



HL7 Version 3 Implementation Guide: Terminology - Using SNOMED CT in CDA R2 Models, Release 1

Draft Standard for Trial Use
December 2015

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SNOMED CT	International Healthcare Terminology Standards Developing Organization (IHTSDO) http://www.ihtsdo.org/snomed-ct/get-snomed-ct or info@ihtsdo.org
Logical Observation Identifiers Names & Codes (LOINC)	Regenstrief Institute
International Classification of Diseases (ICD) codes	World Health Organization (WHO)
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1 INTRODUCTION AND SCOPE

1.1 Purpose of the Guide

The purpose of this guide is to ensure that HL7 Version 3 standards achieve their stated goal of semantic interoperability when used to communicate clinical information that is represented using concepts from SNOMED Clinical Terms®² (SNOMED CT).

This version of the guide addresses use of SNOMED CT in the CDA Release 2 standard in particular. There are two primary reasons for this focus: (1) The current guidance in this ballot represents an incremental update from the prior DSTU (May 2009), as the CDA R2 standard (as a part of the HL7 V3 family) is based on versions of the RIM and Clinical Statement Pattern that are similar to those that were addressed in the prior DSTU; (2) CDA R2 represents a very important current use case of HL7 V3, as there is a great deal of CDA implementation activity occurring worldwide at present and likely for the foreseeable future (including Meaningful Use of Electronic Health Records in the US). Future guide versions are anticipated to expand the guidance related to other HL7 standards and terminologies.

1.2 Overview

This implementation guide has been developed by the HL7 TermInfo Project (a project of the HL7 Vocabulary Work Group) with significant contributions by the International Health Terminology Standards Development Organisation (IHTSDO). The guide is the result of a consensus process involving a wide range of interested parties who have contributed at various times over the span of the project.

- The HL7 Vocabulary and Structured Documents Work Groups
- The HL7 Clinical Statement Project
- Other current and past HL7 Technical Committees and Work Groups that have contributed to the project
- The IHTSDO, which took over ownership of SNOMED Clinical Terms in April 2007
- The IHTSDO Concept Model Working Group
- Vendors and providers actively implementing HL7 Version 3, including CDA R2, with SNOMED CT
- National Health Service (NHS) Connecting for Health in the United Kingdom
- A variety of other organizations and individuals who have contributed to the project or submitted ballot comments

The guide takes account of:

- The SNOMED CT Concept Model, including those elements concerned with the representation of context.

² More information: <http://ihtsdo.org/snomed-ct/>

- The structure and semantics of the HL7 Reference Information Model (RIM).
- The particular features of CDA R2, to which the guidance in this version of the TermInfo implementation guide is specifically addressed.

1.3 Future Work

Future versions of this guide are anticipated to add guidance for:

- Use of both Clinical and Laboratory LOINC within HL7 V3 and CDA R2
- Use of SNOMED CT and LOINC with HL7 V3 features that are not available in CDA R2
- Use of both SNOMED CT and LOINC in FHIR
- Use of both SNOMED CT and LOINC in HL7 V2.x

1.4 Intended Audience – Who Should Read This Guide?

The guide can be used in various ways to assist the design, evaluation, operational implementation and use of various types of software applications that use SNOMED CT. The intended audience includes systems developers, health informatics specialists, purchasers, and system integrators.

Software designers and developers

Software designers and developers should use this guide:

- To enhance their technical understanding of SNOMED CT and the value it offers to their applications;
- As a point of reference when designing a SNOMED CT enabled application and when planning and undertaking the required development.

Designers and developers of fully integrated applications should use the guide:

- As a checklist of SNOMED CT services necessary to meet the needs of their users;
- For advice on how to implement the required services in ways that make the best use of SNOMED CT and which known pitfalls to avoid.

Designers and developers of *terminology servers* should use the guide:

- As a checklist when deciding which SNOMED CT services their server should offer;
- For advice on ways to implement the required services in ways that make the best use of SNOMED CT and avoid known pitfalls;
- As a point of reference when describing the functionality of their server.

Designers and developers of applications that use terminology services should use the guide:

- As a checklist of SNOMED CT services necessary to meet the needs of their users;
- To assist consideration of whether to use a *terminology server*;
- As a point of reference when reviewing the functionality of *terminology servers*.

Health informatics specialists, analysts, purchasers and integrators

Health informatics specialists, analysts, purchasers and integrators should use this guide:

- To enhance their technical understanding of SNOMED CT and the value it offers to their organization;
- As a point of reference when specifying, procuring and evaluating SNOMED CT enabled applications.

Health informatics specialists analyzing the needs of users and organizations should use this guide:

- As a checklist of SNOMED CT services necessary to meet the needs of their users;
- For advice on known pitfalls when implementing clinical terminologies;
- To assist decisions on technical approaches to design and implementation of applications that use SNOMED CT.

