**Using SNOMED CT with HL7 FHIR Resources**

***A Proposed Approach to***

***Model Meaning Binding***

***and Value Set Review***

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# INTRODUCTION

## Background

HL7 FHIR® (Fast Healthcare Interoperability Resources) is a next generation standards framework created by HL7, which builds solutions from a set of modular components called “Resources”. These resources can easily be assembled into working systems that solve real world clinical and administrative problems. FHIR is suitable for use in a wide variety of contexts – mobile phone apps, cloud communications, EHR-based data sharing and server communication in large healthcare providers [<http://www.hl7.org/implement/standards/fhir/summary.html>].

SNOMED CT is the most comprehensive clinical health terminology product in the world, owned and distributed by the International Health Terminology Standards Development Organisation (IHTSDO). SNOMED CT has been developed collaboratively to ensure it meets the diverse needs and expectations of the worldwide medical profession, and is now accepted as a common global language for health terms. Patients and healthcare professionals benefit from improved health records, clinical decision and analysis, leading to higher quality, consistency and safety in healthcare delivery [<http://www.ihtsdo.org/snomed-ct/what-is-snomed-ct>].

The IHTSDO and the HL7 International Terminology Authority (HTA) have agreed to work together to ensure the quality and appropriateness of the use of SNOMED CT in value sets and bindings specified for use in international FHIR resources. The scope of IHTSDO engagement in this work is limited to the provision of expert input to FHIR, in collaboration with the HL7 International Terminology Authority (HTA) in line with the cooperation agreement between IHTSDO and HL7 International. The intention is that the HTA takes responsibility for the resulting international value set and binding work, with advice being provided by IHTSDO. Furthermore, the HTA is encouraged to extend lessons learnt from this activity to the creation of other FHIR value sets and to the consistent creation and maintenance of other HL7 values sets in which SNOMED CT is used. The focus of the work and IHTSDO collaborative activity is on value sets being developed for international usage though it may be appropriate for HL7 to share and use resulting documentation/guidance and lessons learned with HL7 Affiliate developments.

## Purpose

The purpose of this document is to propose an approach to:

* Using SNOMED CT to represent the meaning of elements in FHIR resources, and
* Reviewing SNOMED CT value sets bound to FHIR resources, in a reproducible way.

## Scope

This document describes the proposed approaches, and tests them on the following FHIR resources:

* Condition
* AllergyIntolerance
* Procedure
* Goal
* Observation
* FamilyMemberHistory

## Audience

**The target audiences of this document include:**

* **IHTSDO internal staff**
* **HL7 Terminology Authority (HTA)**
* **HL7 FHIR teams**
* **HL7 TermInfo group**
* **Other members of the HL7 and SNOMED CT communities with a direct interest in implementing HL7 FHIR or using SNOMED CT in information models**

## Document Overview

This document presents a proposed approach for using SNOMED CT to represent the meaning of HL7 FHIR resources, and an approach for reviewing SNOMED CT value sets.

Chapter 2 provides a summary of the proposed approaches for SNOMED CT model meaning binding, and value set review.

Chapters 3 to 8 applies the proposed approaches to the ‘Condition’, ‘Allergy Intolerance’, ‘Procedure’, ‘Goal’, ‘Observation’ and ‘Family Member History’ resources respectively. Each of these chapters presents a table of SNOMED CT meaning bindings, a SNOMED CT template for mapping between semantically equivalent representations of coded data, and discusses the results of testing the value set review process on the given resource’s SNOMED CT value sets.

In Appendix A, a summary of the recommendations made throughout the report is presented.

## Document Status

This document is intended to be a working document, whose outcomes are realized in the live HL7 FHIR Resources. Because the purpose of this document is to propose an approach for binding FHIR resources to SNOMED CT and reviewing SNOMED CT value sets, the bindings presented in this document are illustrative only. It is recommended that these bindings be thoroughly reviewed by both IHTSDO and HL7 before publishing within an HL7 standard.

# APPROACHES

## Overview

This chapter summarizes the proposed approaches to:

1. Using SNOMED CT to represent the meaning of elements in FHIR resources; and
2. Reviewing SNOMED CT value sets bound to FHIR resources, in a reproducible way.

##  Meaning Binding

### Overview

In this section, we describe the proposed approach for using SNOMED CT to represent the meaning of elements in FHIR resources. The 3 main objectives of this approach[[1]](#footnote-1) are:

1. To support quality checking of models (e.g. detecting missing or inappropriate qualifiers)
2. To support the semantic checking of data instances (e.g. to detect inconsistencies)
3. To enable the composition and decomposition of data instances (e.g. to support querying)

To enable these objectives to be met, 3 types of SNOMED CT meaning bindings are proposed:

* *Attribute binding*

Coded data elements, whose meaning corresponds to an attribute in the SNOMED CT concept model, are bound to this attribute.

* *Concept domain binding*

Data elements are associated with a set of SNOMED CT concepts (defined using an Expression Constraint) that represent the intended semantics of the instances.

* *Template binding*

A resource (or data group) is associated with a SNOMED CT Expression Template, which enables the composition and decomposition of data instances using the SNOMED CT Concept Model.

In the following sections, we describe these three binding types in more detail.

### Attribute Binding

Attribute binding involves linking coded data elements to a corresponding attribute in the SNOMED CT concept model. For example, a ‘bodySite’ element on the ‘Condition’ resource may be linked to the ‘findingSite’ attribute from the SNOMED CT concept model.

These bindings help to support:

* Objective 1 (quality checking of models) by clarifying the intended meaning of the data element, and highlighting missing or inappropriate qualifiers (that do not align with the SNOMED CT concept model);
* Objective 3 (enabling composition and decomposition of data instances) by indicating the SNOMED CT concept model attribute whose value may be used to decompose a precoordinated concept into this data element.

### Concept Domain Binding

Concept domain binding involves linking an element (such as a resource or coded data element) to a set of SNOMED CT concepts that represent the intended semantics of the instances (whether or not SNOMED CT is used to encode that data element). It is proposed that this set of concepts is represented using a SNOMED CT expression constraint. For example, a ‘bodySite’ data element may be linked to the expression constraint “**<** 91723000 |Anatomical structure|”.

Please note that the ‘Concept domain binding’ may be a superset of the ‘value set binding’. For example, a ‘severity’ data element may be linked to the SNOMED CT concept domain “**<**272141005 |Severities|” (which contains 7 concepts when expanded against the 20160131 international edition of SNOMED CT), while the value set for this may include only 4 of these concepts – e.g. **{** 399166001 |Fatal|, 24484000 |Severe|, 6736007 |Moderate|, 255604002 |Mild| **}**.

These bindings help to support:

* Objective 1 (quality checking of models) by ensuring that (a) the intended semantics of the instances matches the valid range of the corresponding SNOMED CT attribute, and (b) the intended value set is appropriate for the intended semantics of the instances;
* Objective 2 (semantic checking of data instances) by helping to detect potential inconsistencies caused by overlap between the semantics incorporated in two concept domains.

### Template Binding

Template binding involves linking a resource (or data group) to one or more SNOMED CT expression templates that enable the composition and decomposition of data instances using the SNOMED CT concept model. For example, the Goal resource may be linked to the following SNOMED CT expression template:

413350009 **|**Finding with explicit context**| :** [[ ~ 1..1 @group1 ]]

**{** 246090004 **|**Associated finding**|** **=** [[ +id 1..1 @condition ]]**,**

408732007 **|**Subject relationship context**|** **=** [[+ 1..1 @subjectContext ]][[2]](#footnote-2)**,**

408731000 **|**Temporal context**|** **=** 410512000 **|**Current or specified time**|,**

408729009 **|**Finding context**|** **=** 410518001**|**Goal context**|}**

These SNOMED CT expression templates should be accompanied by a FHIR mapping that uses the values from a FHIR resource instance that have an associated concept model attribute binding, to populate the associated SNOMED CT expression template. The resulting SNOMED CT expression can then be used (in conjunction with the other values from the resource) when querying over a FHIR instance. By using a consistent representation for those values whose meaning overlaps with the SNOMED CT concept model, querying can be done in a consistent way, irrespective of whether this information is recorded in separate data elements or precoordinated into a single code.

These bindings help to support:

* Objective 3 (enabling composition and decomposition of data instances) by providing a pattern for consistently expressing the clinical meaning in a resource instance that may either be precoordinated in a single SNOMED CT code, or represented using codes in separate data elements. This consistent representation may be used to support querying by enabling equivalence and subsumption testing between different representations of the same semantics.

## Value Set Review

### Overview

In this section, we describe the proposed process for reviewing SNOMED CT value sets bound to FHIR resources. This process has been demonstrated by IHTSDO staff using the following resources:

* The IHTSDO SNOMED CT Browser with the 20160131 international edition of SNOMED CT
* The DSTU 2 version of the FHIR website [[www.hl7.org/implement/standards/fhir/]](file:///C%3A%5CUsers%5CFarzaneh%5CDownloads%5Cwww.hl7.org%5Cimplement%5Cstandards%5Cfhir%5C%5D)
* Experience with SNOMED CT and its hierarchies
* *Scope of IHTSDO/HL7 FHIR Terminology Binding Collaboration* document (Appendix D)

### Review Process

The proposed value set review process applied to this resource (as adapted from the principles defined in Appendix D of the ‘IHTSDO/HL7 FHIR Terminology Binding Collaboration’ agreement) includes the following steps:

1. Valid Display Text: Confirm that the ‘Display’ text is a valid synonym for the given code.

Note: It is recommended that one of the Preferred Terms is used as the display text. The international resource specifications may wish to use the US-English Preferred Terms as the default.

1. Active Concepts: All concepts in international value sets should be active in the current international edition of SNOMED CT.

Note: This is particularly relevant to extensionally defined value sets, but is also applicable to the example expansion of intensionally defined value sets.

1. Appropriate Concepts: All concepts used are consistent with the appropriate concept domain, model meaning and intended use.

Note: This will usually (but not always) mean that concepts are selected from the same hierarchy or sub-hierarchy, they have the same ‘semantic tag’, and that they are selected based on their meaning (rather than based purely on term matching).

1. No Content Gaps: There are no obvious gaps in the content of the value set.

Note: If gaps in SNOMED CT content are reported, are the requested concepts already in SNOMED CT (but were not found)? If gaps in SNOMED CT content are found, are these within scope of the international edition (based on known editorial rules)[[3]](#footnote-3), or should these be added in a FHIR/HL7 extension?

1. Clear Context and Meaning: The situation context is clear and represented consistently, either using explicit context precoordined in the concepts from the value set, or using the surrounding context represented by other data elements in the resource. In either case, this context should be consistent and computable. Additional information (such as severity or body site) that may be represented in more than one element of the resource should also be clear and consistent.

For example: A family history construct in FHIR might be populated by SNOMED CT disorder concepts, provided the family history context is clear and processable in the model meaning binding.

### Version Management

In additional to applying the proposed review process to SNOMED CT value sets, it is also recommended that a value set version management strategy is used which includes some or all of the following features:

* A process for inactivating members of an extensional value set that have either been inactivated in the SNOMED CT international release, or deemed unsuitable for inclusion in the reference set. This process should ensure that patient data recorded using a prior version of a FHIR resource (bound to a prior version of the value set) can be queried and interpreted, even when using concepts that have been inactivated from the current FHIR value set.
* A statement about the SNOMED CT edition and version from which extensionally defined value sets are created. Note, this would assist implementers in determining the currency of the value set.
* A statement of the SNOMED CT substrate against which intensional value set definitions are executed to generate the example expansions – for example “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example <http://snomed.info/sct/900000000000207008/version/20160131>.
* An approach to versioning intensional value set definitions, enabling a history of versions to be maintained.

# CONDITION

## Overview

*Condition* is a general clinical resource used to record detailed information about conditions, problems or diagnoses recognized by a clinician. There are many uses including: recording a diagnosis during an encounter, populating a problem list or a summary statement, such as a discharge summary. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/condition.html>.

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *Condition* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Condition resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT** **Concept Domain Binding** |
| **Condition** | - | **<** 243796009 **|**Situation with explicit context**|:**246090004 **|**Associated finding**|** **=****((<** 404684003 **|**Clinical finding**|** **MINUS****<<** 420134006 **|**Propensity to adverse reactions**| MINUS** **<<** 473010000 **|**Hypersensitivity condition**| MINUS** **<<** 79899007 **|**Drug interaction**| MINUS****<<** 69449002 **|**Drug action**| MINUS** **<<** 441742003 **|**Evaluation finding**| MINUS** **<<** 307824009 **|**Administrative status**| MINUS** **<<** 385356007 **|**Tumor stage finding**|) OR****<** 272379006 **|**Event**|)** |
| **clinicalStatus** | - | **<** 303105007 **|**Disease phases**|** |
| **verificationStatus** | 408729009 **|**Finding context**|** | **<** 410514004 **|**Finding context value**|** |
| **category** | - | **<** 404684003 **|**Clinical finding**|** |
| **severity** | 246112005 **|**Severity**|** | **<** 272141005 **|**Severities**|** |
| **code** | 246090004 **|**Associated finding**|** | **(<** 404684003 **|**Clinical finding**|** **MINUS****<<** 420134006 **|**Propensity to adverse reactions**| MINUS** **<<** 473010000 **|**Hypersensitivity condition**| MINUS** **<<** 79899007 **|**Drug interaction**| MINUS****<<** 69449002 **|**Drug action**| MINUS** **<<** 441742003 **|**Evaluation finding**| MINUS** **<<** 307824009 **|**Administrative status**| MINUS** **<<** 385356007 **|**Tumor stage finding**|)** **OR <** 413350009 **|**Finding with explicit context**|****OR <** 272379006 **|**Event**|** |
| **bodySite** | 363698007 **|**Finding site**|** | **<** 442083009  **|**Anatomical or acquired body structure**|** |
| **stage.summary** | - | **<** 254291000 **|**Staging and scales**|** |
| **evidence.code** | - | **<** 404684003 **|**Clinical finding**|** |

### Template Binding

The following table documents the SNOMED CT template binding for the Condition resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **Element** | **SNOMED CT Expression Template** |
| **Condition** | [[ + id @conditionWithContext ]] **:** [[ ~ @group1 ]]**{** 246090004 **|**Associated finding**|** **= (** [[ + id @condition ]] **:** 246112005 **|**Severity**|** **=** [[ + @severity ]]**,**[[ ~ 0..\* @group2 ]] **{** 363698007 **|**Finding site**|** **=** [[+ @bodySite ]]**,**255234002 **|**After**|** **=** [[+ @after ]]**,**116676008 **|**Associated morphology**|** **=** [[+ @morphology ]]**,**47429007 **|**Associated with**|** **=** [[+ @associatedWith ]]**,**246075003 **|**Causative agent**|** **=** [[+ @agent ]]**,**42752001 **|**Due to**|** **=** [[+ @dueTo ]]**,**363713009 **|**Has interpretation**|** **=** [[+ @hasInterpretation ]]**,**363714003 **|**Interprets**|** **=** [[+ @interprets ]]**,**370135005 **|**Pathological process**|** **=** [[+ @pathProcess ]]**,**246454002 **|**Occurrence**|** **=** [[+ @occurrence ]] **} )** 408732007 **|**Subject relationship context**|** **=** [[+ @subjectContext ]][[4]](#footnote-4)**,**408731000 **|**Temporal context**|** **=** [[ + @temporalContext ]]**,** 408729009 **|**Finding context**|** **=** [[ + @findingContext ]] **}** |

## Value Set Review

This section contains the results of applying the proposed value set review process described in Section 2.3 to the SNOMED CT value sets bound to the *Condition* resource.

