999999104 | Has trade name|[1632] = "PANADEINE"}
	322236009 | Paracetamol 500mg tablet|[1633]	
< 91723000 | Anatomical structure|[1634] : R 363698007 |Finding site|[1635] = < 125605004 | Fracture of bone|[1636]	34080009 | Malleus structure|[1637]	34080009 |Malleus structure|[1638] : 272741003 |Laterality|[1639] = 7771000 |Left|[1640]
	10200004 | Liver structure|[1641]	10200004 |Liver structure|[1642] : 272741003 |Laterality|[1643] = 24028007 |Right|[1644]

1625 http://snomed.info/id/374647008
1626 http://snomed.info/id/373873005
1627 http://snomed.org/fictid#209999999104
1628 http://snomed.info/id/373873005
1629 http://snomed.info/id/373873005
1630 http://snomed.info/id/127489000
1631 http://snomed.info/id/412031009
1632 http://snomed.org/fictid#209999999104
1633 http://snomed.info/id/322236009
1634 http://snomed.info/id/91723000
1635 http://snomed.info/id/363698007
1636 http://snomed.info/id/125605004
1637 http://snomed.info/id/34080009
1638 http://snomed.info/id/34080009
1639 http://snomed.info/id/272741003
1640 http://snomed.info/id/7771000
1641 http://snomed.info/id/10200004
1642 http://snomed.info/id/10200004
1643 http://snomed.info/id/272741003
1644 http://snomed.info/id/24028007

< 125605004 |Fracture of bone|[1645] . 363698007 |Finding site|[1646]	34080009 |Malleus structure|[1647]	34080009 |Malleus structure|[1648] : 272741003 |Laterality|[1649] = 7771000 |Left|[1650]
	10200004 |Liver structure|[1651]	10200004 |Liver structure|[1652] : 272741003 |Laterality|[1653] = 24028007 |Right|[1654]
< 105590001 |Substance|[1655] : R << 127489000 |Has active ingredient|[1656] = < 27658006 |Product containing amoxicillin|[1657]	105590001 |Substance|[1658]	373873005 | Pharmaceutical / biologic product|[1659] : 127489000 | Has active ingredient|[1660] = 372687004 | Amoxicillin|[1661]
	387517004 | Paracetamol|[1662]	
249999999101 |TRIPHASIL tablet|[1663] . 127489000 | Has active ingredient|[1664]	105590001 |Substance|[1665]	373873005 | Pharmaceutical / biologic product|[1666] : 127489000 | Has active ingredient|[1667] = 126109000 | Levonorgestrel|[1668]

1645 http://snomed.info/id/125605004
1646 http://snomed.info/id/363698007
1647 http://snomed.info/id/34080009
1648 http://snomed.info/id/34080009
1649 http://snomed.info/id/272741003
1650 http://snomed.info/id/7771000
1651 http://snomed.info/id/10200004
1652 http://snomed.info/id/10200004
1653 http://snomed.info/id/272741003
1654 http://snomed.info/id/24028007
1655 http://snomed.info/id/105590001
1656 http://snomed.info/id/127489000
1657 http://snomed.info/id/27658006
1658 http://snomed.info/id/105590001
1659 http://snomed.info/id/373873005
1660 http://snomed.info/id/127489000
1661 http://snomed.info/id/372687004
1662 http://snomed.info/id/387517004
1663 http://snomed.org/fictid#249999999101
1664 http://snomed.info/id/127489000
1665 http://snomed.info/id/105590001
1666 http://snomed.info/id/373873005
1667 http://snomed.info/id/127489000
1668 http://snomed.info/id/126109000

	387517004 | Paracetamol |[1669]	
< 404684003 | Clinical finding |[1670] : * = 79654002 |Edema|[1671]	263225007 | Hip fracture |[1672]	404684003 | Clinical finding |[1673] : 116676008 | Associated morphology |[1674] = 72704001 | Fracture |[1675]
	385933006 | Edema control education |[1676]	
< 404684003 | Clinical finding |[1677] : 116676008 | Associated morphology |[1678] = *	195967001 | Asthma |[1679]	404684003 | Clinical finding |[1680] : 363698007 | Finding site |[1681] = 80891009 | Heart structure |[1682]
	73211009 | Diabetes mellitus |[1683]	404684003 | Clinical finding |[1684] : 246075003 | Causative agent |[1685] = 372687004 | Amoxicillin |[1686]

1 (see page 162) Please note that some of these examples are based on a hypothetical drug concept model.
2 (see page 162) The SNOMED CT identifiers created with the '9999999' namespace are for example only, and should not be used in a production environment.

9.3 B.3 Cardinality - Invalid Expressions

Expression Constraint	INVALID Expression 1 (see page 0)

1669 http://snomed.info/id/387517004
1670 http://snomed.info/id/404684003
1671 http://snomed.info/id/79654002
1672 http://snomed.info/id/263225007
1673 http://snomed.info/id/404684003
1674 http://snomed.info/id/116676008
1675 http://snomed.info/id/72704001
1676 http://snomed.info/id/385933006
1677 http://snomed.info/id/404684003
1678 http://snomed.info/id/116676008
1679 http://snomed.info/id/195967001
1680 http://snomed.info/id/404684003
1681 http://snomed.info/id/363698007
1682 http://snomed.info/id/80891009
1683 http://snomed.info/id/73211009
1684 http://snomed.info/id/404684003
1685 http://snomed.info/id/246075003
1686 http://snomed.info/id/372687004

	Precoordinated	**Postcoordinated**
< 373873005 | Pharmaceutical / biologic product|[1687] : [1..3] 127489000 | Has active ingredient|[1688] = < 105590001 | Substance|[1689]	279999999108 | Inert tablet|[1690] 437867004 | Chlorphenamine + dextromethorphan + paracetamol + pseudoephedrine|[1700]	373873005 | Pharmaceutical / biologic product|[1691] : { 127489000 | Has active ingredient|[1692] = 412031009 | Paracetamol or derivative|[1693] }, { 127489000 | Has active ingredient|[1694] = 387494007 | Codeine|[1695] }, { 127489000 | Has active ingredient|[1696] = 255641001 | Caffeine|[1697] }, { 127489000 | Has active ingredient|[1698] = 44068004 | Doxylamine|[1699] }
< 373873005 | Pharmaceutical / biologic product|[1701] : [1..1] 127489000 | Has active ingredient|[1702] = < 105590001 | Substance|[1703]	279999999108 | Inert tablet|[1704] 412556009 | Paracetamol + codeine|[1710]	373873005 | Pharmaceutical / biologic product|[1705] : { 127489000 | Has active ingredient|[1706] = 412031009 | Paracetamol or derivative|[1707] }, { 127489000 | Has active ingredient|[1708] = 387494007 | Codeine|[1709] }

1687 http://snomed.info/id/373873005
1688 http://snomed.info/id/127489000
1689 http://snomed.info/id/105590001
1690 http://snomed.org/fictid#279999999108
1691 http://snomed.info/id/373873005
1692 http://snomed.info/id/127489000
1693 http://snomed.info/id/412031009
1694 http://snomed.info/id/127489000
1695 http://snomed.info/id/387494007
1696 http://snomed.info/id/127489000
1697 http://snomed.info/id/255641001
1698 http://snomed.info/id/127489000
1699 http://snomed.info/id/44068004
1700 http://snomed.info/id/437867004
1701 http://snomed.info/id/373873005
1702 http://snomed.info/id/127489000
1703 http://snomed.info/id/105590001
1704 http://snomed.org/fictid#279999999108
1705 http://snomed.info/id/373873005
1706 http://snomed.info/id/127489000
1707 http://snomed.info/id/412031009
1708 http://snomed.info/id/127489000
1709 http://snomed.info/id/387494007
1710 http://snomed.info/id/412556009

< 373873005 | Pharmaceutical / biologic product|[1711] : [0..1] 127489000 | Has active ingredient|[1712] = < 105590001 | Substance|[1713]	412556009 | Paracetamol + codeine|[1714]	373873005 | Pharmaceutical / biologic product|[1715] : { 127489000 | Has active ingredient|[1716] = 412031009 | Paracetamol or derivative|[1717] }, { 127489000 | Has active ingredient|[1718] = 387494007 | Codeine|[1719] }
< 373873005 | Pharmaceutical / biologic product|[1720] : [1..*] 127489000 | Has active ingredient|[1721] = < 105590001 | Substance|[1722]	279999999108 | Inert tablet|[1723]	373873005 | Pharmaceutical / biologic product|[1724] : 411116001 | Has dose form|[1725] = 385055001 | Tablet|[1726]
< 404684003 | Clinical finding|[1727] : [1..1] 363698007 | Finding site|[1728] = < 91723000 | Anatomical structure|[1729]	75857000 | Fracture of radius and ulna|[1730] 40733004 | Infectious disease|[1738]	404684003 | Clinical finding|[1731] : { 116676008 | Associated morphology|[1732] = 72704001 | Fracture|[1733] , 363698007 | Finding site|[1734] = 62413002 | Bone structure of radius|[1735] , 363698007 | Finding site|[1736] = 23416004 | Bone structure of ulna|[1737] }