Purchasers of healthcare information systems should use this guide:

- As a checklist when specifying procurement requirements for applications that use SNOMED CT;
- As a starting point for the evaluation of the SNOMED CT related technical features of the available systems.

Healthcare information systems integrators should use this guide:

- As a checklist for confirming the claimed functionality of SNOMED CT *enabled applications*;
- For advice on alternative approaches to integration of SNOMED CT related services into a wider information system.

Information systems departments and project teams should use this guide:

- As a checklist for the SNOMED CT related functionality needed to meet the requirements of their users;
- For advice on alternative approaches to delivery

Standards designers and developers

Standards designers and developers should use this guide:

- To enhance their technical understanding of the described standards and their relationship when implemented together.
- As a point of reference when updating or designing new artifacts including implementation guides.

1.5 Scope

The primary scope of this implementation guide is to provide guidance for the use of SNOMED CT in the HL7 V3 Clinical Statement Pattern, especially as used within the CDA R2 standard. The guide will be useful to those constructing content based on the Clinical Statement Pattern, representing clinical information from various HL7 domains including Structured Documents (CDA release 2), Patient Care, Orders and Observations and models using the Clinical Statement Common Message Element Types (CMET³).

The guidance in this document should also be applied to the use of SNOMED CT in other HL7 V3 models that share features with the Clinical Statement Pattern, unless domain specific requirements prevent this.

While other code systems (such as LOINC, ICD-9 and ICD-10) may be preferred or even required in some situations, these situations are outside the scope of this current version of the guide. Where a particular constraint profile requires the use of other code systems, that profile should complement and not contradict recommendations stated here.

1.6 How to read this document

Following this introduction (Section 1) this guide contains both normative and informative sections.

Section 1 (informative) covers the background, suggested audience and describes the documentation conventions used in the remainder of the document.

Section 2 (normative) provides detailed guidance on dealing with specific overlaps between RIM and SNOMED CT semantics. It contains normative recommendations for use of SNOMED CT in relevant attributes of various RIM classes including Acts, ActRelationships and Participations. It also contains a subsection providing recommendations on Context conduction. Each subsection consists of:

- A brief introduction to the item.
- An explanation of the potential overlap.
- A statement of rules and guidance on usage. Each normative rule is identified as a numbered conformance (CONF) statement.
- A supporting discussion and rationale.

³ The Clinical Statement CMET is a proposed replacement for the Supporting Clinical Information CMET which is based on the Clinical Statement pattern.

Section 3 (informative) provides a set of examples and patterns for representing common clinical statements. The approaches taken are consistent with the normative statements in Sections 2 and 5, as well as work being done within HL7 domain committees.

Section 4 (informative) describes normal forms, including their use with SNOMED CT. It also discusses considerations for transformations between various common representations and SNOMED CT or HL7 RIM based normal forms.

Section 5 (normative) contains a number of constraints on SNOMED CT concepts applicable to relevant attributes in each of the major classes in the Clinical Statement Pattern. These normative constraints are presented as a series of tables in section 5.3. Each constraint is identified as a numbered conformance (CONF) statement. This section also summarizes the benefits and weaknesses of the offered constraints.

Appendix A (informative) provides a general discussion of the potential overlaps between an information model and a terminology model and the pros and cons of various possible approaches to managing these overlaps.

Appendix B (reference) provides references to relevant documents including SNOMED CT specifications and also outlines the compositional grammar and expression constraint language used to express many of the examples in this document.

Appendix C (informative) notes the changes to this document since the last ballot draft.

The Glossary in Appendix D (informative) is a collection of abbreviations and terms used in this document with their respective definitions.

1.7 Documentation conventions

This document includes [hyperlinks](#) to external documents as well as to other sections within this document, which can be identified by the cited section number listed at the end of the reference, e.g. [§ B.3](#) for Appendix B Section 3.

In this document references to SNOMED CT concepts and expressions are represented using the SNOMED CT Compositional Grammar. An extension to this grammar (the SNOMED CT Expression Constraint Language) is used in this document to represent constraints on use of SNOMED CT concepts and expressions (for example, a common symbol used in the text is << preceding a value – it indicates that either the value or any subtype of the value is permitted). The convention used in this document for representing SNOMED CT compositional expressions is described in [§ 1.8.6](#).

It is recommended to review the material in SNOMED CT Compositional Grammar and Expression Constraint Language [§ B.3](#), together with references to the SNOMED CT source material related to the underlying logical model before reading the main part of this guide. Reviewing Table 12 (Summary of Expression Constraint Language) should be especially useful, as it provides the meaning of the symbols that are used in the constraint examples that are provided throughout this document.