### Condition-code Value Set

The condition-code value set (URI - <http://hl7.org/fhir/ValueSet/condition-code>) is an example value set for Condition, Problem and Diagnosis codes [<http://www.hl7.org/implement/standards/fhir/valueset-condition-code.html>]. This value set is defined intensionally and is bound to the element Condition.code. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.
* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 **|**Déjà vu (finding)**|**
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “<meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders.
* Not all concepts in the value set are appropriate for the intended use. The reasons for this include:
	+ Allergy intolerances, which are included in the SNOMED CT Clinical findings hierarchy, are explicitly stated as out of scope for the condition-code element.
	+ The SNOMED CT definition of a ‘Clinical Finding’ may be considered to be subtly different from the FHIR definition of the ‘Condition’ resource. SNOMED CT editorial guidelines define clinical findings as “observations, judgements or assessments about patients.” They go on to say “more precise and reproducible definitions of clinical findings, and the precise boundaries between findings and events, between findings and situations, and the distinction between finding and disorder, remain ongoing challenges at the margins.” In contrast, FHIR specification of the Condition resource says “This resource is not to be used to record information that might lead to the recording of a Condition. Such signs and symptoms are typically captured using the Observation resource; although in some cases a persistent symptom, e.g. fever, headache, may be captured as a condition before a definitive diagnosis can be discerned by a clinician.”

For example, the value set may include unexpected concepts such as:* Observation results and evaluation findings, e.g. 165507003 **|**White blood cell count normal (finding)**|**
* Drug actions, e.g. 95900002 **|**Drug action decreased (finding)**|**
* Other (non-diagnostic) findings which do not seem to fit with the Condition scope and usage statement, e.g. 409002 **|**Food allergy diet (finding)**|**. Note: This concept is currently in the example expansion.
* Signs and symptoms, e.g. 49727002 **|**Cough**|** – although the line between the Observation and Condition resource is a bit unclear.
* Administrative statuses, e.g. 308540004 **|**Inpatient stay (finding)**|**.
* Clinical stages, e.g. 46333007 **|**Clinical stage I A (finding)**|**.
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|****MINUS** **<<** 473010000 **|**Hypersensitivity condition**|****MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 441742003 **|**Evaluation finding**|****MINUS** **<<** 307824009 **|**Administrative status**|****MINUS** **<<** 385356007 **|**Tumor stage finding**|***Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.* |
| 4. No Content Gaps | * The ‘Use of Condition.code’ section of the specification states:

*The Condition.code may also include such concepts as "history of X" and "good health", where it is useful or appropriate to make such assertions. It can also be used to capture "risk of" and "fear of" in addition to physical conditions.* The concepts referred to here belong to the **|**Situation with explicit context**|** hierarchy in SNOMED CT, and are not included in the given value set.Note: It is not clear whether or not all required Situation concepts are included in the international edition of SNOMED CT. For those that are not, either postcoordination or addition to the international edition or a SNOMED CT extension may be options.* Some concepts from the Event hierarchy may be considered to be a Condition. For example: 242080009 **|** Hit by railway vehicle (event) **|**.
 | * The intensional value set definition should be extended to add missing concept hierarchies. For example (using the SNOMED CT Expression Constraint Language):

**(<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|****MINUS** **<<** 473010000 **|**Hypersensitivity condition**|****MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 441742003 **|**Evaluation finding**|****MINUS** **<<** 308540004 **|**Administrative status**|****MINUS** **<<** 385356007 **|**Tumor stage finding**|**)OR**(<** 413350009 **|**Finding with explicit context**|**:246090004 **|**Associated finding**|** = **(<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|****MINUS** **<<** 473010000 **|**Hypersensitivity condition**|****MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 441742003 **|**Evaluation finding**|****MINUS** **<<** 308540004 **|**Administrative status**|****MINUS** **<<** 385356007 **|**Tumor stage finding**|**),408732007 **|**Subject relationship context**|** = 410604004 **|**Subject of record**|**)OR**(<** 272379006 **|**Event**|**)*Note:* * *It is also necessary to ensure that any 408729009* ***|****Finding context****|*** *precoordinated in the Condition.code is consistent with appropriate values of clinicalStatus and verificationStatus.*
* *The above intensional value set definition provides a broad coverage of allowable values, which may be further specialized in specific implementations.*
 |
| 5. Clear Context and Meaning | * There is the potential for inconsistency or ambiguity when context is both precoordinated into a Condition.code (e.g. 161527007 **|**History of asthma**|**, 394887005 **|**Suspected heart failure**|**) and included in other elements of the resource, such as clinicalStatus and verificationStatus (e.g. clinicalStatus = ‘active’, verificationStatus = ‘confirmed’)
* Other inconsistencies and/or ambiguities may arise when Severity and/or Finding Site are both precoordinated in the Condition.code and populated in the Condition.severity and Condition.bodySite elements.
* Note: The word “intolerance” has been spelled ‘Intoelrance’ in the last line of the ‘Boundaries and Relationships’ specification [<http://www.hl7.org/implement/standards/fhir/condition.html>]:
 | * Rules should be developed to clarify the interpretation of valid combinations of SNOMED CT context with values of clinicalStatus and verificationStatus.
* The SNOMED CT templates (defined above in the Meaning binding) should be used as a canonical representation of the Condition with severity and finding site, to allow semantic equivalence to be tested between different instances of this resource (with different amounts of precoordination).
* The spelling of the word ‘Intolerance’ should be corrected in the ‘Boundaries and Relationships’ section when referring to the ‘AllergyIntolerance’ resource.
 |

### Condition-severity Value Set

The condition-severity value set (URI - <http://hl7.org/fhir/ValueSet/condition-severity>) is the preferred value set for Condition/Diagnosis severity grading [<http://www.hl7.org/implement/standards/fhir/valueset-condition-severity.html>]. This value set is defined extensionally and is bound to the element Condition.severity. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-severity value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * No display text is shown for the concepts in this value set.
 | * The US-English Preferred Term for each of the given codes should be added as the Display Text for this value set.
 |
| 2. Active Concepts | * The concepts in this value set are active in the current version of the SNOMED CT international edition.
* There is no indication of which SNOMED CT version these concepts were selected from.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. 272141005 **|**Severities**|**).
* The concepts in the value set are consistent with the range of the SNOMED CT concept model’s 246112005 **|**Severity**|** attribute.
* It may be difficult to ensure that the recorded severity is always appropriate for each given Condition.code. For example, it may be inappropriate to record a severity for some ‘normal’ states, such as pregnancy,

  | * None
 |
| 4. No Content Gaps | * Some additional concepts that may be needed (such as 371923003 **|**Mild to moderate**|**) are not included in the value set.
 | * An intensional definition for this value set should be considered, which includes all concepts in the valid range of the 246112005 **|**Severity**|** attribute. For example:

***<*** *272141005* ***|****Severities****|****Note 1: The above intensional value set definition provides a broad coverage of allowable values, which may be further specialized in specific implementations.* |
| 5. Clear Context and Meaning | * There is the potential for inconsistency or ambiguity when Severity is both precoordinated in the Condition.code (e.g. 83986005 **|**Severe hypothyroidism**|**) and populated in Condition.severity.
 | * The SNOMED CT templates (defined above in the Meaning binding) should be used as a canonical representation of a Condition with severity, to allow semantic equivalence to be tested between different instances of this resource (with different amounts of precoordination).
 |

### Condition-stage Value Set

The condition-stage value set (URI - <http://hl7.org/fhir/ValueSet/condition-stage>) is an example value set for stages of cancer and other conditions [<http://www.hl7.org/implement/standards/fhir/valueset-condition-stage.html>]. The value set is defined intensionally and is bound to the element Condition.stage.summary. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-stage value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 17816005 **|**Clinical stage II B**|**.
* The intensional definition of the value set – that is:

*Include codes from* [http://snomed.info/sct where concept is-a 385356007](http://snomed.info/sct%20where%20concept%20is-a%20385356007)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct where concept is-a* [*385356007*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Tumor stage finding (finding)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: http://snomed.info/sct/900000000000207008/version/20160131
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. [385356007](http://snomed.info/sct%20where%20concept%20is-a%20404684003) **|**Tumor stage finding (finding)**|**).
* All concepts in the value set seem to be appropriate.
 | * None
 |
| 4. No Content Gaps | * The definition of the value set reads:

*Example value set for stages of cancer and other conditions.*However, the value set contains only tumor stage findings. Note: If it is found that the SNOMED CT international edition does not contain the required staging concepts for other conditions, then the HTA could request for these to be added. | * The HL7 FHIR and the HTA should consider whether or not it is necessary to request that staging concepts for other conditions (besides cancer) are added to the SNOMED CT international edition.
 |
| 5. Clear Context and Meaning | * It is currently unclear as to whether the value for Condition.code must be a **<** 363346000 **|**Cancer**|** to have a tumor stage finding applied.
 | * A dependency may need to be defined between the Condition.code and the appropriate values for Condition.stage.
 |

### Manifestation-or-symptom Value Set

The manifestation-or-symptom value set (URI - <http://hl7.org/fhir/ValueSet/manifestation-or-symptom>) is an example value set for Manifestation and Symptom codes [<http://www.hl7.org/implement/standards/fhir/valueset-manifestation-or-symptom.html>]. The value set is defined intensionally and is bound to the element Condition.evidence.code. The table below contains the results of applying the proposed SNOMED CT value set review process to the manifestation-or-symptom value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.
* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 **|**Déjà vu (finding)**|**
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “<meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: http://snomed.info/sct/900000000000207008/version/20160131
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders.
* Not all concepts in the value set are appropriate for the intended use. The reasons for this include:
	+ The SNOMED CT definition of a ‘Clinical Finding’ may be considered to be subtly different from the FHIR definition of the ‘Condition’ resource. SNOMED CT editorial guidelines define clinical findings as “observations, judgements or assessments about patients.” In contrast, the FHIR specification describes this Condition.evidence.code element as “Supporting evidence – manifestation/symptom”.

For example, the value set may include unexpected concepts such as:* Non-diagnostic findings which do not seem to fit with the meaning of Condition.evidence, e.g. 409002 **|**Food allergy diet (finding)**|**.
* Allergy intolerances, e.g. 91934008 **|**Allergy to nut (finding)**|**.
* Administrative statuses, e.g. 308540004 **|**Inpatient stay (finding)**|**.
* Clinical stages, e.g. 46333007 **|**Clinical stage I A (finding)**|**.
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 307824009 **|**Administrative status**|****MINUS** **<<** 385356007 **|**Tumor stage finding**|***Note:* * *Additional concepts (e.g. 420134006* ***|****Propensity to adverse reactions****|*** *and 473010000* ***|****Hypersensitivity condition****|****) may also be appropriate to exclude from the intensional definition.*
 |
| 4. No Content Gaps | * **|**History of X**|** concepts (from the **|**Situation with Explicit Context**|** hierarchy) may be required in this value set.
 | * It is recommended that **<** **|**History of X**|** concepts are also included in this value set for clinical coverage.
 |
| 5. Clear Context and Meaning | * It is not clear as to why a different value set was used for Evidence.code and Condition.code, when they are defined using the same intensional rule. It is also unclear what the exact difference is between Condition.code and Evidence.code (i.e. Manifestation and Symptoms).
* The value set seems somewhat appropriate for the intended use, however we are unsure why the value set for Condition.code is not used here instead. What is the intended difference between Condition.code and “Manifestation and Symptoms”? The definition of the value set should be more explicit if there is in fact a difference between the two.
 | * If there is a difference between these two value sets, then the definitions (both formal and informal) should be made more explicit if possible.
 |

### Body-site Value Set

The body-site value set (<http://hl7.org/fhir/ValueSet/body-site>) is a value set that includes all the Anatomical Structure concepts from SNOMED CT. The value set is defined intensionally and is bound to the element Condition.bodySite [http://www.hl7.org/implement/standards/fhir/valueset-body-site.html]. The table below contains the results of applying the proposed SNOMED CT value set review process to the body-site value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use a non-preferred synonym - e.g. 111002 **|**Parathyroid gland**|**.
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 91723000*](http://snomed.info/sct%20where%20concept%20is-a%20385356007)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct where concept is-a* [*91723000*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Anatomical structure (body structure))****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: http://snomed.info/sct/900000000000207008/version/20160131
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. [91723000](http://snomed.info/sct%20where%20concept%20is-a%20404684003) **|**Anatomical structure (body structure)**|**), which includes body structures and cell structures.
* It is unclear as to whether or not the value set is intended to include cell concept values (e.g. **|**Burr cell (cell)**|**).
 | * Consider whether or not the subhierarchy 4421005 **|**Cell structure**|** should be excluded from the value set.
 |
| 4. No Content Gaps | * It seems that some acquired body structures may be needed (e.g. **|**Amputee stump (body structure)**|**.
* The binding indicates that the value may include laterality. There are a number of ways of recording laterality using this resource, including:
	1. Precoordinated or postcoordinated in the bodySite.
	2. Precoordinated or postcoordinated in the code.

Note: The IHTSDO has recently agreed to a proposal to add precoordinated literalities to the Body structure, Clinical finding and Procedure hierarchies. Once published, these precoordinated concepts may be used to populate this resource. | * Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**‘ for the intensional value set definition to include these additional acquired body structures. Alternatively, select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.
 |
| 5. Clear Context and Meaning | * There is the potential for inconsistency and/or ambiguity when the Finding Site is both precoordinated in the Condition.code and populated in the Condition.bodySite element.
 | * The SNOMED CT templates (defined above in the Meaning binding) should be used as a canonical representation of the Condition with finding site, to allow semantic equivalence to be tested between different instances of this resource (with different amounts of precoordination).
 |

### Additional Value Sets

Other value sets bound to the *Condition* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* <http://hl7.org/fhir/condition-category>: A category assigned to the condition.
* <http://hl7.org/fhir/condition-clinical>: The clinical status of the condition or diagnosis.
* <http://hl7.org/fhir/condition-ver-status>: The clinical status to support or decline the clinical status of the condition or diagnosis.