1711 http://snomed.info/id/373873005
1712 http://snomed.info/id/127489000
1713 http://snomed.info/id/105590001
1714 http://snomed.info/id/412556009
1715 http://snomed.info/id/373873005
1716 http://snomed.info/id/127489000
1717 http://snomed.info/id/412031009
1718 http://snomed.info/id/127489000
1719 http://snomed.info/id/387494007
1720 http://snomed.info/id/373873005
1721 http://snomed.info/id/127489000
1722 http://snomed.info/id/105590001
1723 http://snomed.org/fictid#279999999108
1724 http://snomed.info/id/373873005
1725 http://snomed.info/id/411116001
1726 http://snomed.info/id/385055001
1727 http://snomed.info/id/404684003
1728 http://snomed.info/id/363698007
1729 http://snomed.info/id/91723000
1730 http://snomed.info/id/75857000
1731 http://snomed.info/id/404684003
1732 http://snomed.info/id/116676008
1733 http://snomed.info/id/72704001
1734 http://snomed.info/id/363698007
1735 http://snomed.info/id/62413002
1736 http://snomed.info/id/363698007
1737 http://snomed.info/id/23416004
1738 http://snomed.info/id/40733004

< 404684003 | Clinical finding |[1739] : [2..*] 363698007 | Finding site |[1740] = < 91723000 | Anatomical structure |[1741]	23406007 | Arm fracture |[1742] 40733004 | Infectious disease |[1748]	404684003 | Clinical finding |[1743] : { 116676008 | Associated morphology |[1744] = 72704001 | Fracture |[1745] , 363698007 | Finding site |[1746] = 702468001 | Bone structure of lower leg |[1747] }
< 404684003 | Clinical finding |[1749] : { [2..*] 363698007 | Finding site |[1750] = < 91723000 | Anatomical structure |[1751] }	75857000 | Fracture of radius and ulna |[1752]	64572001 | Disease |[1753] : { 116676008 | Associated morphology |[1754] = 396351009 | Congenital septal defect |[1755] , 363698007 | Finding site |[1756] = 113262008 | Thoracic aorta structure |[1757] } { 116676008 | Associated morphology |[1758] = 90141005 | Congenital hypertrophy |[1759] , 363698007 | Finding site |[1760] = 244384009 | Entire right ventricle |[1761] }

1739 http://snomed.info/id/404684003
1740 http://snomed.info/id/363698007
1741 http://snomed.info/id/91723000
1742 http://snomed.info/id/23406007
1743 http://snomed.info/id/404684003
1744 http://snomed.info/id/116676008
1745 http://snomed.info/id/72704001
1746 http://snomed.info/id/363698007
1747 http://snomed.info/id/702468001
1748 http://snomed.info/id/40733004
1749 http://snomed.info/id/404684003
1750 http://snomed.info/id/363698007
1751 http://snomed.info/id/91723000
1752 http://snomed.info/id/75857000
1753 http://snomed.info/id/64572001
1754 http://snomed.info/id/116676008
1755 http://snomed.info/id/396351009
1756 http://snomed.info/id/363698007
1757 http://snomed.info/id/113262008
1758 http://snomed.info/id/116676008
1759 http://snomed.info/id/90141005
1760 http://snomed.info/id/363698007
1761 http://snomed.info/id/244384009

< 373873005 | Pharmaceutical / biologic product|[1762] : [1..3] { [1..*] 127489000 | Has active ingredient|[1763] = < 105590001 | Substance|[1764] }	279999999108 | Inert tablet|[1765]	373873005 | Pharmaceutical / biologic product|[1766] : { 127489000 | Has active ingredient|[1767] = 412031009 | Paracetamol or derivative|[1768] }, { 127489000 | Has active ingredient|[1769] = 387494007 | Codeine|[1770] }, { 127489000 | Has active ingredient|[1771] = 255641001 | Caffeine|[1772] }, { 127489000 | Has active ingredient|[1773] = 44068004 | Doxylamine|[1774] }
	437867004 | Chlorphenamine + dextromethorphan + paracetamol + pseudoephedrine|[1775]	
< 373873005 | Pharmaceutical / biologic product|[1776] : [0..1] { 127489000 | Has active ingredient|[1777] = < 105590001 | Substance|[1778] }	412556009 | Paracetamol + codeine|[1779]	373873005 | Pharmaceutical / biologic product|[1780] : { 127489000 | Has active ingredient|[1781] = 412031009 | Paracetamol or derivative|[1782] }, { 127489000 | Has active ingredient|[1783] = 387494007 | Codeine|[1784] }

1762 http://snomed.info/id/373873005
1763 http://snomed.info/id/127489000
1764 http://snomed.info/id/105590001
1765 http://snomed.org/fictid#279999999108
1766 http://snomed.info/id/373873005
1767 http://snomed.info/id/127489000
1768 http://snomed.info/id/412031009
1769 http://snomed.info/id/127489000
1770 http://snomed.info/id/387494007
1771 http://snomed.info/id/127489000
1772 http://snomed.info/id/255641001
1773 http://snomed.info/id/127489000
1774 http://snomed.info/id/44068004
1775 http://snomed.info/id/437867004
1776 http://snomed.info/id/373873005
1777 http://snomed.info/id/127489000
1778 http://snomed.info/id/105590001
1779 http://snomed.info/id/412556009
1780 http://snomed.info/id/373873005
1781 http://snomed.info/id/127489000
1782 http://snomed.info/id/412031009
1783 http://snomed.info/id/127489000
1784 http://snomed.info/id/387494007

< 373873005 | Pharmaceutical / biologic product|[1785] : [1..*] { 127489000 | Has active ingredient|[1786] = < 105590001 | Substance|[1787] }	279999999108 | Inert tablet|[1788]	373873005 | Pharmaceutical / biologic product|[1789] : 411116001 | Has dose form|[1790] = 385055001 | Tablet|[1791]
< 404684003 | Clinical finding|[1792] : [1..1] { 363698007 | Finding site|[1793] = < 91723000 | Anatomical structure|[1794] }	75857000 | Fracture of radius and ulna|[1795] 40733004 | Infectious disease|[1805]	404684003 | Clinical finding|[1796] : { 116676008 | Associated morphology|[1797] = 72704001 | Fracture|[1798] , 363698007 | Finding site|[1799] = 62413002 | Bone structure of radius|[1800] }, { 116676008 | Associated morphology|[1801] = 72704001 | Fracture|[1802] , 363698007 | Finding site|[1803] = 23416004 | Bone structure of ulna|[1804] }
< 404684003 | Clinical finding|[1806] : [0..0] { [2..*] 363698007 | Finding site|[1807] = < 91723000 | Anatomical structure|[1808] }	-	64572001 | Disease|[1809] : { 116676008 | Associated morphology|[1810] =

1785 http://snomed.info/id/373873005
1786 http://snomed.info/id/127489000
1787 http://snomed.info/id/105590001
1788 http://snomed.org/fictid#279999999108
1789 http://snomed.info/id/373873005
1790 http://snomed.info/id/411116001
1791 http://snomed.info/id/385055001
1792 http://snomed.info/id/404684003
1793 http://snomed.info/id/363698007
1794 http://snomed.info/id/91723000
1795 http://snomed.info/id/75857000
1796 http://snomed.info/id/404684003
1797 http://snomed.info/id/116676008
1798 http://snomed.info/id/72704001
1799 http://snomed.info/id/363698007
1800 http://snomed.info/id/62413002
1801 http://snomed.info/id/116676008
1802 http://snomed.info/id/72704001
1803 http://snomed.info/id/363698007
1804 http://snomed.info/id/23416004
1805 http://snomed.info/id/40733004
1806 http://snomed.info/id/404684003
1807 http://snomed.info/id/363698007
1808 http://snomed.info/id/91723000
1809 http://snomed.info/id/64572001
1810 http://snomed.info/id/116676008

		396351009 | Congenital septal defect |[1811] , 363698007 | Finding site |[1812] = 25943004 | Structure of atrioventricular node |[1813] , 363698007 | Finding site |[1814] = 113262008 | Thoracic aorta structure |[1815] } { 116676008 | Associated morphology |[1816] = 90141005 | Congenital hypertrophy |[1817] , 363698007 | Finding site |[1818] = 244384009 | entire right ventricle |[1819] }

[1] (see page 171) The SNOMED CT identifiers created with the '9999999' namespace are for example only, and should not be used in a production environment.