Conformance statements, which are normative constraints on the CDA R2 and RIM structures, are specified in the normative sections of the guide (sections 2 and 5) and are uniquely identified at the end of the constraint (e.g., CONF:123). The conformance verbs (as specified in section 1.10) are highlighted using uppercase **BOLD** text. An example conformance statement is:

The Act.code attribute **SHOULD** permit the use of the Concept Descriptor (CD) data type (CONF:1).

1.8 Background

1.8.1 Semantic interoperability of clinical information

One of the primary goals of HL7 Version 3 is to deliver standards that enable semantic interoperability. Semantic interoperability is a step beyond the exchange of information between different applications that was demonstrated by earlier versions of HL7. The additional requirement is that a receiving application should be able to retrieve and process communicated information, in the same way that it is able to retrieve and process information that originated within its own application. To meet this requirement the meaning of the information communicated must be represented in an agreed upon, consistent and adequately expressive form.

Clinical information is information that is entered and used primarily for clinical purposes. The clinical purposes for which information may be used include care of the individual patient and support to population care. In both cases there are requirements for selective retrieval of information either from within a single patient record or from the set of records pertaining to the population being studied. Meeting these requirements depends on consistent interpretation of the meaning of stored and communicated information. This requires an understanding of the varied and potentially complex ways in which similar information may be represented. This complexity is apparent both in the range of clinical concepts that need to be expressed and the relationships between instances of these concepts. One way to organize information is in templates, which do not carry semantic meaning. The semantics must be communicated through the structure and vocabulary of the data itself.

Delivering semantic interoperability in this field presents a challenge for traditional methods of data processing and exchange. Addressing this challenge requires an established way to represent reusable clinical concepts and a way to express instances of those concepts within a standard clinical record, document or other communication.

1.8.2 Reference Information Model

The HL7 Version 3 Reference Information Model ([RIM](#)) provides an abstract model for representing health related information. The RIM comprises classes which include sets of attributes and which are associated with one another by relationships.

Documentation of RIM classes, attributes and relationships and the concept domains specified for particular coded attributes provide standard ways to represent particular kinds of information. The RIM specifies internal vocabularies for some structurally essential coded attributes but also supports use of external terminologies to express more detailed information. SNOMED CT is one of the external terminologies that may be used in HL7 communications.

1.8.3 Clinical Statements

The RIM is an abstract model and leaves many degrees of freedom with regard to representing a specific item of clinical information. The HL7 Clinical Statement project

has developed and is now maintaining a more refined model for representing discrete instances of clinical information and the context within which they are recorded.

The HL7 Clinical Statement Pattern is a refinement of the RIM, which provides a consistent structural approach to representation of clinical information across a range of different domains. However, neither the RIM nor the Clinical Statement Pattern place any limits on the level of clinical detail that may be expressed in a structured form. At the least structured extreme, an HL7 Clinical Document Architecture (CDA) document may express an entire encounter as text with presentational markup, without any coded clinical information. An intermediate level of structure might be applied when communicating a clinical summary with each diagnosis and operative procedure represented as a separate coded statement. Requirements for more comprehensive communication of electronic health records can be met by using the Clinical Statement Pattern to fully structure and encode each individual finding and/or each step in a procedure.

The Clinical Statement Pattern is the common foundation for the CDA Entries in HL7 Clinical Document Architecture release 2 and for the clinical information content of HL7 Care Provision messages. Details of the Clinical Statement Pattern can be found in the Universal Domains section of the [HL7 Version 3 Normative Edition](#). The clinical statement models used in CDA R2 are based on an early pre-publication version of the Clinical Statement Pattern (the closest available version is published in the [May 2005 ballot package](#) under Common Domains – available to members).

Even within the constraints of the Clinical Statement Pattern, similar clinical information can be represented in different ways. One key variable is the nature of the code system chosen to represent the primary semantics of each statement. The other key variable is the way in which overlaps and gaps between the expressiveness of the information model (clinical statement) and the chosen terminology are reconciled.

1.8.4 Data Types

HL7 has defined “abstract” data types for use in HL7 models, and these definitions have been revised. The two versions are known as Release 1 (R1) and Release 2 (R2) – details can be found in the [HL7 Version 3 Normative Edition](#). While R2 addresses concerns some users have had with the original version (R1), the R1 data type is normative for many existing specifications, including CDA R2. Of particular interest for this implementation guide is the Concept Descriptor (CD) data type (present in both versions), which is used for the representation of coded data (in SNOMED CT or other terminologies), and is the most general coded data type. The CD data types provide for the representation of post-coordinated expressions, although by different mechanism in the two versions.