# ALLERGY INTOLERANCE

## Overview

*AllergyIntolerance* is a general clinical resource used to record a clinical assessment of an allergy, intolerance, propensity, or a potential risk to an individual to have an adverse reaction on future exposure to a specified substance or class of substances. An allergy/intolerance is considered to be a harmful or undesirable physiological response, which is unique to an individual and associated with exposure to a substance. Substances include, but are not limited to, a therapeutic substance administered correctly at an appropriate dosage for the individual, food, material derived from plants or animals, or venom from insect strings. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/allergyintolerance.html>.

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *AllergyIntolerance* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Allergy Intolerance resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT****Concept Domain Binding** |
| **AllergyIntolerance** | N/A | **<** 413350009 **|**Finding with explicit context**|**:246090004 **|**Associated finding**|** =**<<** 473010000 **|**Hypersensitivity condition**|** |
| **status** | 408729009 **|**Finding context**|** | **<** 410514004 **|**Finding context value**|** |
| **type** | - | 473010000 **|**Hypersensitivity condition**|** OR 418038007 **|**Propensity to adverse reactions to substance**|** |
| **category** | - | 116273005 **|**Dietary substance**|** **OR** 410942007 **|**Drug or medicament**| OR** 115668003 **|**Biological substance**|** **OR** AAAAAA **|**Environmental substance**|**[[5]](#footnote-5) |
| **criticality** | - | **<** 30207005 **|**Risk of**|** |
| **code** | 246075003 **|**Causative agent**|** | **<** 105590001 **|**Substance**|** **OR** **<** 373873005 **|**Pharmaceutical / biologic product**|** **OR** **<** 418038007 **|**Propensity to adverse reactions to substance**|** **OR** **<** 267425008 **|**Lactose intolerance**|** **OR** **<** 29736007 **|**Syndrome of carbohydrate intolerance**|** **OR** **<** 340519003 **|**Lysine intolerance**|** **OR** **<** 190753003 **|**Sucrose intolerance**|** **OR** **<** 413427002 **|**Acquired fructose intolerance**|** **OR** **<** 716186003[[6]](#footnote-6) **|**No known allergy**|** |
| **reaction. substance** | 363701004 **|**Direct substance**|** | **<** 105590001 **|**Substance**|** **OR** **<** 373873005 **|**Pharmaceutical / biologic product**|** |
| **reaction.** **certainty** | 408729009 **|**Finding context**|** | **<** 410514004 **|**Finding context value**|** |
| **manifestation** | - | **<** 404684003 **|**Clinical finding**|** |
| **severity** | 246112005 **|**Severity**|** | **<** 272141005 **|**Severities**|** |
| **exposureRoute** | 410675002 **|**Route of administration**|** | **<** 284009009 **|**Route of administration value**|** |

### Template Binding

The following table documents the SNOMED CT template binding for the AllergyIntolerance resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **FHIR Element** | **SNOMED CT Expression Template** |
| **AllergyIntolerance** | [[ +id (<<413350009 |Finding with explicit context|) 1..1 @allergyIntoleranceWithContext ]] **:** [[ ~ 0..\* @group1 ]]**{** 246090004 **|**Associated finding**|** **= (** [[+id (<<404684003 |Clinical finding|) 1..1 @allergyIntolerance ]] **:** [[ ~ 0..\* @group2 ]]**{**363698007 **|**Finding site**|** **=** [[+(< 442083009  |Anatomical or acquired body structure|) 0..1 @bodySite ]]**,**255234002 **|**After**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**116676008 **|**Associated morphology**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**47429007 **|**Associated with**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**246075003 **|**Causative agent**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**42752001 **|**Due to**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**363713009 **|**Has interpretation**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**363714003 **|**Interprets**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]]**,**370135005 **|**Pathological process**|** **=** [[+(< xxxx  |xxx|) 0..1 @xxx ]] **} )** 408732007 **|**Subject relationship context**|** **=** [[+(410604004 |Subject of record| OR 389109008 |Group|) 1..1 @subjectContext ]][[7]](#footnote-7)**,**408731000 **|**Temporal context**|** **=** [[ +(<< 410510008 |Temporal context value|) 1..1 @temporalContext ]]**,** 408729009 **|**Finding context**|** **=** [[ + (<<410514004 |Finding context value|) 1..1 @findingContext ]] **}** |
| **reaction** | 413350009 **|**Finding with explicit context**| :** [[ ~ 1..2 @group1 ]]**{** 246090004 **|**Associated finding**|** **=** **(**282100009 **|**Adverse reaction caused by substance**|** **:**[[ ~ 1..1 @group2 ]]**{** 246075003 **|**Causative agent**|** **=** [[+ (< 105590001 |Substance| OR < 373873005 |Pharmaceutical / biologic product|) 1..1 @agent]]**,** 246112005 **|**Severity**|** **=** [[ + ((< 272141005 |Severities|) 0..1 @severity]]**,** 255234002 **|**After**|** **=** **(**432102000 **|**Administration of substance**|:**[[ ~ 1..1 @group3 ]]**{**363701004 **|**Direct substance**|** **=** [[ + (< 105590001 |Substance| OR < 373873005 |Pharmaceutical / biologic product|) 1..1 @agent]]**,** 410675002 **|**Route of administration**|** **=**[[ + (< 284009009 |Route of administration value|) 1..1 @route]] **} ) } )** 408732007 **|**Subject relationship context**|** **=** 410604004 **|**Subject of record**|,** 408731000 **|**Temporal context**|** **=** [[+(<< 410510008 |Temporal context value|) 1..1 @temporalContext ]]**,** 408729009 **|**Finding context**|** **=** [[ + (<<410514004 |Finding context value|) 1..1 @findingContext ]] **}**  |

## Value Set Review

This section contains the results of applying the proposed value set review process described in Section 2.3 to the SNOMED CT value sets bound to the *AllergyIntolerance* resource.

### Allergyintolerance-substance-code Value Set

The allergyintolerance-substance-code (URI - <http://hl7.org/fhir/ValueSet/allergyintolerance-substance-code>) value set is an example value set that contains the type of the substance or negation codes for reporting no known allergies <http://www.hl7.org/implement/standards/fhir/valueset-allergyintolerance-substance-code.html>]. This value set is defined intensionally and is bound to the element AllergyIntolerance.substance. The table below contains the results of applying the proposed SNOMED CT value set review process to the AllergyIntolerance-substance-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* Also, for negation concepts: there are differences in case sensitivity (initial letter in the expression vs. initial letter for every word):
	+ “No Known Environmental Allergy” versus *428607008* ***|****No known environmental allergy****|***
* The intension definition of the value set <http://hl7.org/fhir/ValueSet/substance-code> is:
	+ *Include codes from* [*http://snomed.info/sct where concept is-a 105590001*](http://snomed.info/sct%20where%20concept%20is-a%20105590001)
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 373873005*

These do not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions (including case sensitivity).
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 105590001* ***|****Substance (substance)****|***
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 373873005* ***|****Pharmaceutical / biologic product (product)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
* Please note that the concept 160244002 **|**No known allergies (situation)**|** was inactivated in the 20160731 release, and has been replaced by the concept 716186003 **|**No known allergy (situation)**|**
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
* It is recommended that the negation concepts in this value set are reviewed against the 20160731 edition of SNOMED CT, and that inactive concepts are replaced with appropriate active ones. For example, please replace 160244002 **|**No known allergies (situation)**|** with 716186003 **|**No known allergy (situation)**|**.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchies (i.e. 105590001 **|**Substance (substance)**|** and 373873005 **|**Pharmaceutical / biologic product (product)**|**). The value set also includes a few negation concepts from SNOMED CT situation hierarchy.
* The substance and product concepts seem to be appropriate for the intended use. However, the negation concepts do not reflect the stated definition of the associated coded data element – that is, the “Substance (or class) considered to be responsible for the risk”.
 | * Consider whether the negation concepts are appropriate for inclusion in this value set, based on the definition of the associated data element.
 |
| 4. No Content Gaps | * The negation concepts included in this value set are limited and do not include specific concepts such as “716184000 **|**No known latex allergy (situation)**|**”.
 | * Consider whether the value set used to represent negation concepts should include all descendants and self of 716186003 **|**No known allergy (situation)**|** - that is
	+ **<<** 716186003 **|**No known allergy (situation)**|**
 |
| 5. Clear Context and Meaning | * There is a potential for inconsistency between the value used to population AllergyIntolerance.substance and AllergyIntolerance.reaction.substance.
* There is the potential for inconsistency between values used to populate AllergyIntolerance.substance and AllergyIntolerance.category (e.g. “food”, “medication”).
* There is a potential for ambiguity if AllergyIntolerance.substance is populated with a negation concept, and other data elements (e.g. type, category, criticality) are also populated.
 | * Rules should be developed to define the valid relationships between substance and reaction.substance.
* Rules should be developed to define the valid categories for each set of substances.
* Rules should be developed to define constraints on when each data element may or may not be populated.
 |

### Substance Code

The substance-code ([URI - http://hl7.org/fhir/ValueSet/substance-code](file:///D%3A%5CIHTSDO%5CGroups%5CHL7%5CFHIR%20Binding%5CURI%20-%20http%3A%5Chl7.org%5Cfhir%5CValueSet%5Csubstance-code)) value set is an example value set that contains concept codes for specific substances (<http://www.hl7.org/implement/standards/fhir/valueset-substance-code.html>). This value set is used by the AllergyIntolerance resource to define the substance which is considered to be responsible for an Adverse Reaction event. This value set is defined intensionally and is bound to the element AllergyIntolerance.reaction.substance. The table below contains the results of applying the proposed SNOMED CT value set review process to the substance-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* The intension definition of the value set is:
	+ *Include codes from* [*http://snomed.info/sct where concept is-a 105590001*](http://snomed.info/sct%20where%20concept%20is-a%20105590001)
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 373873005*

These do not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 105590001* ***|****Substance (substance)****|***
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 373873005* ***|****Pharmaceutical / biologic product (product)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchies (i.e. 105590001 **|**Substance (substance)**|** and 373873005 **|**Pharmaceutical / biologic product (product)**|**). All concepts in the value set seem to be appropriate for the intended use.
 | * Not applicable
 |
| 4. No Content Gaps | * There are no obvious content gaps in this value set.
 | * Not applicable
 |
| 5. Clear Context and Meaning | * There is a potential for inconsistency between the value used to population AllergyIntolerance.substance and AllergyIntolerance.reaction.substance.
 | * Rules should be developed to define the valid relationships between substance and reaction.substance.
 |

### Manifestation-codes Value Set

The manifestation-codes value set (URI - <http://hl7.org/fhir/ValueSet/manifestation-codes> ) is an example value set that contains the clinical symptoms and/or signs that are observed or associated with an Adverse Reaction Event [<http://www.hl7.org/implement/standards/fhir/valueset-manifestation-codes.html>]. This value set is defined intensionally and is bound to the element AllergyIntolerance.reaction.manifestation. The table below contains the results of applying the proposed SNOMED CT value set review process to the manifestation-codes value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 **|**Déjà vu (finding)**|**
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “**<**meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders.
* Not all concepts in the value set are appropriate for the intended use. Concepts that may not be appropriate include to represent a ‘clinical symptom or sign’ include:
	+ Diseases or disorders, i.e. **<<** 64572001 **|**Disease (disorder)**|**
	+ Administrative statuses, e.g. 308540004 **|**Inpatient stay (finding)**|**.
	+ Drug actions, i.e. **<<** 69449002 **|**Drug action (finding)**|**
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|****MINUS** **<<** 64572001 **|**Disease (disorder)**|** **MINUS** **<<** 307824009 **|**Administrative status (finding)**|****MINUS** **<<** 69449002 **|**Drug action (finding)**|***Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.* |
| 4. No Content Gaps | * It is not clear if some concepts from the 413350009 **|**Findings with explicit context**|** hierarchy should be included in this value set. E.g. 162057007 **|**Nausea present (situation)**|**
 | * Consider whether or not some **<** 413350009 **|**Findings with explicit context**|** concepts should be included in this value set.
 |
| 5. Clear Context and Meaning | * There is potential for inconsistency or ambiguity if ‘severity’ is both precoordinated in reaction.manifestation and included in reaction.severity.
* There is potential for inconsistency or ambiguity if a ‘causative agent’ substance is both precoordinated in reaction.manifestation and included in reaction.substance.
 | * Rules should be developed to clarify the interpretation where reaction.severity and reaction.substance are both populated separately and precoordinated in the reaction.manifestation.
 |

### Route-codes Value Set

The route-codes value set (<http://hl7.org/fhir/ValueSet/route-codes>) is an example value set that contains concepts describing the route or physiological path of administration of a therapeutic agent into or onto the body of a subject [<http://www.hl7.org/implement/standards/fhir/valueset-route-codes.html>]. This value set is defined intensionally and is bound to the element AllergyIntolerance.reaction.exposureRoute. The table below contains the results of applying the proposed SNOMED CT value set review process to the route-codes value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* The intensional definition of the value set – that is:
	+ *Include codes from http://snomed.info/sct where concept is-a 284009009*

does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
	+ *Include codes from* [*http://snomed.info/sct*](http://snomed.info/sct) *where concept is-a 284009009* ***|****Route of administration value (qualifier value)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 284009009 **|**Route of administration value (qualifier value)**|**).
* All concepts in the value set seem to be appropriate for the intended use.
 | * Not applicable
 |
| 4. No Content Gaps | * There are no obvious content gaps.
 | * Not applicable
 |
| 5. Clear Context and Meaning | * The context of use seems clear with no obvious overlaps in meaning.
 | * Not applicable
 |

### Additional Value Sets

Other value sets bound to the *AllergyIntolerance* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* <http://hl7.org/fhir/ValueSet/allergy-intolerance-status>: Assertion about certainty associated with a propensity, or potential risk, of a reaction to the identified Substance.
* <http://hl7.org/fhir/ValueSet/allergy-intolerance-type>: Identification of the underlying physiological mechanism for a Reaction Risk.
* <http://hl7.org/fhir/ValueSet/allergy-intolerance-category>: Category of an identified substance.
* <http://hl7.org/fhir/ValueSet/allergy-intolerance-criticality>: Estimate of the potential clinical harm, or seriousness, of a reaction to an Identified Substance.
* <http://hl7.org/fhir/ValueSet/reaction-event-certainty>: Statement about the degree of clinical certainty that a specific substance was a cause of the manifestation in a reaction event.
* <http://hl7.org/fhir/ValueSet/reaction-event-severity>: Clinical assessment of the severity of a reaction event as a whole, potentially considering multiple different manifestations.