9.4 B.4 Conjunction and Disjunction - Invalid Expressions

Expression Constraint	**INVALID Expression** [1] (see page 0)	
	Precoordinated	**Postcoordinated**
< 19829001 | Disorder of lung |[1820] AND < 301867009 | Edema of trunk |[1821]	73452002 | Abscess of lung |[1822]	248508001 | Abdominal wall edema |[1823] : 116676008 | Associated morphology |[1824] = 40829002 | Acute edema |[1825]
	248508001 | Abdominal wall edema |[1826]	

1811 http://snomed.info/id/396351009
1812 http://snomed.info/id/363698007
1813 http://snomed.info/id/25943004
1814 http://snomed.info/id/363698007
1815 http://snomed.info/id/113262008
1816 http://snomed.info/id/116676008
1817 http://snomed.info/id/90141005
1818 http://snomed.info/id/363698007
1819 http://snomed.info/id/244384009
1820 http://snomed.info/id/19829001
1821 http://snomed.info/id/301867009
1822 http://snomed.info/id/73452002
1823 http://snomed.info/id/248508001
1824 http://snomed.info/id/116676008
1825 http://snomed.info/id/40829002
1826 http://snomed.info/id/248508001

< 19829001 |Disorder of lung|[1827] OR < 301867009 |Edema of trunk|[1828]	19829001 |Disorder of lung|[1829] 301867009 |Edema of trunk|[1833] 128121009 |Disorder of trunk|[1834]	128121009 |Disorder of trunk|[1830] : 116676008 |Associated morphology|[1831] = 44132006 |Abscess|[1832]
< 19829001 |Disorder of lung|[1835] AND ^ 700043003 |Example problem list concepts reference set|[1836]	73452002 |Abscess of lung|[1837]	19829001 |Disorder of lung|[1838] : 116676008 |Associated morphology|[1839] = 44132006 |Abscess|[1840]
< 404684003 |Clinical finding|[1841] : 363698007 |Finding site|[1842] = << 39057004 |Pulmonary valve structure|[1843] AND 116676008 |Associated morphology|[1844] = << 415582006 |Stenosis|[1845]	301104003 |Pulmonary valve finding|[1846] 60573004 |Aortic valve stenosis|[1850]	404684003 |Clinical finding|[1847] : 116676008 |Associated morphology|[1848] = 88015002 |Partial stenosis|[1849]
< 404684003 |Clinical finding|[1851] : 116676008 |Associated morphology|[1852] = << 55641003 |Infarct|[1853] OR	368009 |Heart valve disorder|[1856]	95281009 |Sudden cardiac death|[1857] : 42752001 |Due to|[1858] =

1827 http://snomed.info/id/19829001
1828 http://snomed.info/id/301867009
1829 http://snomed.info/id/19829001
1830 http://snomed.info/id/128121009
1831 http://snomed.info/id/116676008
1832 http://snomed.info/id/44132006
1833 http://snomed.info/id/301867009
1834 http://snomed.info/id/128121009
1835 http://snomed.info/id/19829001
1836 http://snomed.info/id/700043003
1837 http://snomed.info/id/73452002
1838 http://snomed.info/id/19829001
1839 http://snomed.info/id/116676008
1840 http://snomed.info/id/44132006
1841 http://snomed.info/id/404684003
1842 http://snomed.info/id/363698007
1843 http://snomed.info/id/39057004
1844 http://snomed.info/id/116676008
1845 http://snomed.info/id/415582006
1846 http://snomed.info/id/301104003
1847 http://snomed.info/id/404684003
1848 http://snomed.info/id/116676008
1849 http://snomed.info/id/88015002
1850 http://snomed.info/id/60573004
1851 http://snomed.info/id/404684003
1852 http://snomed.info/id/116676008
1853 http://snomed.info/id/55641003
1856 http://snomed.info/id/368009
1857 http://snomed.info/id/95281009
1858 http://snomed.info/id/42752001

42752001 |Due to|[1854] =<< 22298006 |Myocardial infarction|[1855]	461089003 | Cardiac abnormality due to heart abscess|[1860]	10633002 | Acute congestive heart failure|[1859]
< 404684003 |Clinical finding|[1861] : { 363698007 |Finding site|[1862] =<< 39057004 |Pulmonary valve structure|[1863] , 116676008 |Associated morphology|[1864] =<< 415582006 |Stenosis|[1865] } OR { 363698007 |Finding site|[1866] =<< 53085002 |Right ventricular structure|[1867] , 116676008 |Associated morphology|[1868] =<< 56246009 |Hypertrophy|[1869] }	93075009 | Congenital hypertrophy of pulmonary valve|[1870] 204370002 | Stenosis of infundibulum of right ventricle|[1876]	404684003 | Clinical finding|[1871] : 363698007 | Finding site|[1872] = 39057004 | Pulmonary valve structure|[1873] , 116676008 | Associated morphology|[1874] = 56246009 | Hypertrophy|[1875]
^ 450990004 | Adverse drug reactions reference set for GP/FP health issue|[1877] : 246075003 | Causative agent|[1878] = (< 373873005 | Pharmaceutical / biologic product|[1879] OR < 105590001 | Substance|[1880])	87628006 | Bacterial infectious disease|[1881] 609328004 | Allergic disposition|[1885]	609328004 | Allergic disposition |[1882] : 246075003 | Causative agent|[1883] = 84489001 | Mold|[1884]

1854 http://snomed.info/id/42752001
1855 http://snomed.info/id/22298006
1860 http://snomed.info/id/461089003
1859 http://snomed.info/id/10633002
1861 http://snomed.info/id/404684003
1862 http://snomed.info/id/363698007
1863 http://snomed.info/id/39057004
1864 http://snomed.info/id/116676008
1865 http://snomed.info/id/415582006
1866 http://snomed.info/id/363698007
1867 http://snomed.info/id/53085002
1868 http://snomed.info/id/116676008
1869 http://snomed.info/id/56246009
1870 http://snomed.info/id/93075009
1871 http://snomed.info/id/404684003
1872 http://snomed.info/id/363698007
1873 http://snomed.info/id/39057004
1874 http://snomed.info/id/116676008
1875 http://snomed.info/id/56246009
1876 http://snomed.info/id/204370002
1877 http://snomed.info/id/450990004
1878 http://snomed.info/id/246075003
1879 http://snomed.info/id/373873005
1880 http://snomed.info/id/105590001
1881 http://snomed.info/id/87628006
1882 http://snomed.info/id/609328004
1883 http://snomed.info/id/246075003
1884 http://snomed.info/id/84489001
1885 http://snomed.info/id/609328004

	10629471000119106 | Allergic rhinitis caused by mould |[1886]	
< 404684003 |Clinical finding|[1887] : 116676008 |Associated morphology|[1888] = (<< 56208002 |Ulcer|[1889] AND << 50960005 |Hemorrhage|[1890])	196652006 | Acute duodenal ulcer|[1891]	64572001 | Disease|[1892] : 116676008 | Associated morphology|[1893] = 405719001 | Chronic ulcer|[1894]
	74474003 | Gastrointestinal haemorrhage|[1895]	

1 (see page 177) Where necessary, these examples make some assumptions about the membership of the example reference sets.

9.5 B.5 Exclusion and Not Equals - Invalid Expressions

Expression Constraint	**INVALID Expression**	
	Precoordinated	**Postcoordinated**
<< 19829001 | Disorder of lung|[1896] MINUS << 301867009 | Edema of trunk|[1897]	27719009 | Acute gastrointestinal hemorrhage|[1898]	19829001 | Disorder of lung|[1899] : { 116676008 | Associated morphology|[1900] = 40829002 | Acute edema|[1901] , 363698007 | Finding site|[1902] = 22943007 | Trunk structure|[1903] }
	19242006 | Pulmonary edema|[1904]	

1886 http://snomed.info/id/10629471000119106
1887 http://snomed.info/id/404684003
1888 http://snomed.info/id/116676008
1889 http://snomed.info/id/56208002
1890 http://snomed.info/id/50960005
1891 http://snomed.info/id/196652006
1892 http://snomed.info/id/64572001
1893 http://snomed.info/id/116676008
1894 http://snomed.info/id/405719001
1895 http://snomed.info/id/74474003
1896 http://snomed.info/id/19829001
1897 http://snomed.info/id/301867009
1898 http://snomed.info/id/27719009
1899 http://snomed.info/id/19829001
1900 http://snomed.info/id/116676008
1901 http://snomed.info/id/40829002
1902 http://snomed.info/id/363698007
1903 http://snomed.info/id/22943007
1904 http://snomed.info/id/19242006

<< 19829001 | Disorder of lung |[1905] MINUS ^ 700043003 | Example problem list concepts reference set |[1906]	67599009 | Pulmonary congestion |[1907]	67599009 | Pulmonary congestion |[1908] : 363698007 | Finding site |[1909] = 3341006 | Right lung structure |[1910]
< 404684003 | Clinical finding |[1911] : 116676008 | Associated morphology |[1912] = ((<< 56208002 | Ulcer |[1913] AND << 50960005 | Hemorrhage |[1914]) MINUS << 26036001 | Obstruction |[1915])	397825006 | Gastric ulcer |[1916] 235670001 | Gastric stomal obstruction |[1920]	64572001 | Disease |[1917] : 116676008 | Associated morphology |[1918] = 26036001 | Obstruction |[1919]
< 404684003 | Clinical finding |[1921] : 116676008 | Associated morphology |[1922] != << 26036001 | Obstruction |[1923]	81060008 | Intestinal obstruction |[1924] 56265001 | Heart disease |[1930]	64572001 | Disease |[1925] : 116676008 | Associated morphology |[1926] = 26036001 | Obstruction |[1927] , 363698007 | Finding site |[1928] = 422897007 | Vascular structure of stomach |[1929]