The Data Types R1 specification, which is used by CDA R2 (and other earlier versions of V3), supports representation of post-coordination using “qualifier” elements (one or more) which encode attribute-value pairs that “qualify” (or modify) a primary concept (code) and are represented as an XML structure. Data Types R2 instead uses an arbitrary length string representation for the “code” attribute, which allows post-coordination to be represented by the grammar (if any) that is defined for that purpose by the terminology (code system) itself. In the case of SNOMED CT, this is the Compositional Grammar.

In this guide examples will be showing the use of both Data Types R1 and R2, with the R1 examples being directly applicable to use in CDA R2. Both data types can support

translation, though translation is not specifically in scope of TermInfo, as the translational mappings should be to the content represented in the respective data type, regardless of its representation⁴.

Example 1: Example of CD data type R1

```
<code code="239873007" codeSystem="2.16.840.1.113883.6.96"
  codeSystemName="SNOMED CT" displayName="Osteoarthritis of knee">
  <originalText>osteoarthritis of the right knee</originalText>
  <qualifier>
    <name code="272741003" codeSystem="2.16.840.1.113883.6.96"
      codeSystemName="SNOMED CT" displayName="Laterality"/>
    <value code="24028007" codeSystem="2.16.840.1.113883.6.96"
      codeSystemName="SNOMED CT" displayName="Right"/>
  </qualifier>
  <translation code="M17.9" codeSystem="2.16.840.1.113883.6.90"
    codeSystemName="icd10CM" displayName="Osteoarthritis of knee,
    unspecified"/>
</code>
```

Example 2: Example of CD data type R2

```
<code xsi:type="CD" code="239873007 |Osteoarthritis of knee|:272741003
  |Laterality| =24028007 |Right|" codeSystem="2.16.840.1.113883.6.96"
  codeSystemName="SNOMED CT">
  <originalText>osteoarthritis of the right knee</originalText>
  <translation code="M17.9" codeSystem="2.16.840.1.113883.6.90"
    codeSystemName="icd10CM" displayName="Osteoarthritis of knee,
    unspecified"/>
</code>
```

1.8.5 Coding and Terminologies

The scope of clinical information is very broad, and this, together with the need to express similar concepts at different levels of detail (granularity), results in a requirement to support a large number of concepts and to recognize the relationships between them.

Several candidate terminologies have been identified at national and international levels. HL7 does not endorse or recommend a particular clinical terminology. However, HL7 is seeking to address the issues raised by combining particular widely-used terminologies with HL7 standards.

This guide focuses on the issues posed by using SNOMED Clinical Terms® (SNOMED CT) with HL7 clinical statements. It includes specific advice on how to specify communications that use SNOMED CT to provide the primary source of clinical meaning in each clinical statement.

Although this guide is specifically concerned with SNOMED CT, it is likely that similar issues will be encountered when considering the use of other code systems within HL7 clinical statements. Therefore some of the advice related to general approaches to gaps and overlaps is more widely applicable.

⁴ The CD data type examples (#1 for R1 and #2 for R2) do include translation elements, for completeness.

1.8.6 SNOMED CT

SNOMED CT is a clinical terminology which covers a broad scope of clinical concepts to a considerable level of detail. It is one of the external terminologies that can and will be used in HL7 Version 3 communications. SNOMED CT has various features that add flexibility to the range and detail of meanings that can be represented. These features summarized below are documented in detail in documents listed in SNOMED CT Reference materials ([§ B.2](#)). The OID value that identifies SNOMED CT when used in HL7 V3 models (in CD and additional coded data types) is "2.16.840.1.113883.6.96".

SNOMED CT provides the capability of expressing compositional “expressions”, which are “a structured combination of one or more concept identifiers used to represent a clinical idea in a logical manner” (see the current version of the IHTSDO [SNOMED CT Compositional Grammar Specification and Guide](#)). The SNOMED CT Compositional Grammar syntax has been defined for representing these expressions. A convention adopted and used throughout this document for displaying compositional grammar and constraint expressions is to display the expression in blue Consolas font, e.g., `233604007 | Pneumonia |`.

1.8.6.1 Logical concept definitions

Each SNOMED CT concept has an associated set of one or more relationships to other concepts, and may be fully defined by these relationships (if the set of relationships is insufficient to fully define the concept, the concept is considered to be primitive). The following example illustrates the type of logical definitions that are distributed as part of SNOMED CT.