# PROCEDURE

## Overview

*Procedure* is a general resource used to record details of procedures performed on a patient. A procedure is an activity that is performed with or on a patient as part of the provision of care. Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, counseling, physiotherapy, and exercise. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/procedure.html> .

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *Procedure* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Procedure resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT Concept Domain Binding** |
| **Procedure** | - | **<** 129125009 **|**Procedure with explicit context**|:** 363589002 **|**Associated procedure**|** **=** **(****<** 71388002 **|**Procedure**|** **MINUS** **<<** 14734007 **|**Administrative procedure**| MINUS** **<<** 389084004 **|**Staff related procedure**| MINUS** **<<** 432102000 **|**Administration of substance**|)** |
| **status** | 408730004 **|**Procedure context**|** | **<** 288532009 **|**Context values for actions**|** |
| **category** | - | **<** 71388002 **|**Procedure**|** |
| **code** | 363589002 **|**Associated procedure**|** | **<** [[ + (< 7138802 |Procedure|) $Procedure.category ]] |
| **notPerformed** | 408730004 **|**Procedure context**|** | **<<** 262008008 **|**Not performed**|** |
| **reasonNot Performed** | - | **<<** 183932001 **|**Procedure contraindicated**|** **OR****<<** 416406003 **|**Procedure discontinued**|** **OR****<<** 416237000 **|**Procedure not done**|** **OR****<<** 428119001 **|**Procedure not indicated**|** **OR****<<** 416064006 **|**Procedure not wanted**|** **OR****<<** 416432009 **|**Procedure not wanted**|** **OR****<<** 183944003 **|**Procedure refused**|** **OR****<<** 394908001 **|**Procedure stopped**|** |
| **bodySite** | 405813007 **|**Procedure site - Direct**|** | **<** 442083009  **|**Anatomical or acquired body structure**|** |
| **reasonCode** | - | **<** 404684003 **|**Clinical finding**|** **OR****<** 71388002 **|**Procedure**|** |
| **performer.role** | - | **<** 223366009 **|**Healthcare professional**|** |
| **outcome** | - | **<<** 385669000 **|**Successful**|** **OR****<<** 385671000 **|**Unsuccessful**|** **OR****<<** 385670004 **|**Partially successful**|** |
| **complication** | - | **<** 404684003 **|**Clinical finding**|** **OR** **<<** 160245001 **|**No current problems or disability**|** |
| **followup** | - | **<** 71388002 **|**Procedure**|** |
| **focalDevice.action** | - | **<<**257867005 **|**Insertion – action**|** **OR** **<<**129415008 **|**Extraction – action**| OR** **<<**129408000 **|**Manipulation – action**|** |
| **focalDevice. manipulated. type** | 363699004 **|**Direct device**|** | **<** 49062001 **|**Device**|** |
| **usedCode** | 424226004 **|**Using device**|** OR 424361007 **|**Using substance**|** | **<** 49062001 **|**Device**|** **OR** **<** 373873005 **|**Pharmaceutical / biologic product**|** **OR****<** 105590001 **|**Substance**|** |

### Template Binding

The following mapping table documents the SNOMED CT meaning binding for the Procedure resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **Element** | **SNOMED CT Expression Template** |
| **Procedure** | 129125009 **|**Procedure with explicit context**| :** [[ ~ 1..1 @group1 ]]**{** 363589002 **|**Associated procedure**|** = **(**[[ + @condition ]] **:** [[ ~ 0..\* @group2 ]]**{** 405813007 **|**Procedure site - Direct**|** **=** [[+ @bodySite]]**,**363699004 **|**Direct device**|** **=** [[+@directDevice ]]**,**424226004 **|**Using device**|** **=** [[+ @directDevice ]]**,**424361007 **|**Using substance**|** **=** [[+ @usedSubstance ]]**,**260507000 **|**Access**|** **=** [[+ @access]]**,** 363700003 **|**Direct morphology**|** **=** [[+ @directMorph]]**,** 363701004 **|**Direct substance**|** **=** [[+ @directSubstance]]**,** 363710007 **|**Indirect device**|** **=** [[+ @indirectDevice]]**,** 363709002 **|**Indirect morphology**|** **=** [[+ @indirectMorph]]**,** 260686004 **|**Method**|** **=** [[+ @method]]**,** 405816004 **|**Procedure morphology**|** **=** [[+ @morphology]]**,** 405814001 **|**Procedure site - Indirect**|** **=** [[+ @indirectSite]]**,** 370130000 **|**Property**|** **=** [[+ @property]]**,** 410675002 **|**Route of administration**|** **=** [[+ @route]]**,** 425391005 **|**Using access device**|** **=** [[+ @accessDevice]]**,** 424244007 **|**Using energy**|** **=** [[+ @energy]] **} ),**408732007 **|**Subject relationship context**|** **=** [[+@subject ]][[8]](#footnote-8)**,**408731000 **|**Temporal context**|** **=** 410512000 **|**Current or specified time**|,**408730004 **|**Procedure context**|** **=** [[ + @procedureContext ]] **}** |

## Value Set Review

This section contains the results of applying the proposed value set review process described in Section 2.3 to the SNOMED CT value sets bound to the *Procedure* resource.

### Procedure-category Value Set

The procedure-category value set (URI - <http://hl7.org/fhir/ValueSet/procedure-category>) is an example value set for procedure category codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-category.html>]. This value set is defined extensionally and is bound to the element Procedure.category. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-category value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept…The Fully Specified Name is not an appropriate choice.** However, the display text in expansion uses the Fully specified name rather than preferred term for all the concepts (e.g. 24642003 **|**Psychiatry procedure or service (procedure)**|**.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
 |
| 2. Active Concepts | * The concepts in this value set are active in the current version of the SNOMED CT international edition (20160131).
* There is no indication of which SNOMED CT version these concepts were selected from.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 71388002 **|**Procedure (procedure)**|**).
* All concepts in the value set seem to be appropriate.
 | * Not applicable
 |
| 4. No Content Gaps | * The scope and usage documentation of the Procedure resource includes “Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, counseling, physiotherapy, exercise, etc.” It appears that the chosen categories in the value set will not support all of the example procedures listed such as physiotherapy and exercise. To support these uses, additional concepts from the Procedure hierarchy may be required. For example:
	+ 363687006 **|**Endoscopic procedure**|**
	+ 86273004 **|**Biopsy**|**
	+ 91251008 **|**Physical therapy procedure**|**
 | * Consider adding additional concepts from the Procedure hierarchy.
 |
| 5. Clear Context and Meaning | * There is a dependency constraint between Procedure category and Procedure code. There is a potential for inconsistency if the Procedure code is not a subtype of the Procedure category.
 | * No comments
 |

### Procedure-code Value Set

The procedure-code value set (URI - <http://hl7.org/fhir/ValueSet/procedure-code>) is an example value set for procedure codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-code.html>]. This value set is defined intensionally and is bound to the element Procedure.code. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.** While some of the display text in the examples use the US-English Preferred Term, e.g., 63322005 **|**Excision of cystic duct remnant**|**, the Fully Specified Name (FSN) is used in some cases, e.g. 3968003 **|**Facetectomy of vertebra (procedure)**|**.
* In some cases the US-Great Britain Preferred Term is shown in the display text, e.g. 1339004 **|**Removal of impacted faeces**|**.
* The intensional definition of the value set – that is:

*Include codes from http://snomed.info/sct where concept is-a 71388002*does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct  where concept is-a 71388002* ***|****Procedure (procedure)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example:<http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 71388002 **|**Procedure**|**). This includes both procedures and regimes/therapies.
* Not all concepts in the value set are appropriate for the intended use, i.e., they do not fit the definition of the Procedure resource in FHIR: “This resource is used to record the details of procedures performed on a patient. A procedure is an activity that is performed with or on a patient as part of the provision of care.” Some examples:
* 14734007 **|**Administrative procedure (procedure)**|** and its descendants such as 185449004 **|**Outgoing mail processing (procedure)**|**
* 389084004 **|**Staff related procedure (procedure)**|** and its descendants such as Staff supervision and Nursing conference education
* FHIR states that “The Procedure resource should not be used to capture an event if a more specific resource already exists - i.e. [immunizations](http://hl7-fhir.github.io/immunization.html), [drug administrations](http://hl7-fhir.github.io/medicationadministration.html) and [communications](http://hl7-fhir.github.io/communication.html)” however the procedure hierarchy includes these type of concepts such as 39343008 **|**Pertussis vaccination (procedure)**|** and 18629005 **|**Administration of drug or medicament (procedure)**|**.
* We are unsure if procedures that include the reason they are performed are desired in this value set, e.g. 1640009 **|**History and physical examination, insurance (procedure)**|**.
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 71388002 **|**Procedure**|****MINUS** **<<**  **|**Administrative procedure (procedure)**|****MINUS** **<<** 389084004 **|**Staff related procedure (procedure)**|****MINUS** **<<** 432102000 **|**Administration of substance (procedure)**|** or 18629005 **|**Administration of drug or medicament (procedure)**|**Notes:* 127785005 **|**Administration of substance to produce immunity, either active or passive (procedure)**|** is a subhierarchy of 432102000 **|**Administration of substance (procedure)**|** and 18629005 **|**Administration of drug or medicament (procedure)**|** which are already in the suggested excluded list above.
* We could not locate individual subhierarcies of SNOMED CT which contain procedure "Communications" concepts or procedure concepts that include the reason they are performed.
* Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.
 |
| 4. No Content Gaps | * There are no obvious content gaps in this value set
 | * No comments
 |
| 5. Clear Context and Meaning | * The boundary between procedure and communication may not be distinguished in SNOMED CT as it is in FHIR. The FHIR Procedure resource Boundary and Relationship: “The boundary between determining whether an action is considered to be training or counseling (and thus a procedure) as opposed to a Communication is based on whether there's a specific intent to change the mind-set of the patient. Mere disclosure of information would be considered a Communication. A process that involves verification of the patient's comprehension or to change the patient's mental state would be a Procedure.”
* There is potential inconsistency or ambiguity caused by information that is both precoordinated in the Procedure code and included in other elements such as body site, reason and performer.
 | * No comments
 |

### Procedure-not-performed-reason Value Set

The procedure-not-performed-reason value set (URI - <http://hl7.org/fhir/ValueSet/procedure-not-performed-reason>) is an example value set for procedure category codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-not-performed-reason.html>]. This value set is defined intensionally and is bound to the element Procedure.reasonNotPerformed. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-not-performed-reason value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion uses the Fully Specified Name (FSN) in many cases.* While many of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 394965000 **|**Urine leucocyte test not done**|**.
* The intensional definitions of the value set – for example:

*Include codes from http://snomed.info/sct where concept is-a 183932001*Do not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct  where concept is-a 404684003* ***|****Procedure contraindicated (situation)****|*** |
| 2. Active Concepts | * It is assumed that the example expansion was created against the current version (i.e. 20160131) of the SNOMED CT international edition. However, extensive testing has not been performed.
* There is at least one extension concept in the example that is not available in the current International Release of SNOMED CT: 439201000124106 **|**Mother refuses to breastfeed (situation)**|**
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example:<http://snomed.info/sct/900000000000207008/version/20160131>
* If additional SNOMED CT releases are included in the value set, e.g. US Extension Release of SNOMED CT, this should be included in the intensional definition.
* Verify that all listed concepts are in the current SNOMED CT International Edition
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 243796009 **|**Situation with explicit context (situation)**|**).
* There might be some redundancy in the list, e.g. what is difference between procedure discontinued and procedure stopped?
* It is not clear to us if the value set is called “procedure not performed reason,” how can one of the valid value set choices be “procedure not done?”
 | * Review the list and determine if the included concepts make sense in the model
 |
| 4. No Content Gaps | * We cannot adequately assess how many concepts are missing during this review, however it seems that:
* Not all possible choices are enumerated. For example, the value set includes 169649009 **|**Antenatal amniocentesis - not wanted (situation)**|** and 408837008 **|**Amniocentesis sample not obtained (situation)**|** but does not include “Amniocentesis contraindicated.”
* There are other reasons that a procedure is not performed, including Clinical Findings such as 45007003 **|**Low blood pressure (disorder) **|**, 34014006 **|**Viral disease (disorder)**|** and Findings with Explicit Context such as  394967008 **|**Suspected asthma (situation) **|**.
* Stating that a procedure was contraindicated may not be enough information. In particular, what is the reason it was contraindicated?
 | * Have a subject matter expert determine if and which additional concepts are needed
 |
| 5. Clear Context and Meaning | * It is not clear if a more general concept like 183932001 **|**Procedure contraindicated**|** or a more specific one like 135809002 **|**Nitrate contraindicated**|** would be more appropriately used.
* “Not performed” is not included in the Procedure.status value set. Is it intentional? There should be some link between these two value sets.
 | * **|**Not performed**|** should be a possible value of status, rather than a separate boolean element.
* reasonNotPerformed should only be populated if status = **|**Not performed**|**.
 |

### Body-site Value Set

The body-site value set (URI - <http://hl7.org/fhir/ValueSet/body-site>) is an example value set for body structure codes [<http://www.hl7.org/implement/standards/fhir/valueset-body-site.html>]. This value set is defined intensionally and is bound to the element Procedure.bodySite. The table below contains the results of applying the proposed SNOMED CT value set review process to the body-site value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use a non-preferred synonym - e.g. 111002 **|**Parathyroid gland**|**.
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 91723000*](http://snomed.info/sct%20where%20concept%20is-a%20385356007)* does not include a term with the concept identifier, making it less human readable.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
* *Include codes from http://snomed.info/sct where concept is-a* [*91723000*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Anatomical structure (body structure))****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: http://snomed.info/sct/900000000000207008/version/20160131
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. [91723000](http://snomed.info/sct%20where%20concept%20is-a%20404684003) **|**Anatomical structure (body structure)**|**), which includes body structures and cell structures.
* It is unclear as to whether or not the value set is intended to include cell concept values (e.g. **|**Burr cell (cell)**|**).
 | * Consider whether or not the subhierarchy 4421005 **|**Cell structure**|** should be excluded from the value set.
 |
| 4. No Content Gaps | * It seems that some acquired body structures may be needed (e.g. **|**Amputee stump (body structure)**|**.
* The binding indicates that the value may include laterality. There are a number of ways of recording laterality using this resource, including:
	1. Precoordinated or postcoordinated in the bodySite.
	2. Precoordinated or postcoordinated in the code.
* Note: The IHTSDO has recently agreed to a proposal to add precoordinated literalities to the Body structure, Clinical finding and Procedure hierarchies. Once published, these precoordinated concepts may be used to populate this resource.
 | * Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**‘ for the intensional value set definition to include these additional acquired body structures. Alternatively, select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.
 |
| 5. Clear Context and Meaning | * There is the potential for inconsistency and/or ambiguity when the Finding Site is both precoordinated in the Procedure.code and populated in the Procedure.bodySite element.
 | * The SNOMED CT template (defined above in section 5.3.2) should be used as a canonical representation of the Condition with finding site, to allow semantic equivalence to be tested between different instances of this resource (with different amounts of precoordination).
 |