1905 http://snomed.info/id/19829001
1906 http://snomed.info/id/700043003
1907 http://snomed.info/id/67599009
1908 http://snomed.info/id/67599009
1909 http://snomed.info/id/363698007
1910 http://snomed.info/id/3341006
1911 http://snomed.info/id/404684003
1912 http://snomed.info/id/116676008
1913 http://snomed.info/id/56208002
1914 http://snomed.info/id/50960005
1915 http://snomed.info/id/26036001
1916 http://snomed.info/id/397825006
1917 http://snomed.info/id/64572001
1918 http://snomed.info/id/116676008
1919 http://snomed.info/id/26036001
1920 http://snomed.info/id/235670001
1921 http://snomed.info/id/404684003
1922 http://snomed.info/id/116676008
1923 http://snomed.info/id/26036001
1924 http://snomed.info/id/81060008
1925 http://snomed.info/id/64572001
1926 http://snomed.info/id/116676008
1927 http://snomed.info/id/26036001
1928 http://snomed.info/id/363698007
1929 http://snomed.info/id/422897007
1930 http://snomed.info/id/56265001

< 404684003 | Clinical finding |[1931] : [0..0] 116676008 | Associated morphology |[1932] = << 26036001 | Obstruction |[1933]	81060008 | Intestinal obstruction |[1934]	64572001 | Disease |[1935] : { 116676008 | Associated morphology |[1936] = 26036001 | Obstruction |[1937] , 363698007 | Finding site |[1938] = 422897007 | Vascular structure of stomach |[1939] } { 116676008 | Associated morphology |[1940] = 45771005 | Acute bleeding ulcer |[1941] , 363698007 | Finding site |[1942] = 422897007 | Vascular structure of stomach |[1943] }
	234059001 | Venous stenosis |[1944]	
< 404684003 | Clinical finding |[1945] : [0..0] 116676008 | Associated morphology |[1946] != << 26036001 | Obstruction |[1947]	196652006 | Acute duodenal ulcer |[1948]	64572001 | Disease |[1949] : { 116676008 | Associated morphology |[1950] = 26036001 | Obstruction |[1951] , 363698007 | Finding site |[1952] = 422897007 | Vascular structure of stomach |[1953] } { 116676008 | Associated morphology |[1954] = 45771005 | Acute bleeding ulcer |[1955] , 363698007 | Finding site |[1956] = 422897007 | Vascular structure of stomach |[1957] }

1931 http://snomed.info/id/404684003
1932 http://snomed.info/id/116676008
1933 http://snomed.info/id/26036001
1934 http://snomed.info/id/81060008
1935 http://snomed.info/id/64572001
1936 http://snomed.info/id/116676008
1937 http://snomed.info/id/26036001
1938 http://snomed.info/id/363698007
1939 http://snomed.info/id/422897007
1940 http://snomed.info/id/116676008
1941 http://snomed.info/id/45771005
1942 http://snomed.info/id/363698007
1943 http://snomed.info/id/422897007
1944 http://snomed.info/id/234059001
1945 http://snomed.info/id/404684003
1946 http://snomed.info/id/116676008
1947 http://snomed.info/id/26036001
1948 http://snomed.info/id/196652006
1949 http://snomed.info/id/64572001
1950 http://snomed.info/id/116676008
1951 http://snomed.info/id/26036001
1952 http://snomed.info/id/363698007
1953 http://snomed.info/id/422897007
1954 http://snomed.info/id/116676008
1955 http://snomed.info/id/45771005
1956 http://snomed.info/id/363698007
1957 http://snomed.info/id/422897007

	8377001 | Hernia, with obstruction|[1958]	
< 404684003 | Clinical finding|[1959] : [0..0] 116676008 | Associated morphology|[1960] != << 26036001 | Obstruction|[1961] AND [1..*] 116676008 | Associated morphology|[1962] = << 26036001 | Obstruction|[1963]	196652006 | Acute duodenal ulcer|[1964]	64572001 | Disease|[1965] : { 116676008 | Associated morphology|[1966] = 26036001 | Obstruction|[1967] , 363698007 | Finding site|[1968] = 422897007 | Vascular structure of stomach|[1969] } { 116676008 | Associated morphology|[1970] = 45771005 | Acute bleeding ulcer|[1971] , 363698007 | Finding site|[1972] = 422897007 | vascular structure of stomach|[1973] }
	8377001 | Hernia, with obstruction|[1974]	
	56265001 | Heart disease|[1980]	64572001 | Disease|[1975] : { 116676008 | Associated morphology|[1976] = 45771005 | Acute bleeding ulcer|[1977] , 363698007 | Finding site|[1978] = 422897007 | Vascular structure of stomach|[1979] }

1958 http://snomed.info/id/8377001
1959 http://snomed.info/id/404684003
1960 http://snomed.info/id/116676008
1961 http://snomed.info/id/26036001
1962 http://snomed.info/id/116676008
1963 http://snomed.info/id/26036001
1964 http://snomed.info/id/196652006
1965 http://snomed.info/id/64572001
1966 http://snomed.info/id/116676008
1967 http://snomed.info/id/26036001
1968 http://snomed.info/id/363698007
1969 http://snomed.info/id/422897007
1970 http://snomed.info/id/116676008
1971 http://snomed.info/id/45771005
1972 http://snomed.info/id/363698007
1973 http://snomed.info/id/422897007
1974 http://snomed.info/id/8377001
1975 http://snomed.info/id/64572001
1976 http://snomed.info/id/116676008
1977 http://snomed.info/id/45771005
1978 http://snomed.info/id/363698007
1979 http://snomed.info/id/422897007
1980 http://snomed.info/id/56265001

9.6 B.6 Nested Expression Constraints - Invalid Expressions

Expression Constraint	Valid Expression [1](see page 0)	
	Precoordinated	**Postcoordinated**
<< (^ 700043003 | Example problem list concepts reference set|[1981])	6143009 | Diabetic education|[1982] 75367002 | Blood pressure|[1986]	71388002 | Procedure|[1983] : 405813007 | Procedure site - Direct|[1984] = 80891009 | Heart structure|[1985]
^ (< 450973005 | GP/FP health issue reference set|[1987])	80146002 | Appendectomy|[1988] 305342007 | Admission to ward|[1989]	-
(< 404684003 |Clinical finding|[1990] : 363698007 |Finding site|[1991] = << 39057004 |Pulmonary valve structure|[1992]) AND ^ 700043003 |Example problem list concepts reference set|[1993]	125605004 | Fracture of bone|[1994] 195967001 | Asthma|[1998]	404684003 | Clinical finding|[1995] : 363698007 | Finding site|[1996] = 17401000 | Cardiac valve structure|[1997]

1981 http://snomed.info/id/700043003
1982 http://snomed.info/id/6143009
1983 http://snomed.info/id/71388002
1984 http://snomed.info/id/405813007
1985 http://snomed.info/id/80891009
1986 http://snomed.info/id/75367002
1987 http://snomed.info/id/450973005
1988 http://snomed.info/id/80146002
1989 http://snomed.info/id/305342007
1990 http://snomed.info/id/404684003
1991 http://snomed.info/id/363698007
1992 http://snomed.info/id/39057004
1993 http://snomed.info/id/700043003
1994 http://snomed.info/id/125605004
1995 http://snomed.info/id/404684003
1996 http://snomed.info/id/363698007
1997 http://snomed.info/id/17401000
1998 http://snomed.info/id/195967001

(< 404684003 |Clinical finding|[1999] : 363698007 |Finding site|[2000] = << 39057004 |Pulmonary valve structure|[2001]) AND (< 64572001 |Disease|[2002] : 116676008 |Associated morphology|[2003] = << 415582006 |Stenosis|[2004])	301104003 | Pulmonary valve finding|[2005]	404684003 | Clinical finding|[2006] : 363698007 | Finding site|[2007] = 39057004 | Pulmonary valve structure|[2008]
	76107001 | Spinal stenosis|[2009]	64572001 | Disease|[2010] : 116676008 | Associated morphology|[2011] = 415582006 | Stenosis|[2012]
(<< 17636008 |Specimen collection|[2013] : 424226004 |Using device|[2014] = << 19923001 |Catheter|[2015]) . 363701004 |Direct substance|[2016]	57617002 | Urine specimen collection|[2017]	17636008 | Specimen collection|[2018] : 424226004 | Using device|[2019] = 19923001 | Catheter|[2020]
	122575003 | Urine specimen|[2021]	
(<< 404684003 |Clinical finding (finding)|[2022] OR << 272379006 | Event (event)|[2023]): 255234002 |After|[2024] = << 71388002 |Procedure (procedure)|[2025]	293690005 | Peppermint oil allergy|[2026]	404684003 | Clinical finding|[2027] : 255234002 | After|[2028] = 417163006 | Injury|[2029]