Example 3: SNOMED CT definition of 'fracture of femur'

```
(71620000 | Fracture of femur |) ===  
(46866001 | Fracture of lower limb |  
+ 7523003 | Injury of thigh |:  
{116676008 | Associated morphology | = 72704001 | Fracture |,  
363698007 | Finding site | = 71341001 | Bone structure of femur |})
```

Note: This example and many of the other illustrations in this document are expressed using the SNOMED CT compositional grammar. Where relevant this document also uses the Expression Constraint Language to represent constraints on use of SNOMED CT concepts and expressions. The Expression Constraint Language is explained in SNOMED CT Compositional Grammar and Expression Constraint Language ([§ B.3](#)), together with references to the SNOMED CT source material.

In the above example, the ‘===’ symbol represents a definition status of “equivalentTo” (i.e. “fully defined”), indicating that the concept on the left hand side is equivalent to (or fully defined by) the compositional grammar expression on the right hand side.

1.8.6.2 Formal rules for post-coordinated expressions

When a SNOMED CT concept is used to record an instance of information, it can be refined in accordance with the SNOMED CT Concept Model to represent more precise meanings.

- For example, it might be necessary to record a "compression fracture of the neck of the femur".

- SNOMED CT does not contain a concept identifier for this specific type of fracture at this precise location. However, the post-coordination rules allow refinement of the "finding site" and "associated morphology" attributes in the definition of the concept "fracture of femur" (see above example).
- Therefore the required information can be recorded by refining the concept "fracture of femur" with the site "neck of femur" and the morphology "compression fracture".

The result of a refinement is referred to as a *post-coordinated expression*. A post-coordinated expression conforms to the abstract logical model specified in the "SNOMED CT Compositional Grammar Specification and Guide" (see SNOMED CT Reference materials (§ B.2)). The same guide also specifies a compositional grammar for representing these expressions in a way that is both human-readable and computer-processable (see also SNOMED CT Compositional Grammar and Expression Constraint Language (§ B.3)). The example below uses this grammar to represent a post-coordinated expression for "compression fracture of neck of femur".

Example 4: Expression representing 'Compression fracture of neck of femur' in SNOMED CT compositional grammar

```
71620000 | Fracture of femur | :
116676008 | Associated morphology | =21947006 | Compression fracture |
,363698007 | Finding site | =29627003 | Structure of neck of femur |
```

These expressions can also be accommodated within the HL7 Concept Descriptor (CD) data type which may be applied to various coded attributes in HL7 specification. The SNOMED CT expression indicating a "compression fracture of neck of femur" can be represented as shown in the following example:

Example 5: Expression representing 'Compression fracture of neck of femur' in CD data type

CD data type R1 (used in CDA R2)

```
<code code="71620000" codeSystem="2.16.840.1.113883.6.96"
  displayName="fracture of femur">
  <originalText>Compression fracture of neck of femur</originalText>
  <qualifier>
    <name code="363698007" displayName="Finding site"/>
    <value code="29627003" displayName="Structure of neck of
      femur"/>
  </qualifier>
  <qualifier>
    <name code="116676008" displayName="Associated morphology"/>
    <value code="21947006" displayName="Compression fracture"/>
  </qualifier>
</code>
```

CD data type R2

```
<code code="71620000 | Fracture of femur |:116676008 | Associated
  morphology | =21947006 | Compression fracture |,363698007 |
  Finding site | =29627003 | Structure of neck of femur |"
  codeSystem="2.16.840.1.113883.6.96">
  <originalText>Compression fracture of neck of femur</originalText>
</code>
```

1.8.6.3 A logical model for representation of semantic context

SNOMED CT "clinical finding" and "procedure" concepts have assumed (default) contexts which apply if they are used in a record without an explicit context.

1.8.6.3.1 Default context

- The default context for a [404684003 | Clinical finding](#) | is that the finding is asserted to be present in the person who is the subject of the record at the current time (or at a specified time).
 - E.g. When the concept [233604007 | Pneumonia](#) | is used in a clinical record it is assumed to mean that pneumonia was found to be present in the subject of the record either at an explicitly stated effective time or at the current time when the statement was made.
- The default context for a [71388002 | Procedure](#) | is that the procedure is asserted to have been done to the person who is the subject of the record, at the current time (or at a specified time).
 - E.g. When the concept [80146002 | Appendectomy](#) | is used in a clinical record it is assumed to mean that an appendectomy was done on the subject of the record either at an explicitly stated effective time or at the current time when the statement was made.

1.8.6.3.2 Overwriting default context

- The default context for a [404684003 | Clinical finding](#) | can be overridden by an explicit representation of context. Alternative contexts include:
 - Finding contexts such as: present, absent, unknown, goal, risk, etc.
 - Subject relationship contexts such as: family member, mother, father, sibling, contact, etc.
 - Temporal contexts such as: past, current, recent, etc.
- The default context for a [71388002 | Procedure](#) | can be overridden by an explicit representation of context. Alternative contexts include:
 - Procedure contexts such as: requested, planned, in progress, done, not done, not to be done, etc.
 - Subject relationship contexts: as above for findings
 - Temporal contexts: as above for findings.