### Procedure-reason Value Set

The procedure-reason value set (URI - <http://hl7.org/fhir/ValueSet/procedure-reason>) is an example value set for procedure reason codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-reason.html>]. This value set is defined intensionally and is bound to the element Procedure.reason. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-reason value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion uses the Fully Specified Name (FSN) in many cases.* While many of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 122003 **|**Choroidal hemorrhage**|**.
* The intensional definitions of the value set – for example:

*Include codes from http://snomed.info/sct where concept is-a 404684003*Do not include a term with the concept identifier, making it less human readable.* There are some misspellings in the Display text, due to the incorrect display of special characters – 39795003 **|**Hand-SchÃ¼ller-Christian disease**|**
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct  where concept is-a 404684003* ***|****Clinical finding (finding)****|**** Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “**<**meta charset=”utf-8”/>” to the HTML.
 |
| 2. Active Concepts | * It is assumed that the example expansion was created against the current version (i.e. 20160131) of the SNOMED CT international edition. However, extensive testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example:<http://snomed.info/sct/900000000000207008/version/20160131>
* If additional SNOMED CT releases are included in the value set, e.g. US Extension Release of SNOMED CT, this should be included in the intensional definition.
 |
|  3. Appropriate Concepts | * The concepts in the value set are from two hierarchies (i.e., 404684003 **|**Clinical finding (finding)**|** and 71388002 **|**Procedure (procedure)**|**.
* It is not clear why procedures are included here. We are not sure if it makes sense to have a procedure be a reason for a procedure. In most cases the reason for a procedure will be a clinical finding or an event. There may be outlying cases when a procedure results in a follow up procedure, e.g. biopsy after a surgical procedure. However these outlying cases can be added in an extensional way.
* If Procedures are indeed needed here consider removing some of the administrative procedures, and clinical findings as noted in other value set reviews.
 | * Review the list and determine if the including Procedure concepts in the model here make sense
 |
| 4. No Content Gaps | Some additional hierarchies may be needed:* 272379006 **|** Event (event)**|** hierarchy, specifically the 18019003 **|**Accidental event (event)**|** subhierarchy should be included in this value set.
* 9413000 **|**Finding suspected or known present (situation)**|** hierarchy should also be considered - e.g. a **|**Suspected appendicitis**|** could lead to an **|**Appendectomy**|** being performed, or a suspected disorder of some kind could lead to a biopsy being taken. Note that this content could be represented with precoordinated concepts and/or with post-coordinated expressions.
 | * Have a subject matter expert determine if and which additional concepts are needed
 |
| 5. Clear Context and Meaning | * No comments
 | * No comments
 |

### Performer-role Value Set

The performer-role value set (URI - <http://hl7.org/fhir/ValueSet/procedure-category>) is an example value set for performer role codes [[http://www.hl7.org/implement/standards/fhir/valueset-performer-role. html](http://www.hl7.org/implement/standards/fhir/valueset-performer-role.%20html)]. This value set is defined intensionally and is bound to the element Procedure.performer.role. The table below contains the results of applying the proposed SNOMED CT value set review process to the performer-role value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion uses the Fully Specified Name (FSN) in many cases.* While many of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3842006 **|**Chiropractor**|**.
* The intensional definitions of the value set – for example:

*Include codes from http://snomed.info/sct where concept is-a 223366009** Do not include a term with the concept identifier, making it less human readable.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:

*Include codes from http://snomed.info/sct  where concept is-a 223366009* **|***Healthcare professional (occupation)***|** |
| 2. Active Concepts | * It is assumed that the example expansion was created against the current version (i.e. 20160131) of the SNOMED CT international edition. However, extensive testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example:<http://snomed.info/sct/900000000000207008/version/20160131>
* If additional SNOMED CT releases are included in the value set, e.g. US Extension Release of SNOMED CT, this should be included in the intensional definition.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. 223366009 **|**Healthcare professional (occupation)**|**).
* All concepts in the value set seem to be appropriate.
 | * No comments
 |
| 4. No Content Gaps | * The definition of a procedure in FHIR includes an activity performed by a patient, so limiting the value set to descendants of 223366009 **|**Healthcare professional (occupation)**|** may be inappropriate. It is unclear what value is intended to be used for procedure-performer element when the procedure is performed by a patient.
* Consider adding content to the value set to represent the additional people besides a healthcare provider who would be performing a procedure.
 | * Clarify how a procedure performed by a patient would be recorded in the procedure-performer-role element in the model.
* Consider additions of the 444018008 **|**Person with characteristic related to subject of record (person)**|** subhierarchy and 410604004 **|**Subject of record (person)**|** to represent the patient and someone with a relationship to the patient as performer of a procedure.
 |
| 5. Clear Context and Meaning | * Will the procedure performer role be equivalent to the job title of the performer?
* There is a potential for inconsistency between the role a performer is playing here and the practitionerRoles documented in the Practitioner resource.
 | * No comments
 |

### Procedure-outcome Value Set

The procedure-outcome value set (URI - <http://hl7.org/fhir/ValueSet/procedure-outcome>) is an example value set for procedure category codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-outcome.html>]. This value set is defined extensionally and is bound to the element Procedure.outcome. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-outcome value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.** However, the display text in expansion uses the Fully specified name rather than preferred term for all the concepts (e.g. 385669000 **|**Successful (qualifier value)**|**.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
 |
| 2. Active Concepts | * All 3 concepts in the value set are active in the current (20160131) International Release of SNOMED CT.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 36298100 **|**Qualifier value (qualifier value)**|**).
* A stronger understanding of what defines a successful procedure is needed before we can comment on whether the concepts included in the value set are appropriate for purpose.
 | * No comments
 |
| 4. No Content Gaps | * No obvious gaps were detected. This may change once the definition of a successful and unsuccessful procedure is better understood by the reviewers.
 | * No comments
 |
| 5. Clear Context and Meaning | * There is a level of ambiguity here. What is a “Successful” procedure? Does “Successful” mean the procedure was performed? Is a successful procedure one that achieves its objectives? Does “Procedure unsuccessful” mean the procedure was not done? It is not obvious how the Procedure outcome and Procedure status value sets reconcile with each other.  The Procedure outcome is conditional and only applicable if the procedure was performed (based on current values).
 | * We recommend that the dependencies between the values of Procedure.outcome and Procedure.status is clarified. For example, if the procedure was not done, is the outcome “Procedure unsuccessful”?
 |

### Condition-code Value Set

The condition-code value set (URI - <http://hl7.org/fhir/ValueSet/condition-code>) is an example value set for Condition, Problem and Diagnosis codes [<http://www.hl7.org/implement/standards/fhir/valueset-condition-code.html>]. This value set is defined intensionally and is bound to the element Procedure.complication. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.
* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 39795003 | Hand-SchÃ¼ller-Christian disease|
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “**<**meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
* *Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders.
* Not all concepts in the value set are appropriate for the intended use. For example:
	+ The Clinical findings hierarchy in SNOMED CT includes normal findings, e.g. 144008 **|**Normal peripheral vision**|** as shown in the list.
	+ The Clinical findings hierarchy in SNOMED CT includes some findings that cannot be complications of procedures: e.g. 11806006 **|**Separation anxiety disorder of childhood**|** or 151004 **|**Gonococcal meningitis**|**
* SNOMED CT has a 116224001 **|**Complication of procedure (disorder)**|** concept but it will not have all the complications needed because some complications are findings, e.g. 2134003 **|**Diffuse pain (finding) **|**.
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|****MINUS** **<<** 473010000 **|**Hypersensitivity condition**|****MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 441742003 **|**Evaluation finding**|****MINUS** **<<** 307824009 **|**Administrative status**|****MINUS** **<<** 385356007 **|**Tumor stage finding**|***Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.* |
| 4. No Content Gaps | * No obvious missing content.
 | * No comments
 |
| 5. Clear Context and Meaning | * The context of use seems clear with no obvious overlaps in meaning
 | * No comments
 |

### Procedure-followup Value Set

The procedure-followup value set (URI - <http://hl7.org/fhir/ValueSet/procedure-followup>) is an example value set for procedure followup codes [<http://www.hl7.org/implement/standards/fhir/valueset-procedure-followup.html>]. This value set is defined extensionally and is bound to the element Procedure.followUp. The table below contains the results of applying the proposed SNOMED CT value set review process to the procedure-followup value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.** While some of the display text in the examples use the US-English Preferred Term, e.g., 225164002 **|**Removal of ligature**|**, the Fully Specified Name (FSN) is used in most cases, e.g. 447346005 **|**Cardiopulmonary exercise test (procedure)**|**.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
 |
| 2. Active Concepts | * All 8 concepts in the value set are active in the current (20160131) International Release of SNOMED CT.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 71388002 **|**Procedure**|**). This includes both procedures and regimes/therapies.
* All concepts in the value set seem to be appropriate.
 | * Not applicable
 |
| 4. No Content Gaps | * This list seems particularly small. We think many additional concepts will be needed. The provided list seems imbalanced with a range of general concepts like 18949003 **|**Change of dressing (procedure)**|** to 359825008 **|**Cytopathology, review of bronchioalveolar lavage specimen (procedure)**|**.
 | * Consult with subject matter experts to add necessary content to the value set.
 |
| 5. Clear Context and Meaning | * The exact definition of “Follow up” is not provided in the resource. It is not clear whether this set is just for immediate follow up? What would be the general time period for constraint here?
 | * Clearly define what is considered “follow up” and the length of time which should be considered.
 |

### Additional Value Sets

Other value sets bound to the *Procedure* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* <http://hl7.org/fhir/ValueSet/procedure-status>: A code specifying the state of the procedure.
	+ Note: A spelling error appears in the ‘Display’ name for the code ‘aborted’ (i.e. “Aboted”)
* <http://hl7.org/fhir/ValueSet/device-action>: A kind of change that happened to the device during the procedure.

In addition to these value sets, the Boolean data element ‘notPerformed’ could also be represented using SNOMED CT, and could be added to the procedure-status value set (to replace the ‘notPerformed’ Boolean data element).

# GOAL

## Overview

*Goal* is a care provision clinical resource used to express a desired health state or intended objective to be achieved by a subject of care, group or organization over a period or at a specific point of time. For example, weight loss, restoring an activity of daily living, obtaining herd immunity via immunization or meeting a process improvement objective. The desired target may be achieved as a result of health care interventions or resulting from natural recovery over time. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/goal.html>.

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *Goal* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Goal resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT** **Concept Domain Binding** |
| **Goal** | - | **<**413350009 **|**Finding with explicit context**|:**246090004 **|**Associated finding**|** **=** **<**404684003 **|**Clinical finding**|,**408732007 **|**Subject relationship context**|** **=** 410604004 **|**Subject of record**|,**408731000 **|**Temporal context**|** **=** 410512000 **|**Current or specified**|,**408729009 **|**Finding context**|** **=** 410518001 **|**Goal context**|}** |
| **category** | - | **<** 404684003 **|**Clinical finding**|** |
| **description** | 246090004 **|**Associated finding**|** | **<** [[ + (< 404684003 |Clinical finding|) $Goal.category ]] |
| **status** | - | **<** 390800000 **|**Goal achievement finding**|[[9]](#footnote-9)** |
| **statusReason** | - | **<** 404684003 **|**Clinical finding**|** |
| **priority** | 260870009 **|**Priority**|** | **<** 272125009**|**Priorities**|** |
| **outcome.result [CodeableConcept]** | - | **<** 404684003 **|**Clinical finding**|** |

### Template Binding

The following table documents the SNOMED CT template binding for the Goal resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **Element** | **SNOMED CT Expression Template** |
| **Goal** | 413350009 **|**Finding with explicit context**| :** [[ ~ 1..1 @group1 ]]**{** 246090004 **|**Associated finding**|** **=** [[ + @condition ]]**,**408732007 **|**Subject relationship context**|** **=**  [[+@subjectContext ]][[10]](#footnote-10)**,**408731000 **|**Temporal context**|** **=** 410512000 **|**Current or specified time**|,**408729009 **|**Finding context**|** **=** 410518001**|**Goal context**|}** |

## Value Set Review

This section contains the results of applying the proposed value set review process described below to the SNOMED CT value sets bound to the *Goal* resource.

### Goal-start-event Value Set

The goal-start-event value set (URI - <http://hl7.org/fhir/ValueSet/goal-start-event>) is an example value set that identifies types of events that might trigger the start of a goal [<http://www.hl7.org/implement/standards/fhir/valueset-goal-start-event.html>]. This value set is defined extensionally and is bound to the element Goal.start[x]. The table below contains the results of applying the proposed SNOMED CT value set review process to the goal-start-event value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept…*However, the display text in expansion uses a synonym rather than preferred term for couple of concepts. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
 |
| 2. Active Concepts | * The concepts in this value set are active in the current version of the SNOMED CT international edition.
* There is no indication of which SNOMED CT version these concepts were selected from.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the value set are from two different hierarchies (i.e. 71388002 **|**Procedure (procedure)**|** and 363787002 **|**Observable entity (observable entity)**|**
* It is not appropriate to include Observable entity concepts in this value set. For example, 442137000 **|**Completion time of procedure (observable entity)**|** refers to the observation of actual time value at which the procedure was completed. It is not an event that triggers other actions.
 | * Consider replacing the observable entity concepts in this value set with procedure concepts or procedures with explicit context – for example:
	+ 442137000 **|**Completion time of procedure (observable entity)**|** could be replaced with the Procedure with explicit context concept 443938003 **|**Procedure carried out on patient**|** (which has a procedure context of ‘done’).
	+ 386216000 **|**Childbirth (observable entity)**|** should be replaced with 236973005 **|**Birthing procedure**|**
 |
| 4. No Content Gaps | * The scope and usage documentation of the Goal resource states “Goals may address the prevention of illness, cure or mitigation of a condition, prolongation of life, or mitigation of pain and discomfort.” To support these uses, additional concepts from the Procedure and Clinical finding hierarchies may be required. For example:
	+ 387713003 **|**Surgical procedure (procedure)**|**
	+ 166831007 **|**Serum cholesterol very high (finding)**|**

It is also possible that some concepts from the Event hierarchy may be useful. For example:* + 418019003 **|**Accidental event (event)**|**
 | * Consider adding additional concepts from the Procedure, Clinical finding, and Event hierarchies.
 |
| 5. Clear Context and Meaning | * The context of use seems clear with no obvious overlaps in meaning.
 | * Not applicable
 |

### Additional Value Sets

Other value sets bound to the *Goal* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* <http://hl7.org/fhir/ValueSet/goal-status>: Indicates whether the goal has been met and is still being targeted.
* <http://hl7.org/fhir/ValueSet/goal-status-reason>: Codes to identify the reason for a goal’s current status.
* <http://hl7.org/fhir/ValueSet/goal-priority>: The level of importance associated with a goal.