1999 http://snomed.info/id/404684003
2000 http://snomed.info/id/363698007
2001 http://snomed.info/id/39057004
2002 http://snomed.info/id/64572001
2003 http://snomed.info/id/116676008
2004 http://snomed.info/id/415582006
2005 http://snomed.info/id/301104003
2006 http://snomed.info/id/404684003
2007 http://snomed.info/id/363698007
2008 http://snomed.info/id/39057004
2009 http://snomed.info/id/76107001
2010 http://snomed.info/id/64572001
2011 http://snomed.info/id/116676008
2012 http://snomed.info/id/415582006
2013 http://snomed.info/id/17636008
2014 http://snomed.info/id/424226004
2015 http://snomed.info/id/19923001
2016 http://snomed.info/id/363701004
2017 http://snomed.info/id/57617002
2018 http://snomed.info/id/17636008
2019 http://snomed.info/id/424226004
2020 http://snomed.info/id/19923001
2021 http://snomed.info/id/122575003
2022 http://snomed.info/id/404684003
2023 http://snomed.info/id/272379006
2024 http://snomed.info/id/255234002
2025 http://snomed.info/id/71388002
2026 http://snomed.info/id/293690005
2027 http://snomed.info/id/404684003
2028 http://snomed.info/id/255234002
2029 http://snomed.info/id/417163006

	82510005 | Posttraumatic vertigo |[2030]	
<< 125605004 |Fracture of bone|[2031] : [0..0] ((<< 410662002 |Concept model attribute|[2032] MINUS 363698007 |Finding site|[2033]) MINUS 116676008 |Associated morphology|[2034]) = *	704333004 | Pathological fracture of hand due to osteoporosis |[2035] 722571004 | Linear fracture of skull due to birth trauma |[2039]	125605004 | Fracture of bone|[2036] : 42752001 | Due to |[2037] = 417163006 | Injury |[2038]
< 404684003 |Clinical finding|[2040] : 47429007 |Associated with|[2041] = (< 404684003 |Clinical finding|[2042] : 116676008 |Associated morphology|[2043] = << 55641003 |Infarct|[2044])	3238004 | Pericarditis |[2045]	64572001 | Disease|[2046] : 47429007 | Associated with|[2047] = (404684003 | Clinical finding|[2048] : 363698007 | Finding site|[2049] = 277712000 | Cardiac internal structure|[2050])

1 (see page 184) Where necessary, these examples make some assumptions about the membership of the example reference sets.

2030 http://snomed.info/id/82510005
2031 http://snomed.info/id/125605004
2032 http://snomed.info/id/410662002
2033 http://snomed.info/id/363698007
2034 http://snomed.info/id/116676008
2035 http://snomed.info/id/704333004
2036 http://snomed.info/id/125605004
2037 http://snomed.info/id/42752001
2038 http://snomed.info/id/417163006
2039 http://snomed.info/id/722571004
2040 http://snomed.info/id/404684003
2041 http://snomed.info/id/47429007
2042 http://snomed.info/id/404684003
2043 http://snomed.info/id/116676008
2044 http://snomed.info/id/55641003
2045 http://snomed.info/id/3238004
2046 http://snomed.info/id/64572001
2047 http://snomed.info/id/47429007
2048 http://snomed.info/id/404684003
2049 http://snomed.info/id/363698007
2050 http://snomed.info/id/277712000

10 Appendix C - Dialect Aliases

This appendix provides a list of example aliases that may be used to specify a particular dialect in an ECL filter constraint. Please refer to the 'Dialect Filter' section on 6.8 Description Filters(see page 102) for more information on how these dialect aliases are used in ECL.

All dialect aliases should follow the ABNF syntax shown below. This format is designed to be compatible with BCP-47 (Internet Best Current Practice Specification)[2051], which ensures alignment with a range of other specifications - e.g. HTTP "accept-language" headers, and the HL7 FHIR "designation.language" data element.

dialectAlias = (language ["-" script] ["-" region] ["-" privateuse]) / privateuse

language = alpha alpha ; ISO 639-1 code (List of codes[2052])

script = alpha alpha alpha alpha ; ISO 15924 code (List of codes[2053])

region = alpha alpha ; ISO 3166-1 code (List of codes[2054])

privateuse = "x" 1*("-" 1*8(alpha / digit)) ; the clinical scope or context of use

The table below lists the valid 'dialect' filter values and their equivalent 'dialectId' filter values, for a selection of known language reference sets. To request the addition of a new dialect alias, please use the 'Feedback' button on the bottom of this page.

dialect	dialectId
da-dk	554461000005103 |Danish language reference set|
en-au	32570271000036106 |Australian English language reference set|
en-ca	19491000087109 |Canada English language reference set|
en-gb	900000000000508004 |Great Britain English language reference set|
en-ie	21000220103 |Irish language reference set|
en-nz	271000210107 |New Zealand English language reference set|
en-nz-x-pat	281000210109 |New Zealand English patient friendly terms language reference set|
en-us	900000000000509007 |United States of America English language reference set|
en-x-gmdn	608771002 |GMDN language reference set|

2051 https://www.rfc-editor.org/rfc/rfc5646.html
2052 https://en.wikipedia.org/wiki/List_of_ISO_639-1_codes
2053 https://en.wikipedia.org/wiki/ISO_15924#List_of_codes
2054 https://en.wikipedia.org/wiki/ISO_3166-1#Current_codes

dialect	dialectId
en-x-nhs-clinical	999001261000000100 |National Health Service realm language reference set (clinical part)|
en-x-nhs-dmd	999000671000001103 |National Health Service dictionary of medicines and devices realm language reference set|
en-x-nhs-pharmacy	999000691000001104 |National Health Service realm language reference set (pharmacy part)|
en-gb-x-drug	999000681000001101 |United Kingdom Drug Extension Great Britain English language reference set|
en-gb-x-ext	999001251000000103 |United Kingdom Extension Great Britain English language reference set|
es	450828004 |Conjunto de referencias de lenguaje castellano para América Latina|
es-uy	5641000179103 |Conjunto de referencias de lenguaje castellano para Uruguay|
et-ee	71000181105 |Estonian language reference set|
de	722130004 |German language reference set|
fr	722131000 |French language reference set|
fr-be	21000172104 |Belgian French language reference set|
fr-ca	20581000087109 |Canada French language reference set|
ja	722129009 | Japanese language reference set|
mi	291000210106 |Maori language reference set|
nl-be	31000172101 |Belgian Dutch language reference set|
nl-nl	31000146106 |Netherlands Dutch language reference set|
nb-no	61000202103 |Norwegian Bokmål language reference set|

dialect	dialectId
nn-no	91000202106 |Norwegian Nynorsk language reference set|
sv-se	46011000052107 |Swedish language reference set|
zh	722128001 |Chinese language reference set|

11 Appendix D - ECL Quick Reference

This section provides a quick reference to the key syntax features of the Expression Constraint Language.

11.1 Syntax Overview

The following table summarises the key symbols used in the Expression Constraint Language's brief syntax, with the ECL version in which each symbol was introduced. For more information about the version history of ECL, please refer to the 'History' section in 1. Introduction(see page 8).