- Explicit context may be represented either in a pre-coordinated form using a `<243796009 | Situation with explicit context |` or by using a post-coordinated expression.

1.8.6.3.2.1 Using Pre-coordination to overwrite default context:

- The following concepts provide examples of pre-coordinated concepts that include explicit context:
 - `297243001 | Family history of pernicious anemia |`
 - `399211009 | Past history of myocardial infarction |`
 - `160274005 | No family history diabetes |`
 - `168748001 | Mammography requested |`
- No pre-coordinated concept exists for “Patient has goal of being able to walk”

1.8.6.3.2.2 Using Post coordination to overwrite default context:

- The following expressions illustrate ways in which in post-coordination can be applied to represent explicit context:
 - `281666001 | Family history of disorder |: 246090004 | Associated finding | = 84027009 | Pernicious anemia |`
 - `417662000 | Past history of clinical finding |: 246090004 | Associated finding | = 22298006 | Myocardial infarction |`
 - `281666001 | Family history of disorder |: 408729009| Finding context | = 410516002 | Known absent |, 246090004 | Associated finding | = 73211009 | Diabetes mellitus |`
 - `129125009 | Procedure with explicit context | : 363589002 | Associated procedure |= 71651007 | Mammography |: 408730004 | Procedure context | = 385644000 | Requested |`
 - `413350009 | Finding with explicit context |: 246090004 | Associated finding | = 282144007 | Able to walk |, 408729009 | Finding context | = 410518001 | Goal |`

1.8.6.3.2.3 Example in CDA R2:

Example 6: Family history of pernicious anemia (CDA R2)

```
<section>
  <templateId root="2.16.840.1.113883.10.20.22.2.15" extension="2014-06-09"/>
  <code code="10157-6" codeSystem="2.16.840.1.113883.6.1" displayName="Family History"/>
  <title>Family History</title>
  <text>
    <paragraph>Patient has a family history of <content ID="FHGenericIprob">heart disease</content>.</paragraph>
  </text>
  <entry>
    <organizer classCode="CLUSTER" moodCode="EVN">
      <templateId root="2.16.840.1.113883.10.20.22.4.45" extension="2014-06-09"/>
      <id root="01faa204-3333-4610-864f-cb50b650d0fa"/>
      <statusCode code="completed"/>
      <subject>
        <relatedSubject classCode="PRS">
```



```

        <code code="FAMMEMB" codeSystem="2.16.840.1.113883.5.111"
codeSystemName="HL7 RoleCode" displayName="Family Member"/>
    </relatedSubject>
</subject>
<component>
    <observation classCode="OBS" moodCode="EVN">
        <templateId root="2.16.840.1.113883.10.20.22.4.46" extension="2014-06-
09"/>
        <id root="02faa204-3333-4610-864f-cb50b650d0fa"/>
        <code code="75315-2" codeSystem="2.16.840.1.113883.6.1"
displayName="Condition Family Member"/>
        <statusCode code="completed"/>
        <effectiveTime nullFlavor="UNK"/>
        <value xsi:type="CD" code="84027009"
codeSystem="2.16.840.1.113883.6.96" displayName="Pernicious anemia">
            <originalText>
                <reference value="#FHGenericIprob"/>
            </originalText>
        </value>
    </observation>
</component>
</organizer>
</entry>
</section>

```

Depending on how the information model is set up, selection of pre-coordination or post-coordination using the terminology or the information model is important. For example, where the information model supports the use of qualifiers, pre-coordination of concepts that overlap with said qualifiers should be disallowed.

1.8.6.4 Transformation and comparison of alternative representations

SNOMED CT expressions can be compared by applying "normal form" transformations that make use of logical concept definitions. These transformations generate the same normal form when applied to two expressions that logically have the same meaning. For more information on transformation to normal forms refer to Normal Forms [\[§4\]](#).

- When the transformation rules are applied to either of the following two expressions:
 - 297243001 | Family history of pernicious anemia |
 - 281666001 | Family history of disorder | : 246090004 | Associated finding | = 84027009 | Pernicious anemia |
- The following normal form is generated:
 - 243796009 | Situation with explicit context | :
 - { 246090004 | Associated finding | = 84027009 | Pernicious anemia |,
 - 408729009 | Finding context | = 410515003 | Known present |,
 - 408731000 | Temporal context | = 410512000 | Current or specified |,
 - 408732007 | Subject relationship context | = 303071001 | Person in the family | }

This means that these two expressions are equivalent (i.e. they mean the same thing, and are computably substitutable), as they transform to the same normal form.