# OBSERVATION

## Overview

*Observation* is a diagnostics resource used to support diagnosis, monitor progress, determine baselines and patterns and even capture demographic characteristics. Most observations are simple name/value pair assertions with some metadata, but some observations group other observations together logically, or even are multi-component observations. Note that the DiagnosticReport resource provides a clinical or workflow context for a set of observations. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/observation.html>.

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *Observation* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Condition resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT** **Concept Domain Binding** |
| **Observation** | - | **<** 363787002 **|**Observable entity**|** |
| **status** | - | **<** 445584004 **|**Report by finality status**|** |
| **category** | 116680003 **|**Is a**|** | **<** 363787002 **|**Observable entity**| OR** **<** 386053000 **|**Evaluation procedure**|** |
| **value [codeableConcept]** | R 363714003 **|**Interprets**|** | **<** 441742003 **|**Evaluation finding**|** |
| **interpretation** | 363713009 **|**Has interpretation**|** | **<** 260245000 **|**Findings values**|** |
| **bodySite** | 718497002 **|**Inherent location**|** | **<** 123037004 **|**Body structure**|** |
| **method** | 246501002 **|**Technique**|** | **<** 272394005 **|**Technique**|** |
| **specimen** | 704319004 **|**Inheres in**|** | **<** 123038009 **|**Specimen**|** |
| **device.type** | 424226004**|**Using device**|** | **<** 49062001 **|**Device**|** |
| **referenceRange. meaning** | - | **<** 260245000 **|**Findings values**| OR** **<** 365860008 **|**General clinical state finding**|** **OR** **<** 250171008 **|**Clinical history or observation findings**| OR** **<** 415229000 **|**Racial group**|** **OR** **<** 365400002 **|**Finding of puberty stage**|** **OR****<** 443938003 **|**Procedure carried out on subject**|** |
| **component.code** | - | **<** 363787002 **|**Observable entity**| OR** **<** 386053000 **|**Evaluation procedure**|** |
| **component.value** | R 363714003 **|**Interprets**|** | **<** 441742003 **|**Evaluation finding**|** |
| **component. interpretation** | 363713009**|**Has interpretation**|** | **<** 260245000 **|**Findings values**|** |

### Template Binding

The following table documents the SNOMED CT template binding for the Observation resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **Element** | **SNOMED CT Expression Template** |
| **Observation** | [[ +id @observation ]] **:** [[ ~ @group1 ]]**{** 718497002 **|**Inherent location**|** **=** [[+@bodySite ]]**,**246501002 **|**Technique**|** **=** [[+ @method ]]**,**704319004 **|**Inheres in**|** **=** [[+ @specimen]]**,**424226004 **|**Using device**|** **=** [[+ @specimen]] **}** |

## Value Set Review

This section contains the results of applying the proposed value set review process described in Section 2.3 to the SNOMED CT value sets bound to the *Observation* resource.

### Body-site Value Set

The body-site value set (URI - <http://hl7.org/fhir/ValueSet/body-site>) is an example value set that includes Anatomical Structure concepts [<http://www.hl7.org/implement/standards/fhir/valueset-body-site.html>]. This value set is defined intensionally and is bound to the element Observation.body-site. The table below contains the results of applying the proposed SNOMED CT value set review process to the body-site value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use a non-preferred synonym - e.g. 111002 **|**Parathyroid gland**|**.
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 91723000*](http://snomed.info/sct%20where%20concept%20is-a%20385356007)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
* *Include codes from http://snomed.info/sct where concept is-a* [*91723000*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Anatomical structure (body structure))****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same subhierarchy (i.e. [91723000](http://snomed.info/sct%20where%20concept%20is-a%20404684003) **|**Anatomical structure (body structure)**|**), which includes body structures, cell structures and cells.
* Combined sites, e.g.110522009 **|**Bone and joint (combined site) (body structure)**|**, are also included in this hierarchy.
 | * Consider whether or not the subhierarchy 116007004 **|**Combined site (body structure)**|** should be excluded from the value set.
 |
| 4. No Content Gaps | * It seems that some acquired body structures may be needed (e.g. **|**Amputee stump (body structure)**|**.
* The binding indicates that the value may include laterality. There are a number of ways of recording laterality using this resource, including:
	1. Precoordinated or postcoordinated in the bodySite.
	2. Precoordinated or postcoordinated in the code.
	+ Note: The IHTSDO has recently agreed to a proposal to add precoordinated literalities to the Body structure, Clinical finding and Procedure hierarchies. Once published, these precoordinated concepts may be used to populate this resource.
 | * Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**‘ for the intensional value set definition to include these additional acquired body structures. Alternatively, select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.
 |
| 5. Clear Context and Meaning | * There is the potential for inconsistency and/or ambiguity when the Finding Site is both precoordinated in the Observation.code and populated in the Observation.bodySite element. For example, an Observation code of **|**Heart rate**|** or **|**Eye color**|** with an Observation.bodySite of **|**Liver structure**|** would be inconsistent.
 | * The SNOMED CT templates (defined above in the Meaning binding) should be used as a canonical representation of the Condition with finding site, to allow semantic equivalence to be tested between different instances of this resource (with different amounts of precoordination), and inconsistency to be identified within a single instance of this resource.
 |

### Observation-method Value Set

The observation-methods value set (URI - <http://hl7.org/fhir/ValueSet/observation-methods>) is a value set that includes observation method codes from SNOMED CT. The value set is defined intensionally and is bound to the element Observation.method [http://www.hl7.org/implement/standards/fhir/valueset-observation-method.html]. The table below contains the results of applying the proposed SNOMED CT value set review process to the observation-method value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the expansion uses the Fully Specified Name rather than the preferred term for some of the concepts (e.g. 260710009 **|**Obturation technique (qualifier value)**|**.* The intensional definition of the value set – that is:

*Include codes from http://snomed.info/sct where concept is-a 272394005*does not include a term with the concept identifier, making it less human readable.* There are some misspellings in the Display text, due to the incorrect display of special characters – 258128000 | SjÃ¶gren hand technique (qualifier value).
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. Eg.:

Include codes from <http://snomed.info/sct> where concept is-a272394005 **|**Technique (qualifier value)**|*** Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “<meta charset=”utf-8”/>” to the HTML.
 |
| 2. Active Concepts | * It is assumed that the example expansion was created against the current version (i.e. 20160131) of the SNOMED CT international edition. However, extensive testing has not been performed.
* The Resource states that the HL7 v3 Code System "ObservationMethod" is no longer actively maintained.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example:<http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the SNOMED CT value set are consistently from the same hierarchy (i.e. 272394005 **|**Technique (qualifier value)**|**.
* It is unclear why two coding systems are needed. There will certainly be overlap between the HL7 and SNOMED CT value sets, e.g. 703448004 **|**Latex agglutination test technique (qualifier value)**|** is in SNOMED CT and 0019 Latex agglutination is in the HL7 value set.
* Some concepts in the SNOMED CT Technique hierarchy are not appropriate for Observation techniques, including some treatment techniques like 284466007 **|**Anger management technique (qualifier value)**|** and 258011001 **|**Chessboard method (qualifier value)**|** as well as other technique concepts (e.g., 418449005 **|**Gently (qualifier value)**|**).
 | * Suggest use of SNOMED CT only to avoid duplication and to link to precoordinated definitions in the Observation.code when they become available.
 |
| 4. No Content Gaps | * There are likely some content gaps in SNOMED CT. For example, we could not find a suitable concept in SNOMED CT for the HL7 code “algorithm.”
* Some needed content may be in other hierarchies of SNOMED CT, e.g. 129264002 **|**Action (qualifier value)**|** which contains concepts like 312250003 **|**Magnetic resonance imaging - action (qualifier value) **|** or 386053000 **|**Evaluation procedure (procedure) **|** which contains concepts like 113091000 **|**Magnetic resonance imaging (procedure)**|**.
* Note: The IHTSDO is currently considering a proposal to move some of the Procedure concepts to either the Technique hierarchy or the Observables hierarchy. However, this proposal has not been finalized.
 | * Consider the enhancements of IHTSDO’s proposal to move some content from the Procedure hierarchy to the Techniques hierarchy or the Observables hierarchy.
* Identify any gaps and request additions through the HTA.
 |
| 5. Clear Context and Meaning | * There is potential for overlap/discrepancy if LOINC Terms which include the method are used. How will this be managed?
 | * No comments
 |

### Referencerange-meaning Value Set

The referencerange-meaning value set (<http://hl7.org/fhir/ValueSet/referencerange-meaning>) is a value set that includes reference range meaning codes from three areas – one of which uses SNOMED CT. The SNOMED CT value set is defined extensionally and is bound to the element Observation.referenceRange.meaning [http://www.hl7.org/implement/standards/fhir/valueset-referencerange-meaning.html]. The table below contains the results of applying the proposed SNOMED CT value set review process to the referencerange-meaning value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in value set uses the Fully Specified Name (FSN) for all three concepts. | * The US-English Preferred Term should be consistently used as the Display Text of the concepts.
 |
| 2. Active Concepts | * The three SNOMED CT concepts in this value set are active in the current version of the SNOMED CT international edition.
* There is no indication of which SNOMED CT version these concepts were selected from.
 | * It may be useful to state the SNOMED CT edition and version from which the value set is created.
 |
|  3. Appropriate Concepts | * The concepts in the SNOMED CT value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding (finding)**|**) although they are not from the same subhierachy of Clinical findings.
* Two inconsistencies in the content were noted: 1) A copyright statement pertaining to SNOMED CT concepts is placed by a list of codes which are not from SNOMED CT (see image below from [here](http://hl7-fhir.github.io/codesystem-referencerange-meaning.html)); 2) There is duplication in two components of the value sets. For example, see the same code “Pre-puberty” listed in two value sets (images from [here](http://hl7-fhir.github.io/codesystem-referencerange-meaning.html) and [here](http://hl7-fhir.github.io/valueset-referencerange-meaning.html)).

https://lh5.googleusercontent.com/uV1fQziloMFDUrJbQAJj6xCL97S7NVPitneaQnhNDWJklRcqu0MvaZGHh8cqSRyRlYAx6iRcP7fPednQJsPfbFret7_PbXjOhq0LL3cmeC-3fegku6HsWL5GOO0Tk_9kmYzSBSLQ* https://lh6.googleusercontent.com/zfGnDsC1bUIR1jqLl8tHw05kL7Fo2dQta0uqxiUno-Gyg8D0oCnLsswaS2wlV5oidJn3l8kKIoaaDuCn_SQX7JUw0OCf_uMRy8mTOqxJukiIg46tgUvKGKpHFvPJt8TRacTBrujR
 | * The SNOMED CT copyright statement at 4.2.11.217.2 is placed above a list of codes which are not from SNOMED CT. Suggest moving this to 4.3.1.217.1, which refers to 3 SNOMED CT codes.
* Remove duplicate codes in different sub-value-sets (e.g. “Pre-puberty”)
* Use SNOMED CT for all sub-value-sets. Where required concepts are not available, HTA should request addition of this content to SNOMED CT.
 |
| 4. No Content Gaps | * We cannot readily assess if and how many specific concepts are missing, however, it seems that there are some gaps in codes for diet, use of prescribed or herbal drugs, stress, etc.
 | * Consult a Subject Matter Expert to determine the concepts that are missing.
 |
| 5. Clear Context and Meaning | * It is not clear how the data element “age” is to be used with these meaning codes.
* Only one value is allowed per reference range but this doesn’t allow for a combination of meanings like “above average in males” or “pre-puberty in females.”
 | * No recommendations
 |

### Additional Value Sets

Other value sets bound to the *Observation* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* Observation Status
* Observation Category Codes
* Observation Code
* Observation Interpretation Codes

General comments:

* Spelling error noticed in Scope and Usage section on main Observation [page](http://hl7-fhir.github.io/observation.html): “Laboratory Data llike [blood glucose](http://hl7-fhir.github.io/observation-example-f001-glucose.html), or an [estimated GFR”](http://hl7-fhir.github.io/observation-example-f205-egfr.html)
* Observation.code
	+ Resources uses all of LOINC, which includes terms such as document codes (Human Prescription Drug Product) which are not in the scope of Observations in FHIR
	+ A large number of terms used in veterinary medicine have also been included → should they be included?
	+ In addition, the scope includes those non-test measurements that are commonly required to interpret test results and are usually included as part of the report with the laboratory observations. Examples include:
		- for cervical pap smears, the phase of menstrual cycle or use of estrogens
		- for arterial blood gases, inspired oxygen
		- for drug concentrations used in pharmacokinetics, the dose
		- for a blood bank, the number of units dispensed

# FAMILY MEMBER HISTORY

## Overview

*FamilyMemberHistory* is a general clinical resource used to record significant health events and conditions for a particular individual related to the subject. This information can be known to different levels of accuracy. For more information about this resource, including scope, usage, boundaries and relationships, please refer to <http://www.hl7.org/implement/standards/fhir/familymemberhistory.html>.

## UML Diagram



## ****Meaning Binding****

This section describes the results of binding the FHIR *FamilyMemberHistory* resource to SNOMED CT using the approach described in Section 2.2.