Symbol	Name	Version	Notes
|	Pipe	1.0	Used on either side of a concept's term for human readability
*	Any	1.0	Retrieves all concepts in the substrate
^	Member of	1.0	Retrieves the referencedComponentId of all (active) members of a reference set (or set of reference sets)
^ [A, B]	Member of (with field selection)	2.0	Retrieves the values of fields A and B of all (active) members of a reference set (or set of reference sets) that match the included Member filters (if applicable)
<	Descendant of	1.0	Retrieves all descendants (subtypes) of the specified concept *excluding* the concept itself
<<	Descendant or self of	1.0	Retrieves all descendants (subtypes) of the specified concept *including* the concept itself
<!	Child of	1.1	Retrieves all children (immediate subtypes) of the specified concept *excluding* the concept itself
<<!	Child or self of	1.4	Retrieves all children (immediate subtypes) of the specified concept *including* the concept itself
>	Ancestor of	1.0	Retrieves all ancestors (supertypes) of the specified concept *excluding* the concept itself

Symbol	Name	Version	Notes
>>	Ancestor or self of	1.0	Retrieves all ancestors (supertypes) of the specified concept *including* the concept itself
>!	Parent of	1.1	Retrieves all parents (immediate supertypes) of the specified concept *excluding* the concept itself
>>!	Parent or self of	1.4	Retrieves all parents (immediate supertypes) of the specified concept *including* the concept itself
AND	Conjunction	1.0	Retrieves the intersection of the results of each sub-expressions
OR	Disjunction	1.0	Retrieves the union of the results of each sub-expressions
MINUS	Exclusion	1.0	Retrieves the members of the first expression and excludes the members returned by the second expression
:	Refinement	1.0	Used before one or more attribute-value pairs to refine the set of concepts retrieved
[1..3]	Cardinality	1.0	Used to indicate the minimum and maximum number of occurrences of attributes or relationship groups
R	Reverse flag	1.0	Retrieves the set of attribute values (i.e. destination concepts) of a specified attribute for a specified set of concepts
.	Dot notation	1.2	Retrieves the set of attribute values (i.e. destination concepts) of a specified attribute for a specified set of concepts
/* */	Comment	1.1	Allows comments to be added within the text of an expression constraint

Symbol	Name	Version	Notes
{{ }}	Description filter	1.5	Filters the result set, by matching only on concepts which have a description with a matching term, language, type, dialect and/or acceptability
{{ D }}	Description filter	1.6	Filters the result set, by matching only on concepts which have a description with a matching term, language, type, dialect and/or acceptability
{{ C }}	Concept filter	1.6	Filters the result set based on the definition status, module, effectiveTime and active status of each concept
{{ M }}	Member filter	2.0	Filters the result set based on the value of specific fields in a reference set.
{{+ HISTORY}}	History supplement	2.0	Supplements the results with relevant inactive concepts

11.2 Examples

The following table provides some examples of each of the key syntax features of the Expression Constraint Language.

Notes:

1. In the table above:
   - '**id**' represents a single SNOMED CT concept identifier,
   - '**term**' represents a term associated with the concept identified by '**id**',
   - '**x**', '**y**' and '**v**' each represent either a single concept or a set of concepts defined using an expression constraint,
   - '**z**' represents either a single concept or a set of concepts that are a subtype of 900000000000455006 | Reference set[2055] ,
   - '**a**' and '**b**' each represent either a single concept or a set of concepts that are a subtype of 410662002 | Concept model attribute[2056] , and
   - '**min**' and '**max**' are two numeric values that represent the minimum and maximum cardinality allowed.
2. The default substrate, to which expression constraints are applied, includes all concepts, active relationships, active descriptions and active reference set members of a chosen SNOMED CT versioned edition.

Simple expression constraints

2055 http://snomed.info/id/900000000000455006
2056 http://snomed.info/id/410662002

Syntax	Evaluation Notes	Example	Example Expansion Concepts
id | term |	Only the concept with the identifier 'id'	128477000 |Abscess|[2057]	128477000 |Abscess|[2058]
*	All concepts in the given substrate	*	*Any concept in the given substrate*
^ z	The set of concepts which are members of the reference sets in z	^ 723264001 |Lateralizable body structure reference set|[2059]	181216001 |Entire lung|[2060] 65784005 |Structure of fundus of eye|[2061]
< x	The set of all descendants (both direct and indirect) of x	< 73211009 |Diabetes mellitus|[2062] < 73211009 |Diabetes mellitus)|	46635009 |Diabetes mellitus type 1|[2063] 8801005 |Secondary diabetes mellitus|[2064]
<< x	The set of all descendants (both direct and indirect) of x, plus x itself	<< 73211009 |Diabetes mellitus|[2065]	73211009 |Diabetes mellitus|[2066] 46635009 |Diabetes mellitus type 1|[2067] 8801005 |Secondary diabetes mellitus|[2068]

2057 http://snomed.info/id/128477000
2058 http://snomed.info/id/128477000
2059 http://snomed.info/id/723264001
2060 http://snomed.info/id/181216001
2061 http://snomed.info/id/65784005
2062 http://snomed.info/id/73211009
2063 http://snomed.info/id/46635009
2064 http://snomed.info/id/8801005
2065 http://snomed.info/id/73211009
2066 http://snomed.info/id/73211009
2067 http://snomed.info/id/46635009
2068 http://snomed.info/id/8801005

<! x	The set of all immediate children of x	<! 362965005 |Disorder of body system|[2069]	49601007 |Disorder of cardiovascular system|[2070] 362969004 |Disorder of endocrine system|[2071]
<<! x	The set of all immediate children of x, plus x itself	<<! 362965005 |Disorder of body system|[2072]	362965005 |Disorder of body system|[2073] 49601007 |Disorder of cardiovascular system|[2074] 362969004 |Disorder of endocrine system|[2075]
> x	The set of all ancestors (both direct and indirect) of x	> 279420009 |Hematoma of skin|[2076]	106076001 |Skin finding|[2077] 297968009 |Bleeding skin|[2078]
>> x	The set of all ancestors (both direct and indirect) of x, plus x itself	>> 279420009 |Hematoma of skin|[2079]	106076001 |Skin finding|[2080] 297968009 |Bleeding skin|[2081] 279420009 |Hematoma of skin|[2082]
>! x	The set of all immediate parents of x	>! 22298006 |Myocardial infarction|[2083]	57809008 |Myocardial disease|[2084]

2069 http://snomed.info/id/362965005
2070 http://snomed.info/id/49601007
2071 http://snomed.info/id/362969004
2072 http://snomed.info/id/362965005
2073 http://snomed.info/id/362965005
2074 http://snomed.info/id/49601007
2075 http://snomed.info/id/362969004
2076 http://snomed.info/id/279420009
2077 http://snomed.info/id/106076001
2078 http://snomed.info/id/297968009
2079 http://snomed.info/id/279420009
2080 http://snomed.info/id/106076001
2081 http://snomed.info/id/297968009
2082 http://snomed.info/id/279420009
2083 http://snomed.info/id/22298006
2084 http://snomed.info/id/57809008

			251061000 |Myocardial necrosis|[2085]
>>! x	The set of all immediate parents of x, plus x itself	>>! 22298006 |Myocardial infarction|[2086]	22298006 |Myocardial infarction|[2087] 57809008 |Myocardial disease|[2088] 251061000 |Myocardial necrosis|[2089]
Conjunction, Disjunction and Exclusion			
Syntax	**Evaluation Notes**	**Example**	**Example Expansion Concepts**
x **AND** y	The set of concepts that are both in x and in y (i.e. the intersection of x and y)	< 19829001 |Disorder of lung|[2090] AND < 87628006 |Bacterial infectious disease|[2091]	430395005 |Pneumonia caused by Gram negative bacteria|[2092] 154283005 |Pulmonary tuberculosis|[2093]
x **OR** y	The set of concepts that are either in x or in y (i.e. the union of x and y)	< 73452002 |Abscess of lung|[2094] OR < 275504005 |Cyst of lung|[2095]	446543007 |Tuberculous abscess of lung|[2096] 87119009 |Congenital cystic lung|[2097]

2085 http://snomed.info/id/251061000
2086 http://snomed.info/id/22298006
2087 http://snomed.info/id/22298006
2088 http://snomed.info/id/57809008
2089 http://snomed.info/id/251061000
2090 http://snomed.info/id/19829001
2091 http://snomed.info/id/87628006
2092 http://snomed.info/id/430395005
2093 http://snomed.info/id/154283005
2094 http://snomed.info/id/73452002
2095 http://snomed.info/id/275504005
2096 http://snomed.info/id/446543007
2097 http://snomed.info/id/87119009

x **MINUS** y	The set of concepts that are in x but are not in y (i.e. x excluding concepts in y)	< 29303009 |Electrocardiographic procedure|[2098] MINUS < 75444003 |Fetal electrocardiogram|[2099]	447114004 |12 lead electrocardiogram during exercise|[2100] 252417001 |24 Hour electrocardiogram|[2101]
Refinement			
Syntax	**Evaluation Notes**	**Example**	**Example Expansion Concepts**
x **:** a **=** y	The set of concepts in **x**, which have a necessary relationship with an attribute in **a** and a value in **y**	< 385494008 |Hematoma|[2102] : << 370135005 |Pathological process|[2103] = << 441862004 |Infectious process|[2104]	698573001 |Infected hematoma|[2105] 444109008 |Infection of wound hematoma|[2106]
x **:** a **=** y**,** b **=** v	The set of concepts in **x**, which have both a necessary relationship with an attribute in **a** and a value in **y**, and also have a necessary relationship (either the same one or a different one) with an attribute in **b** and a value in **v**	< 71388002 |Procedure|[2107] : << 363704007 |Procedure site|[2108] = << 69695003 |Stomach structure|[2109] , << 405815000 |Procedure device|[2110] = << 86174004 |Laparoscope|[2111]	708987006 |Laparoscopic total gastrectomy|[2112] 57922004 |Laparoscopic pyloromyotomy|[2113]