1.8.6.5 Potential conflicts when using SNOMED CT within HL7

The expressivity of SNOMED CT is one of its strengths. However this also leads to cases where overlaps may occur with semantics that may also be represented by an information model such as the HL7 RIM. For example:

- A single SNOMED CT coded expression can represent a meaning that the HL7 RIM could also represent using a combination of several coded attributes or related classes;
- HL7 RIM semantics may modify the default assumptions about the meaning of a SNOMED CT expression;
- HL7 RIM semantics may contradict the meaning expressed by a SNOMED CT expression.
- There may be mis-alignment in understanding or perspective between otherwise similar HL7 RIM and SNOMED CT elements.
 - For example, the RIM definition of the PROC (procedure) class code states that procedure is “An Act whose immediate and primary outcome (post-condition) is the **alteration of the physical condition of the subject**” (emphasis added). The SNOMED CT Procedure hierarchy, on the other hand, encompasses a broader range of concepts, many of which do not result directly in any physical alteration of the subject – including, for example, “Administrative procedure” and “Patient education” (and their subtypes).

There is a requirement for clear rules and guidance on these overlaps to minimize the risk that alternative representational forms, may lead to duplication, ambiguity and erroneous interpretation.

1.8.7 Guidance

This guide identifies gaps between the SNOMED CT terminology model and the HL7 RIM model and areas in which they overlap as a potential source of inconsistency and variability in representation. Both overlaps and gaps will require identification and then either adjustments to the information model or terminology model (but ideally not both at the same time) in order to be addressed. Bridging gaps may require new functionality, while overlaps can be managed by adjusting how the information and terminology models are used together to meet the common goal of semantic interoperability. Gaps will be identified as the standards are implemented, and are not specifically addressed further in this document. Identified gaps should be reported back to the appropriate standards organizations (e.g., HL7, IHTSDO, etc.).

The guide identifies options for use of SNOMED CT concepts, in both pre and post-coordinated forms in various attributes of HL7 RIM classes. The primary focus is on the RIM class clones used in the HL7 Clinical Statement Pattern. However, the general principles of the advice are also applicable to many RIM class clones used in constrained information models that form part of other HL7 specifications and standards.

In some situations, the features of HL7 Version 3 and SNOMED CT dictate a single way to utilize these two models together. Where this is true, the guide contains a single

recommended approach which is normative, based on referenced pre-existing standards.

In other situations, there are several possible ways to combine HL7 and SNOMED CT to resolve a gap or an overlap. In these cases, the advantages and disadvantages of each option are evaluated. The next section explains the criteria used in this evaluation.

1.9 Requirements and Criteria

The intent of this section is to describe the requirements and criteria used to weigh various instance representations in order to arrive at the recommendations in this specification.

As discussed above, there are situations where there are several possible ways to combine HL7 and SNOMED CT to resolve a gap or an overlap. In these cases, the advantages and disadvantages of each option are evaluated using the criteria stated here. The guide recommends against approaches that have a disproportionate balance of disadvantages and are unlikely to deliver semantic interoperability. In some cases, the guide contains advice on several alternative approaches and the recommended approach may be based on prior implementation in accordance with criterion 4 below.

The following criteria have been identified to address these requirements:

1. Understandable, Reproducible, Useful: Normative statements and recommendations in this guide:
 - Must be widely understandable by implementers who are familiar with the use of SNOMED CT and HL7 V3.
 - Must be able to be applied consistently.
 - Must cover common scenarios, but need not cover all conceivable cases of SNOMED CT/HL7 overlap.
2. Transformable into a common "Model of Meaning": Normative statements and recommendations in this guide should result in instance representations that can be converted, by following a set of computationally tractable rules, into a single normal form (known as the "Model of Meaning").⁵
 - Where this implementation guide supports multiple representations of the same meaning, they are all transformable (using appropriate procedures/tooling) to one another and/or into a single Model of Meaning.
 - Representations that can be reused consistently in many contexts (problem list, family history, chief complaint, medical history, documentation of findings, final diagnosis, etc.) are preferred to representations that are specific to a particular context.
 - Representation of data, precisely in the form in which it was captured in the application of origin (also referred to as the "Model of Use"), is not

⁵ See the IHTSDO Glossary entry for http://ihtsdo.org/fileadmin/user_upload/doc/en_us/gl.html?t=glscct_cm_ModelOfMeaning

recommended unless the representation is transformable into a common Model of Meaning.