### Attribute and Concept Domain Binding

The following table documents the SNOMED CT attribute and concept domain binding for the Procedure resource, using the approach described in section 2.2.

|  |  |  |
| --- | --- | --- |
| **FHIR Element** | **SNOMED CT****Attribute Binding** | **SNOMED CT Concept Domain Binding** |
| **FamilyMember History** | - | **<** 416471007 **|**Family history of clinical finding**|** |
| **status** | - | **<** 445584004 **|**Report by finality status**|** |
| **relationship** | 408732007 **|**Subject relationship context**|** | **<** 444148008 **|**Person in family of subject**|** |
| **gender** | - | **<** 429019009 **|**Finding related to biologic sex**|** |
| **condition.code** | 246090004 **|**Associated finding**|** | **<** 404684003 **|**Clinical finding**|** |
| **condition.outcome** | - | **<** 404684003 **|**Clinical finding**|** OR**<** 272379006 **|**Event**|** |

### Template Binding

The following table documents the SNOMED CT template binding for the FamilyMemberHistory resource using the approach described in section 2.2.4. Please note that the template syntax used below is currently under development. Please also note that the FHIR mapping used to populate this template from an instance of a FHIR resource is outside the scope of this initial work.

|  |  |
| --- | --- |
| **Element** | **SNOMED CT Expression Template** |
| **FamilyMember History.Condition** | 413350009 **|**Finding with explicit context**| :** [[ ~ @group1 ]]**{** 246090004 **|**Associated finding**|** **=** [[ + @condition ]]**,**408732007 **|**Subject relationship context**|** **=** [[+ @relationship ]]**,**408731000 **|**Temporal context**|** **=** 410511007 **|**Current or past**|,**408729009 **|**Finding context**|** **=** 410515003 **|**Known present**|}** |

## Value Set Review

This section contains the results of applying the proposed value set review process described below to the SNOMED CT value sets bound to the *FamilyMemberHistory* resource.

### Condition-code Value Set

The condition-code value set (URI - <http://hl7.org/fhir/ValueSet/condition-code>) is an example value set for condition codes [<http://www.hl7.org/implement/standards/fhir/valueset-condition-code.html>]. This value set is defined intensionally and is bound to the element FamilyMemberHistory.condition.code. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-code value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.
* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 39795003 | Hand-SchÃ¼ller-Christian disease|
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)* does not include a term with the concept identifier, making it less human readable.
 | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “**<**meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
* *Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * Most concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders. The concept 160245001 **|**No current problem or disability (situation)**|** is also included in the value set.
* Not all concepts in the value set are appropriate for the intended use. For example:
	+ **<<** 69449002 **|**Drug action**|**
	+ **<<** 307824009 **|**Administrative status**|**
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 307824009 **|**Administrative status**|***Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.* |
| 4. No Content Gaps | * No obvious missing content.
 | * No comments
 |
| 5. Clear Context and Meaning | * It may be possible that a **<** 57177007 **|**Clinical finding**|** is used to populate FamilyMemberHistory. code, Condition.code (or similar data elements). If so, then the same information could be represented in more than one way.
 | * If it is possible that a **<** 57177007 **|**Clinical finding**|** is used to populate FamilyMemberHistory.code, Condition.code (or similar data elements), the SNOMED CT template should be used to compare the two representations.
 |

### Condition-outcome Value Set

The condition-outcome value set (URI - <http://hl7.org/fhir/ValueSet/condition-code>) is an example value set for condition-outcome codes [<http://www.hl7.org/implement/standards/fhir/valueset-condition-outcome.html>]. This value set is defined intensionally and is bound to the element FamilyMemberHistory.condition.outcome. The table below contains the results of applying the proposed SNOMED CT value set review process to the condition-outcome value set and the recommendations that follow.

|  |  |  |
| --- | --- | --- |
| REVIEW STEP | ANALYSIS | RECOMMENDATIONS |
| 1. Valid Display Text | * As stated on the website “Using SNOMED CT with FHIR” [<http://www.hl7.org/implement/standards/fhir/snomedct.html>]:

*The correct display for a SNOMED CT concept is one of the preferred terms for the concept… The Fully Specified Name is not an appropriate choice.*However, the display text in the example expansion mostly uses the Fully Specified Name (FSN).* While most of the display text in the example expansion uses the FSN, there are some that use US-English Preferred Term - e.g. 3716002 **|**Goitre**|**.
* There are some misspelling in the Display text, due to the incorrect display of special characters – e.g. 313005 **|**Déjà vu (finding)**|**
* The intensional definition of the value set – that is:

*Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)does not include a term with the concept identifier, making it less human readable. | * The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions.
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “**<**meta charset=”utf-8”/>” to the HTML.
* The intensional definition should include the FSN of the relevant concept to make it more human readable. E.g.:
* *Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|***
 |
| 2. Active Concepts | * It is assumed that the example expansion was created by executing the intentional value set definition against the current version (i.e. 20160131) of the SNOMED CT international edition. However, testing has not been performed.
 | * All example expansions should state the SNOMED CT substrate against which the intensional definition was executed – for example: “SNOMED CT International Edition (20160131)”. It may be preferable to state this as a URI – for example: <http://snomed.info/sct/900000000000207008/version/20160131>
 |
|  3. Appropriate Concepts | * The concepts in the value set are consistently from the same hierarchy (i.e. 404684003 **|**Clinical finding**|**). This includes both findings and disorders.
* Not all concepts in the value set are appropriate for the intended use. For example, the value set may include unexpected concepts such as:
* Observation results and evaluation findings, e.g. 165507003 **|**White blood cell count normal (finding)**|**
* Drug actions, e.g. 95900002 **|**Drug action decreased (finding)**|**
* Other (non-diagnostic) findings which do not seem to fit with the Condition scope and usage statement, e.g. 409002 **|**Food allergy diet (finding)**|**. Note: This concept is currently in the example expansion.
* Signs and symptoms, e.g. 49727002 **|**Cough**|** – although the line between the Observation and Condition resource is a bit unclear.
* Administrative statuses, e.g. 308540004 **|**Inpatient stay (finding)**|**.
* Clinical stages, e.g. 46333007 **|**Clinical stage I A (finding)**|**.
 | * The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|****MINUS** **<<** 473010000 **|**Hypersensitivity condition**|****MINUS** **<<** 79899007 **|**Drug interaction**|****MINUS** **<<** 69449002 **|**Drug action**|****MINUS** **<<** 441742003 **|**Evaluation finding**|****MINUS** **<<** 307824009 **|**Administrative status**|***Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.* |
| 4. No Content Gaps | * Some concepts from the Event hierarchy may be considered to be an outcome. For example: 419620001 **|**Death (event)**|**.
 | * Add concepts which are **<** 272379006 **|**Event**|**
 |
| 5. Clear Context and Meaning | * No comments
 | * No comments
 |

### Additional Value Sets

Other value sets bound to the *FamilyMemberHistory* resource, which are in scope of SNOMED CT, but do not currently use SNOMED CT, include:

* <http://hl7.org/fhir/ValueSet/history-status>: A code that identifies the status of the family history record.
* <http://hl7.org/fhir/ValueSet/V3-FamilyMember>: A relationship between two people characterizing their familial relationship.
* <http://hl7.org/fhir/ValueSet/administrative-gender>: The gender of a person used for administrative purposes.

# Appendix A – Summary of Recommendations

## Overview

In this appendix, we summarize the recommendations that result from the value set reviews described in this report. We also add some additional recommendations that result from the meaning bindings.

## General Recommendations

The following general recommendations are made:

* A value set version management strategy is adopted, as suggested in section 2.3.3. This strategy should include:
	+ A process for adding and inactivating members of an extensional value set (e.g. when a concept is inactivated in the source code system)
	+ Stating the SNOMED CT edition and version from which extensionally defined value sets or intensionally defined expansions are created. For example:
		- http://snomed.info/sct/900000000000207008/version/20160131
	+ An approach to versioning intensional value set definitions
* The US-English Preferred Term should be consistently used as the Display Text of the international example Expansions (and *not* the Fully Specified Name).
* All SNOMED CT intensional definitions should include the Fully Specified Name of the relevant concepts to make them more human readable. For example:
	+ *Include codes from* [*http://snomed.info/sct where concept is-a 404684003*](http://snomed.info/sct%20where%20concept%20is-a%20404684003)***|****Clinical finding (finding)****|***
* Special characters in the display text of the expansion concepts should be rendered correctly. This may be achieved by adding “<meta charset=”utf-8”/>” to the HTML. This should avoid errors in the Display text, due to the incorrect display of special character. For example:
	+ 313005 **|**Déjà vu (finding)**|**
* The proposed model meaning binding approach, including attribute, concept domain and template binding, should be adopted for all clinical FHIR resources.
* Work should be done to better align the status values used in the clinical resources (including clinicalStatus and verificationStatus) with SNOMED CT. Please note that this may result in a recommendation to add new concepts to the SNOMED CT context value hierarchies to support the associated clinical requirements.

## Condition Resource Recommendations

The following recommendations are made for the Condition resource:

* General
	+ Rules should be developed to clarify the interpretation of valid combinations of SNOMED CT context with values of clinicalStatus and verificationStatus. This may be made easier by adding new concepts to the 410514004 **|**Finding context value**|** subhierarchy that correspond to the suggested verificationStatus. For example:
		- **|**Provisional**|** could be considered as a new subtype of 415684004 **|**Suspected**|**
		- **|**Differential**|** could be considered as a new subtype of 410590009 **|**Known possible**|**
		- **|**Confirmed**|** could be mapped to **|**Confirmed present**|**
	+ The spelling of the word ‘Intolerance’ should be corrected in the ‘Boundaries and Relationships’ section when referring to the ‘AllergyIntolerance’ resource.
	+ Consider using SNOMED CT to define Condition.category. Please note that a valid relationship should exist between the Condition.code and the Condition.code. There is an argument for making Condition.category derivable from Condition.code.
	+ Consider whether any SNOMED CT attributes included in the SNOMED CT Expression Template from Section 3.3.2 should be added as data elements to this resource.
* Condition-code Value Set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|**

**MINUS** **<<** 473010000 **|**Hypersensitivity condition**|**

**MINUS** **<<** 79899007 **|**Drug interaction**|**

**MINUS** **<<** 69449002 **|**Drug action**|**

**MINUS** **<<** 441742003 **|**Evaluation finding**|**

**MINUS** **<<** 307824009 **|**Administrative status**|**

**MINUS** **<<** 385356007 **|**Tumor stage finding**|**

* + - *Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.*
	+ Based on the discussion under “Use of Condition.code”, the intensional value set definition should be extended to add missing concept hierarchies. For example to add:

**OR (<** 413350009 **|**Finding with explicit context**|**:

246090004 **|**Associated finding**|** **=**  **(<** 404684003 **|**Clinical finding**|** **MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|**

**MINUS** **<<** 473010000 **|**Hypersensitivity condition**|**

**MINUS** **<<** 79899007 **|**Drug interaction**|**

**MINUS** **<<** 69449002 **|**Drug action**|**

**MINUS** **<<** 441742003 **|**Evaluation finding**|**

**MINUS** **<<** 308540004 **|**Administrative status**|**

**MINUS** **<<** 385356007 **|**Tumor stage finding**|),**

408732007 **|**Subject relationship context**|** =

410604004 **|**Subject of record**|)**

**OR (<** 272379006 **|**Event**|**)

* + - *Note: If the value set is extended in the way suggested by “Use of Condition.code”, it is necessary to ensure that any 408729009 |Finding context| precoordinated in the Condition.code is consistent with appropriate values of clinicalStatus and verificationStatus.*
* Condition-severity Value Set
	+ An intensional definition for this value set should be considered, which includes all concepts in the valid range of the 246112005 **|**Severity**|** attribute. For example:
		- ***<*** *272141005* ***|****Severities****|***
		- *Note: This intensional value set definition provides a broad coverage of allowable values, which may be further specialized in specific implementations.*
* Condition-stage Value Set
	+ The HL7 FHIR and the HTA should consider whether or not it is necessary to request that staging concepts for other conditions (besides cancer) are added to the SNOMED CT international edition.
	+ A dependency may need to be defined between the Condition.code and the appropriate values for Condition.stage.
* Manifestation-or-symptom Value set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example (using the SNOMED CT Expression Constraint Language):

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 79899007 **|**Drug interaction**|**

**MINUS** **<<** 307824009 **|**Administrative status**|**

**MINUS** **<<** 385356007 **|**Tumor stage finding**|**

* + - Note: *Additional concepts (e.g. 420134006* ***|****Propensity to adverse reactions****|*** *and 473010000* ***|****Hypersensitivity condition****|****) may also be appropriate to exclude from the intensional definition.*
	+ It is recommended that **<** **|**History of X**|** concepts are also included in this value set for clinical coverage.
	+ The value sets bound to Condition.code and Condition.Evidence.code use the same intentional definition. However, one records manifestations and the other records symptoms. If there is a difference between these two value sets, then the definitions (both descriptive and computable) should be made more specific. If this is not possible, then why are these value sets different?
* Body-site Value Set
	+ Consider excluding the subhierarchy 4421005 **|**Cell structure**|** from the value set. For example:
		- **MINUS** 4421005 **|**Cell structure**|**
	+ Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**’ for the intensional value set definition to also include the acquired body structures (e.g. **|**Amputee stump**|**). If this is considered to be too general, then select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.

## Allergy Intolerance Resource Recommendations

The following recommendations are made for the Allergy Intolerance resource:

* General
	+ Rules should be developed to clarify the interpretation of SNOMED CT context with values of status. This may be made easier by adding some new concepts to the 410514004 **|**Finding context value**|** subhierarchy that correspond to the values of status (where possible).
	+ There is a potential for inconsistency between the values used for AllergyIntolerance.substance, AllergyIntolerance.reaction.substance and AllergyIntolerance.category. Rules should be developed to avoid inconsistency.
	+ Consider using SNOMED CT to define values for status, type, category, criticality, certainty and severity.
	+ Consider whether any SNOMED CT attributes included in the SNOMED CT Expression Template from Section 4.3.2 should be added as data elements to this resource.
* Allergy-intolerance-substance Value Set
	+ Consider whether the disorders, substances, and negation concepts should each be represented in separate data elements to keep the meaning of these elements distinct.
	+ Replace concepts that have been inactivated with the appropriate new concept. For example, replace 160244002 **|**No known allergies (situation)**|** with 716186003 **|**No known allergy (situation)**|**.
	+ Consider whether the value set used to represent negation concepts should include all descendants and self of 716186003 **|**No known allergy (situation)**|** - that is
		- **<<** 716186003 **|**No known allergy (situation)**|**
* Manifestation-code Value Set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example:

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 64572001 **|**Disease (disorder)**|**

**MINUS** **<<** 307824009 **|**Administrative status (finding)**|**

**MINUS** **<<** 69449002 **|**Drug action (finding)**|**

* + - *Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.*
	+ Consider whether or not some **<** 413350009 **|**Findings with explicit context**|** concepts should be included in this value set.
	+ Rules should be developed to clarify the interpretation when reaction.severity and reaction.substance are both populated separately and precoordinated in the reaction.manifestation.