2098 http://snomed.info/id/29303009
2099 http://snomed.info/id/75444003
2100 http://snomed.info/id/447114004
2101 http://snomed.info/id/252417001
2102 http://snomed.info/id/385494008
2103 http://snomed.info/id/370135005
2104 http://snomed.info/id/441862004
2105 http://snomed.info/id/698573001
2106 http://snomed.info/id/444109008
2107 http://snomed.info/id/71388002
2108 http://snomed.info/id/363704007
2109 http://snomed.info/id/69695003
2110 http://snomed.info/id/405815000
2111 http://snomed.info/id/86174004
2112 http://snomed.info/id/708987006
2113 http://snomed.info/id/57922004

x **:** **{** a **=** y**,** b **=** v **}**	The set of concepts in **x**, which have a role group that contains both a necessary relationship with an attribute in **a** and a value in **y**, and also have a necessary relationship (either the same one or a different one) with an attribute in **b** and a value in **v**	< 71388002 |Procedure (procedure)|[2114] : { 405813007 |Procedure site - Direct|[2115] =<< 10200004 |Liver structure|[2116] , 260686004 |Method|[2117] =<< 129433002 |Inspection - action|[2118] }	773252007 |Diagnostic laparoscopy of liver|[2119] 20933000 |Endoscopy of liver|[2120]
Cardinality			
Syntax	**Evaluation Notes**	**Example**	**Example Expansion Concepts**
x **: [min .. max]** a **=** y	The set of concepts in **x**, which have between **min** and **max** necessary relationships with an attribute in **a** and a value in **y**	< 373873005 |Pharmaceutical / biologic product|[2121] : [3..*] 127489000 |Has active ingredient|[2122] =< 105590001 |Substance|[2123]	786732006 |Product containing only brompheniramine and codeine and phenylpropanolamine|[2124] 787979009 |Product containing cyanocobalamin and folic acid and pyridoxine|[2125]

2114 http://snomed.info/id/71388002
2115 http://snomed.info/id/405813007
2116 http://snomed.info/id/10200004
2117 http://snomed.info/id/260686004
2118 http://snomed.info/id/129433002
2119 http://snomed.info/id/773252007
2120 http://snomed.info/id/20933000
2121 http://snomed.info/id/373873005
2122 http://snomed.info/id/127489000
2123 http://snomed.info/id/105590001
2124 http://snomed.info/id/786732006
2125 http://snomed.info/id/787979009

x **: [min .. max]** **{** a **=** y **}**	The set of concepts in **x**, which have between **min** and **max** role groups that contain a necessary relationship with an attribute in **a** and a value in **y**	< 404684003 |Clinical finding|[2126] : [2..3]{ 363698007 |Finding site|[2127] = *, 116676008 |Associated morphology|[2128] = 72704001 |Fracture|[2129] }	271577005 |Fracture of shaft of tibia and fibula|[2130] 75857000 |Fracture of radius AND ulna|[2131]
Reversed Attributes			
Syntax	**Evaluation Notes**	**Example**	**Example Expansion Concepts**
y **: R** a **=** x	The set of concepts in y, which are the destination (ie attribute value) of a necessary relationship on a source concept in **x** with an attribute in **a**	< 91723000 |Anatomical structure|[2132] : R 363698007 |Finding site|[2133] =< 445945000 |Infectious disease associated with acquired immune deficiency syndrome|[2134]	280369009 |Brain tissue structure|[2135] 39607008 |Lung structure|[2136] 395939008 |Clavulanic acid (substance)|
x **.** a	The set of attribute values (ie destination concepts) of all necessary relationships on a source concept in **x** with an attribute in **a**	< 27658006 |Product containing amoxicillin|[2137] . 127489000 |Has active ingredient|[2138]	372687004 |Amoxicillin|[2139] 395939008 |Clavulanic acid|[2140]

2126 http://snomed.info/id/404684003
2127 http://snomed.info/id/363698007
2128 http://snomed.info/id/116676008
2129 http://snomed.info/id/72704001
2130 http://snomed.info/id/271577005
2131 http://snomed.info/id/75857000
2132 http://snomed.info/id/91723000
2133 http://snomed.info/id/363698007
2134 http://snomed.info/id/445945000
2135 http://snomed.info/id/280369009
2136 http://snomed.info/id/39607008
2137 http://snomed.info/id/27658006
2138 http://snomed.info/id/127489000
2139 http://snomed.info/id/372687004
2140 http://snomed.info/id/395939008

12 Appendix E - Reference Set Fields

In the SNOMED CT Release File Specification (http://snomed.org/rfs), SNOMED International specifies a set of reference set types[2141] with their own specific properties (e.g. an attribute value type reference set). Each reference set that is developed to conform to a specified type is defined as a subtype of the associated reference set type concept (e.g. 900000000000480006 | Attribute value type reference set|[2142]). All reference sets of a given type are populated with members using the same data structure - with the same set of field names in the same order. SNOMED International uses these reference set type data structures (as defined in the Release File Specification[2143]) as the release file format for all reference sets of that type.

All reference set type[2144] concepts are a subtype of 900000000000455006 | Reference set|[2145] , and have an associated set of reference set descriptors in the | Reference set descriptor reference set|[2146] . Some reference set type concepts are organised under one or more reference set groups (e.g. 723564002 | MRCM reference set|[2147]), which represent a group of reference set types (often with different data structures).

In the Expression Constraint Language (v2.0+) reference set field names are used to indicate which field values to return, and to filter reference set members based on specific field criteria. The first (non-metadata) field in every reference set (in order '0') must always be 'referencedComponentId'. For reference sets, which are a subtype of an international reference set type, the additional field names defined in the SNOMED CT Release File Specification[2148] must be used. In all other cases, the additional field names may use any latin-script alphabetic character (a-z or A-Z) defined by the owner of the corresponding reference set type concept. Owners of a reference set type are encouraged to explicitly document these field names, keep them unchanged and publish a machine readable representation of these (following the format used below). In the absence of this, the column name from the corresponding RF2 file (with all whitespace removed) will be used.

The international reference set types and their corresponding list of field names to be used in ECL v2.0+ are shown in the table below (for information only). A normative, computable representation of this table is attached below the table. Please note that this file may be extended by implementers with national or local reference set types.

Content Reference Set Types	
Reference Set Type	**Field Names**
446609009 | Simple type reference set|[2149]	referencedComponentId
733619002 | Ordered component type reference set|[2150]	referencedComponentId,order
900000000000480006 | Attribute value type reference set|[2151]	referencedComponentId,valueId

2141 https://confluence.ihtsdotools.org/display/DOCRELFMT/5.2+Reference+Set+Types
2142 http://snomed.info/id/900000000000480006
2143 http://snomed.org/rfs
2144 https://confluence.ihtsdotools.org/display/DOCRELFMT/5.2+Reference+Set+Types
2145 http://snomed.info/id/900000000000455006
2146 http://snomed.info/id/900000000000456007
2147 http://snomed.info/id/723564002
2148 http://snomed.org/rfs
2149 http://snomed.info/id/446609009
2150 http://snomed.info/id/733619002
2151 http://snomed.info/id/900000000000480006

900000000000521006 | Association type reference set|[2152]	referencedComponentId,targetComponentId
733618005 | Ordered association type reference set|[2153]	referencedComponentId,targetComponentId,order
900000000000516008 | Annotation type reference set|[2154]	referencedComponentId,annotation
900000000000512005 | Query specification type reference set|[2155]	referencedComponentId,query
447258008 | Ordered type reference set|[2156]	referencedComponentId,order,linkedToId
762676003 | OWL expression type reference set|[2157]	referencedComponentId,owlExpression
1119417006 | Postcoordinated expression type reference set|[2158]	referencedComponentId,expression,substrate
Language Reference Set Types	
Reference Set Type	**Field Names**
900000000000506000 | Language type reference set|[2159]	referencedComponentId,acceptabilityId
Map Reference Set Types	
Reference Set Type	**Field Names**
900000000000496009 | Simple map from SNOMED CT type reference set|[2160]	referencedComponentId,mapTarget

2152 http://snomed.info/id/900000000000521006
2153 http://snomed.info/id/733618005
2154 http://snomed.info/id/900000000000516008
2155 http://snomed.info/id/900000000000512005
2156 http://snomed.info/id/447258008
2157 http://snomed.info/id/762676003
2158 http://snomed.info/id/1119417006
2159 http://snomed.info/id/900000000000506000
2160 http://snomed.info/id/900000000000496009