## Procedure Resource Recommendations

The following recommendations are made for the Procedure resource:

* General
	+ The value **|**Not performed**|** should be added as a possible value of status, rather than defining this in a separate boolean data element – i.e. ‘notPerformed’ should be removed. Combining these two fields will reduce the risk of these being populated inconsistently.
	+ Rules should be developed to clarify the interpretation of SNOMED CT procedure context with values of status. For example, is “aborted” the same as 385657008 **|**Abandoned**|**? Or should a new concept **|**Aborted**|** be added as a subtype of 410545000 **|**Stopped before completion**|**.
	+ A clear relationship should be defined between the Procedure.category and the Procedure.code – for example:
		- Procedure.code **= <** [[+ $Procedure.category]]
	+ The spelling error in the ‘Display’ name for the code “aborted” (i.e. “aboted”) should be fixed.
	+ Consider using SNOMED CT to define values for status, device-action.
	+ Consider whether any SNOMED CT attributes included in the SNOMED CT Expression Template from Section 5.3.2 should be added as data elements to this resource.
	+ Consider splitting ‘usedCode’ into two separate data elements to match the SNOMED CT concept model – ‘usedDevice’ and ‘usedSubstance’.
* Procedure-category value set
	+ The scope and usage documentation of the Procedure resource states “Examples include surgical procedures, diagnostic procedures, endoscopic procedures, biopsies, counseling, physiotherapy, exercise, etc.” However, the example value set does not support all of these examples (e.g. physiotherapy and exercise). There are also potentially many other potential values for this value set. To support these uses, additional concepts from the Procedure hierarchy may be required. For example:
		- 363687006 **|**Endoscopic procedure**|**
		- 86273004 **|**Biopsy**|**
		- 91251008 **|**Physical therapy procedure**|**

A more general approach would be to support a broader concept domain that includes all relevant subhierarchies from the 71388002 **|**Procedure**|** hierarchy.

* Procedure-code value set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example:

**<** 71388002 **|**Procedure**|**

**MINUS** **<<**  **|**Administrative procedure (procedure)**|**

**MINUS** **<<** 389084004 **|**Staff related procedure (procedure)**|**

**MINUS** **<<** 432102000 **|**Administration of substance (procedure)**|** **OR** 18629005 **|**Administration of drug or medicament (procedure)**|**

Notes: 127785005 **|**Administration of substance to produce immunity, either active or passive (procedure)**|** is a subhierarchy of 432102000 **|**Administration of substance (procedure)**|** and 18629005 **|**Administration of drug or medicament (procedure)**|** which are already in the suggested excluded list above.

* + Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation (please refer to notes in section 5.4.2).
* Procedure-not-performed-reason Value Set
	+ There might be some redundancy in the list, e.g. what is difference between procedure discontinued and procedure stopped? Is the value “procedure not done” a valid ‘procedure-not-performed-**reason**’? The list should be reviewed to determine if the values are appropriate.
	+ The list should be reviewed to determine if any additional values should be added. For example, the value set includes 169649009 **|**Antenatal amniocentesis - not wanted (situation)**|** and 408837008 **|**Amniocentesis sample not obtained (situation)**|** but does not include “Amniocentesis contraindicated.” There are also a range of other reasons that a procedure may be not performed, including clinical findings such as 45007003 **|**Low blood pressure (disorder) **|**, 34014006 **|**Viral disease (disorder)**|** and Findings with Explicit Context such as  394967008 **|**Suspected asthma (situation)**|**. Stating that a procedure was contraindicated may not be enough information. In particular, what is the reason it was contraindicated?
	+ Body-site Value Set
		- Consider removing the subhierarchy 4421005 **|**Cell structure**|** from this value set.
		- Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**‘ for the intensional value set definition to include additional acquired body structures (e.g. **|**Amputee stump (body structure)**|**). Alternatively, select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.
	+ Procedure-reason Value Set
		- Review the intensional definition of this value set. This value set currently includes all concepts from two hierarchies (i.e., 404684003 **|**Clinical finding (finding)**|** and 71388002 **|**Procedure (procedure)**|**.
			* There are only a small set of cases in which one procedure may result in another procedure (e.g. a surgical procedure may result in a biopsy). Therefore, it is suggested that these outlying cases should be added in an extensional way. If this is not considered appropriate, then subhierarchies that are not relevant should be removed (e.g. **|**Administrative procedure**|**).
			* Some additional hierarchies may be needed. For example:
				+ 272379006 **|** Event (event)**|** hierarchy, specifically the 18019003 **|**Accidental event (event)**|** subhierarchy should be included in this value set.
				+ 9413000 **|**Finding suspected or known present (situation)**|** hierarchy should also be considered - e.g. a **|**Suspected appendicitis**|** could lead to an **|**Appendectomy**|** being performed, or a suspected disorder of some kind could lead to a biopsy being taken. Note that this content could be represented with precoordinated concepts and/or with post-coordinated expressions.
	+ Performer-role Value Set
		- The definition of a procedure in FHIR includes an activity performed by a patient, so limiting the value set to descendants of 223366009 **|**Healthcare professional (occupation)**|** may be inappropriate. The resource should clarify the value that should be used for the procedure-performer-role element when the procedure is performed by a patient.
		- Consider additions of the 444018008 **|**Person with characteristic related to subject of record (person)**|** subhierarchy and 410604004 **|**Subject of record (person)**|** to represent the patient and someone with a relationship to the patient as performer of a procedure.
	+ Procedure-outcome Value Set
		- It would be helpful if there was a definition of a successful procedure and unsuccessful procedure.
		- We recommend that the dependencies between the values of Procedure.outcome and Procedure.status is clarified. For example, if the procedure was not done, is the outcome “Procedure unsuccessful”?
	+ Condition-code Value Set (bound to Procedure.complication)
		- The intensional value set definition should exclude as many inappropriate concepts as feasible. For example:

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|**

**MINUS** **<<** 473010000 **|**Hypersensitivity condition**|**

**MINUS** **<<** 79899007 **|**Drug interaction**|**

**MINUS** **<<** 69449002 **|**Drug action**|**

**MINUS** **<<** 441742003 **|**Evaluation finding**|**

**MINUS** **<<** 307824009 **|**Administrative status**|**

**MINUS** **<<** 385356007 **|**Tumor stage finding**|**

* + - * *Note: Additional inappropriate concepts could be excluded by further restriction of the intensional definition, or by defining a compatible extensional value set for a specific implementation.*
	+ Procedure-followup Value Set
		- A subject matter expert should be consulted to add necessary content to this value set. We anticipate that many additional concepts will be needed. For example:
			* 18949003 **|**Change of dressing (procedure)**|** to 359825008 **|**Cytopathology, review of bronchioalveolar lavage specimen (procedure)**|**.
		- Clearly define what is meant by “follow up”, and the length of time which should be considered. Is this intended to cover only immediate follow up?

## Goal Resource Recommendations

The following recommendations are made for the Goal resource:

* General
	+ Consider using SNOMED CT to define values for status, statusReason and priority.
* Goal-start-event Value Set
	+ The concepts in the value set are from two different hierarchies (i.e. 71388002 **|**Procedure (procedure)**|** and 363787002 **|**Observable entity (observable entity)**|**. The Observable entity concepts in this value set should be replaced with procedure concepts, as their meaning is not appropriate for this value set. For example:
		- 442137000 **|**Completion time of procedure (observable entity)**|** refers to the observation of the time value at which the procedure was completed. It is not an event that triggers other actions. In this case, the Procedure with explicit context concept 443938003 **|**Procedure carried out on patient**|** (which has a procedure context of ‘done’) is more appropriate.
		- 386216000 **|**Childbirth (observable entity)**|** should be replaced with 236973005 **|**Birthing procedure**|**.
	+ Consider adding additional concepts from the Procedure, Clinical finding and Event hierarchies to support Goals that address the prevention of illness, cure or mitigation of a condition, prolongation of life, or mitigation of pain and discomfort (as stated in the ‘scope and usage’ documentation). For example:
		- 387713003 **|**Surgical procedure (procedure)**|**
		- 166831007 **|**Serum cholesterol very high (finding)**|**
		- 418019003 **|**Accidental event (event)**|**

## Observation Resource Recommendations

The following recommendations are made for the Observation resource:

* General
	+ Address the potential inconsistency created when the finding site is both precoordinated in the Observation.code and populated in the Observation.bodySite element. For example, an Observation code of **|**Heart rate**|** or **|**Eye color**|** with an Observation.bodySite of **|**Liver structure**|** would be inconsistent.
	+ Consider using SNOMED CT to define values for status, category, and interpretation.
	+ Consider whether any SNOMED CT attributes included in the SNOMED CT Expression Template from Section 7.3.2 should be added as data elements to this resource.
	+ The spelling error in the Scope and Usage section for Observation should be fixed. That is: “Laboratory Data llike blood glucose, or an estimated GFR.”
* Observation.code
	+ Consider the scope of the associated value set. For example:
		- The value set for this data element uses all of LOINC, which includes terms such as document codes (Human Prescription Drug Product) which are not in the scope of the FHIR Observation resource.
		- A large number of terms used in veterinary medicine have also been included.
		- The value set should also include those non-test measurements that are commonly required to interpret test results and are usually included as part of the report with the laboratory observations. Examples include:
			* for cervical pap smears, the phase of menstrual cycle or use of estrogens
			* for arterial blood gases, inspired oxygen
			* for drug concentrations used in pharmacokinetics, the dose
			* for a blood bank, the number of units dispensed
* Body-site Value Set
	+ Consider excluding the subhierarchy 116007004 **|**Combined site (body structure)**|** from the value set (e.g. 110522009 **|**Bone and joint (combined site) (body structure)**|**).
	+ Consider using ‘**<** 442083009 **|**Anatomical or acquired body structure (body structure)**|**’ as to include these additional acquired body structures (e.g. **|**Amputee stump (body structure)**|**). Alternatively, select specific concepts or subhierarchies of 280115004 **|**Acquired body structure**|** to add to the value set.
* Observation-method Value Set
	+ It is recommended that only SNOMED CT is used for this value set to (a) avoid alternative codes being used, and (b) to enable identification of inconsistencies between precoordinated concepts in the Observation.code.
	+ Consider using additional content from other subhierarchies of SNOMED CT. For example, 129264002 **|**Action (qualifier value)**|** which contains concepts like 312250003 **|**Magnetic resonance imaging - action (qualifier value) **|** and 386053000 **|**Evaluation procedure (procedure) **|** which contains concepts like 113091000 **|**Magnetic resonance imaging (procedure)**|**. If required concepts are not available in SNOMED CT, it is suggested that the HTA submits a request for their addition to IHTSDO’s international release.
	+ Define dependencies with LOINC codes used for Observation.code, to ensure that no inconsistencies are introduced.
* Referencerange-meaning Value Set
	+ The SNOMED CT copyright statement at 4.2.11.217.2 is placed above a list of codes which are not from SNOMED CT. Suggest moving this to 4.3.1.217.1, which refers to 3 SNOMED CT codes.
	+ Remove duplicate codes in different sub-value-sets (e.g. “Pre-puberty”)
	+ Use SNOMED CT for all sub-value-sets. Where required concepts are not available, HTA should request addition of this content to SNOMED CT.

## Family Member History Resource Recommendations

The following recommendations are made for the Family Member History resource:

* General
	+ Consider using SNOMED CT to define values for history status, family member and administrative gender.
* Condition-code Value Set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example:

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 69449002 **|**Drug action**|**

**MINUS** **<<** 307824009 **|**Administrative status**|**

* + If it is possible that a **<** 57177007 **|**Clinical finding**|** is used to populate FamilyMemberHistory.code, Condition.code (or similar data elements), the SNOMED CT template should be used to compare the two representations.
* Condition-outcome Value Set
	+ The intensional value set definition should exclude as many inappropriate concepts as feasible. For example:

**<** 404684003 **|**Clinical finding**|**

**MINUS** **<<** 420134006 **|**Propensity to adverse reactions**|**

**MINUS** **<<** 473010000 **|**Hypersensitivity condition**|**

**MINUS** **<<** 79899007 **|**Drug interaction**|**

**MINUS** **<<** 69449002 **|**Drug action**|**

**MINUS** **<<** 441742003 **|**Evaluation finding**|**

**MINUS** **<<** 307824009 **|**Administrative status**|**

* + Add concepts which are **<** 272379006 **|**Event**|**. For example: 419620001 **|**Death (event)**|**.
1. As described by Grahame Grieve in Montreal, May 2016. [↑](#footnote-ref-1)
2. Please note that the range of 408732007 **|**Subject relationship context**|** is currently **<<** 125676002 **|**Person**|**. However, it is proposed that this should be extended to support **<<**389109008|Group|, **<<** 385437003 |Institution|, **<<**49062001 |Device| and **<<**308916002 |Environment or geographic location|. [↑](#footnote-ref-2)
3. Note: the SNOMED CT International Request Submission (SIRS) system can be found at <https://sirs.nlm.nih.gov/>. For more information, please refer to http://www.ihtsdo.org/snomed-ct/change-or-add-snomed-ct. [↑](#footnote-ref-3)
4. Please note that the range of 408732007 **|**Subject relationship context**|** is currently **<<** 125676002 **|**Person**|**. However, it is proposed that this should be extended to support **<<**389109008|Group|, **<<** 385437003 |Institution|, **<<**49062001 |Device| and **<<**308916002 |Environment or geographic location|. [↑](#footnote-ref-4)
5. New concept required. [↑](#footnote-ref-5)
6. 160244002 |No known allergies| has been retired and moved to 716186003 |No known allergy| [↑](#footnote-ref-6)
7. Please note that the range of 408732007 **|**Subject relationship context**|** is currently **<<** 125676002 **|**Person**|**. However, it is proposed that this should be extended to support **<<**389109008|Group|, **<<** 385437003 |Institution|, **<<**49062001 |Device| and **<<**308916002 |Environment or geographic location|. [↑](#footnote-ref-7)
8. Please note that the range of 408732007 **|**Subject relationship context**|** is currently **<<** 125676002 **|**Person**|**. However, it is proposed that this should be extended to support **<<**389109008|Group|, **<<** 385437003 |Institution|, **<<**49062001 |Device| and **<<**308916002 |Environment or geographic location|. [↑](#footnote-ref-8)
9. Some new concepts will need to be added to support all the examples provided. [↑](#footnote-ref-9)
10. Please note that the range of 408732007 |Subject relationship context| is currently << 125676002 |Person|. However, it is proposed that this should be extended to support <<389109008|Group|, << 385437003 |Institution|, <<49062001 |Device| and <<308916002 |Environment or geographic location|. [↑](#footnote-ref-10)