1187636009 | Simple map to SNOMED CT type reference set|[2161]	referencedComponentId,mapSource
447250001 | Complex map from SNOMED CT type reference set|[2162]	referencedComponentId,mapGroup,mapPriority,mapRule,mapAdvice,mapTarget,correlationId
609331003 | Extended map from SNOMED CT type reference set|[2163]	referencedComponentId,mapGroup,mapPriority,mapRule,mapAdvice,mapTarget,correlationId,mapCategoryId
705111002 | Map to SNOMED CT with correlation and origin type reference set|[2164]	referencedComponentId,mapSource,attributeId,correlationId,contentOriginId
705109006 | Code to expression type reference set type reference set|[2165]	referencedComponentId,mapSource,expression,definitionStatusId,correlationId,contentOriginId
1193542003 | Simple map with correlation from SNOMED CT type reference set|[2166]	referencedComponentId,mapTarget,correlationId
1193543008 | Simple map with correlation to SNOMED CT type reference set|[2167]	referencedComponentId,mapSource,correlationId
1193544002 | Simple map with correlation from SNOMED CT to SNOMED CT type reference set|[2168]	referencedComponentId,mapTarget,correlationId
Metadata Reference Set Types	
Reference Set Type	**Field Names**
900000000000456007 | Reference set descriptor type reference set|[2169]	referencedComponentId,attributeDescription,attributeType,attributeOrder

2161 http://snomed.info/id/1187636009
2162 http://snomed.info/id/447250001
2163 http://snomed.info/id/609331003
2164 http://snomed.info/id/705111002
2165 http://snomed.info/id/705109006
2166 http://snomed.info/id/1193542003
2167 http://snomed.info/id/1193543008
2168 http://snomed.info/id/1193544002
2169 http://snomed.info/id/900000000000456007

900000000000534007 | Module dependency type reference set[2170]	referencedComponentId,sourceEffectiveTime,targetEffectiveTime
900000000000538005 | Description format type reference set[2171]	referencedComponentId,descriptionFormat,descriptionLength
723589008 | MRCM domain type reference set[2172]	referencedComponentId,domainConstraint,parentDomain,proximalPrimitiveConstraint,proximalPrimitiveRefinement,domainTemplateForPrecoordination,domainTemplateForPostcoordination,guideURL
723604009 | MRCM attribute domain type reference set[2173]	referencedComponentId,domainId,grouped,attributeCardinality,attributeInGroupCardinality,ruleStrengthId,contentTypeId
723592007 | MRCM attribute range type reference set[2174]	referencedComponentId,rangeConstraint,attributeRule,ruleStrengthId,contentTypeId
723563008 | MRCM module scope type reference set[2175]	referencedComponentId,mrcmRuleRefsetId

2170 http://snomed.info/id/900000000000534007
2171 http://snomed.info/id/900000000000538005
2172 http://snomed.info/id/723589008
2173 http://snomed.info/id/723604009
2174 http://snomed.info/id/723592007
2175 http://snomed.info/id/723563008

13 References

1. *HL7 Version 3 Implementation Guide: TermInfo – Using SNOMED CT in CDA R2 Models, Release 1*, HL7 5th DSTU Ballot, January 2014, http://wiki.hl7.org/index.php?title=File:V3_IG_SNOMED_R1_D5_2014JAN.docx
2. *SNOMED International APG Syntax Parsers*, IHTSDO, 2016, http://apg.ihtsdotools.org/
3. *NHS Logical Record Architecture for Health and Social Care*, UK Terminology Centre, November 2013, https://isd.hscic.gov.uk/trud3/user/guest/group/0/pack/12
4. *SNOMED CT Compositional Grammar – Specification and Guide*, IHTSDO, July 2015, http://snomed.org/compgrammar
5. SNOMED International Glossary, Draft version July 2014, http://snomed.org/gl
6. SNOMED CT Languages Github Repository, https://github.com/IHTSDO/SNOMEDCT-Languages
7. *SNOMED CT Starter Guide*, IHTSDO, February 2014, http://snomed.org/sg
8. *SNOMED CT Technical Implementation Guide*, IHTSDO, July 2014, http://snomed.org/tig

14 Previous Versions

This page provides access to downloadable PDF copies of the current and previous versions of this document.
The most recent version should also be available via a link on the front page of the document.

15 Recent Updates

15.1 The most recently updated pages in this document are listed below

- 1. Introduction(see page 8)
  2022-Sep-01 • updated by Linda Bird[2176] • view change[2177]
- 6.11 History Supplements(see page 121)
  2022-Aug-31 • updated by Anne Randorff Højen[2178] • view change[2179]
- Expression Constraint Language - Specification and Guide(see page 7)
  2022-Aug-24 • updated by Linda Bird[2180] • view change[2181]
- Appendix C - Dialect Aliases(see page 187)
  2022-Aug-11 • updated by Linda Bird[2182] • view change[2183]
- 6.8 Description Filters(see page 102)
  2022-Aug-11 • updated by Linda Bird[2184] • view change[2185]
- 6.10 Member Filters(see page 118)
  2022-Jun-27 • updated by Linda Bird[2186] • view change[2187]
- 5.3 Informative Comments(see page 29)
  2022-Jun-27 • updated by Linda Bird[2188] • view change[2189]
- 5.2 Long Syntax (Informative)(see page 25)
  2022-Jun-27 • updated by Linda Bird[2190] • view change[2191]
- 5.1 Brief Syntax (Normative)(see page 21)
  2022-Jun-27 • updated by Linda Bird[2192] • view change[2193]
- 4.1 Details(see page 19)
  2022-Jun-06 • updated by Linda Bird[2194] • view change[2195]
- 4. Logical Model(see page 18)
  2022-Jun-06 • updated by Linda Bird[2196] • view change[2197]
- 3.2 Expression Constraint and Query Requirements(see page 14)

2176 https://confluence.ihtsdotools.org/display/~lbird
2177 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739382&selectedPageVersions=16&selectedPageVersions=17
2178 https://confluence.ihtsdotools.org/display/~ahojen
2179 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=142144136&selectedPageVersions=1&selectedPageVersions=2
2180 https://confluence.ihtsdotools.org/display/~lbird
2181 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=26840518&selectedPageVersions=49&selectedPageVersions=50
2182 https://confluence.ihtsdotools.org/display/~lbird
2183 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=115872393&selectedPageVersions=2&selectedPageVersions=3
2184 https://confluence.ihtsdotools.org/display/~lbird
2185 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=115872392&selectedPageVersions=4&selectedPageVersions=5
2186 https://confluence.ihtsdotools.org/display/~lbird
2187 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=142144135&selectedPageVersions=3&selectedPageVersions=4
2188 https://confluence.ihtsdotools.org/display/~lbird
2189 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739407&selectedPageVersions=18&selectedPageVersions=19
2190 https://confluence.ihtsdotools.org/display/~lbird
2191 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739406&selectedPageVersions=14&selectedPageVersions=15
2192 https://confluence.ihtsdotools.org/display/~lbird
2193 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739405&selectedPageVersions=16&selectedPageVersions=17
2194 https://confluence.ihtsdotools.org/display/~lbird
2195 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739402&selectedPageVersions=12&selectedPageVersions=13
2196 https://confluence.ihtsdotools.org/display/~lbird
2197 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739399&selectedPageVersions=10&selectedPageVersions=11

2022-Jun-06 • updated by Linda Bird[2198] • view change[2199]

- 6.9 Concept Filters(see page 113)
  2022-Apr-04 • updated by Linda Bird[2200] • view change[2201]
- Appendix D - ECL Quick Reference(see page 190)
  2022-Apr-04 • updated by Linda Bird[2202] • view change[2203]
- Appendix E - Reference Set Fields(see page 199)
  2022-Apr-01 • created by Linda Bird[2204]
- 6.1 Simple Expression Constraints(see page 61)
  2022-Mar-30 • updated by Linda Bird[2205] • view change[2206]
- Previous Versions(see page 204)
  2022-Feb-24 • updated by Linda Bird[2207] • view change[2208]
- 6.11 History Supplements(see page 121)
  2022-Feb-24 • created by Linda Bird[2209]
- 5.4 Order of Operation(see page 53)
  2022-Feb-21 • updated by Linda Bird[2210] • view change[2211]
- 2. Use Cases(see page 12)
  2021-Nov-28 • updated by Linda Bird[2212] • view change[2213]

2198 https://confluence.ihtsdotools.org/display/~lbird
2199 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739397&selectedPageVersions=12&selectedPageVersions=13
2200 https://confluence.ihtsdotools.org/display/~lbird
2201 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=134520492&selectedPageVersions=2&selectedPageVersions=3
2202 https://confluence.ihtsdotools.org/display/~lbird
2203 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=115883413&selectedPageVersions=4&selectedPageVersions=5
2204 https://confluence.ihtsdotools.org/display/~lbird
2205 https://confluence.ihtsdotools.org/display/~lbird
2206 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739409&selectedPageVersions=12&selectedPageVersions=13
2207 https://confluence.ihtsdotools.org/display/~lbird
2208 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=33493263&selectedPageVersions=20&selectedPageVersions=21
2209 https://confluence.ihtsdotools.org/display/~lbird
2210 https://confluence.ihtsdotools.org/display/~lbird
2211 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739415&selectedPageVersions=7&selectedPageVersions=8
2212 https://confluence.ihtsdotools.org/display/~lbird
2213 https://confluence.ihtsdotools.org/pages/diffpagesbyversion.action?pageId=28739390&selectedPageVersions=3&selectedPageVersions=4