3. Practical: Tractable tooling/data manipulation requirements
 - We can confirm with tools that an instance conforms to the recommendations.
 - Existing tools and applications, either in their current form or with reasonable enhancements, can produce the recommended instances.
 - Model does not require a combinatorial explosion of pre-coordinated concepts. For example, the model should not require the creation of the cross product of "Allergic to" and all drugs and substances.
4. Not superfluous: Where more than one approach appears to be viable and broadly equal in respect of the criteria above a single approach is recommended to avoid unnecessary divergence.
 - Where one approach has already been successfully implemented and the other has not, the implemented approach is recommended.
 - Optionality is restricted where possible to simplify the delivery of semantic interoperability.

1.10 Asserting Conformance to this Implementation Guide

This specification defines constraints on the use of SNOMED CT in an HL7 CDA R2 or other V3 instance. HL7 V3 provides a mechanism to reference a template or implementation guide that has been assigned a unique identifier, by referencing the guide's identifier in the InfrastructureRoot.templateId field. The formal identifier for this guide is '2.16.840.1.113883.10.5'.

The following example shows how to formally assert the use of this implementation guide. Use of the templateId indicates that the HL7 V3 instance not only conforms to the base specification, but in addition, conforms to constraints specified in this implementation guide.

Example 7: Use of the templateId element to assert conformance to this guide

```
<V3Instance>  
  <templateId root='2.16.840.1.113883.10.5' />  
  ...  
</V3Instance>
```

The format used for the conformance statements (normative constraints) in this guide is described in section 1.7.

Note: The normative constraints are expressed in a technology-neutral formalism. The key words "**SHALL**", "**SHALL NOT**", "**SHOULD**", "**SHOULD NOT**", "**MAY**", and "**NEED NOT**" in this document are to be interpreted as described in the HL7 Version 3 Publishing Facilitator's Guide (available to members at the [HL7 ballot site](#)).

2 GUIDANCE ON OVERLAPS BETWEEN RIM AND SNOMED CT SEMANTICS

2.1 Introduction

When used together, SNOMED CT and HL7 often offer multiple possible approaches to representing the same clinical information. This need not be a problem where clear rules can be specified that enable transformation between alternative forms. However, unambiguous interpretation and thus reliable transformation depends on understanding the semantics of both the RIM and SNOMED CT and having guidelines available to manage areas of overlap or apparent conflict.

Note: See [Appendix A](#) (General Options for Dealing with Potential Overlaps) for further information on overlaps in semantics between an information model and a terminology model and discussion of the advantages and disadvantages of requiring, prohibiting or allowing either or both of two overlapping forms of representation. This discussion forms the basis for the rules and guidance provided in this chapter for the specific RIM attributes.

Table 1: Key to phrases used in this section

Phrase	Meaning	Examples
<i>[RimClass]</i> class	The HL7 Version 3 Reference Information Model class named <i>[RimClass]</i> .	"Act class" - refers to the RIM class Act as specified in the RIM.
<i>[RimClass]</i> class specialization	Any class in the RIM that is a specialization of the named <i>[RimClass]</i> .	"Act class specialization" - refers to any RIM class that is modeled as a specialization of Act in the RIM. For example, the "Observation class".
<i>[RimClass]</i> class clone	A class in a constrained information model (e.g. an DMIM, RMIM, HMD or template) that is derived from one of the following: <ul style="list-style-type: none"> the named <i>[RimClass]</i> a <i>[RimClass]</i> class specialization 	"Observation class clone" - refers to any design time constraint on the Observation class. This may be part of a domain model, a message design specification or a template.

<p><i>[RimClass]</i> class instance</p>	<p>An instance of information structured in accordance with one of the following:</p> <ul style="list-style-type: none"> • the named <i>[RimClass]</i> • a <i>[RimClass]</i> class specialization • a <i>[RimClass]</i> clone. 	<p>"Act class instance" - refers to an instance of run time information structured in accordance with either the Act class or any specialization or constraint applied to the Act class.</p>
<p><i>[RimClass].[Attribute]</i></p>	<p>The named <i>[Attribute]</i> in any of the following:</p> <ul style="list-style-type: none"> • the named <i>[RimClass]</i> • a <i>[RimClass]</i> class specialization • a <i>[RimClass]</i> clone • a <i>[RimClass]</i> instance 	<p>"Act.code" refers the "code" attribute of either the Act class itself or of an Act class specialization (.e.g. Observation, Procedure). In contrast, "Observation.code" refers specifically to the "code" attribute of an Observation class.</p>
<p>SNOMED CT expression</p>	<p>A structured combination of one or more SNOMED CT concept identifiers used to represent a clinical meaning.</p>	<p>See the examples for "Pre-coordinated expression" and "Post-coordinated expression" in the following two rows.</p>
<p>Pre-coordinated expression</p>	<p>A SNOMED CT expression containing only one SNOMED identifier. In an HL7 attribute any of the coded data types can be used to represent a pre-coordinated expression.</p>	<pre><code code="370221004" displayName="Severe asthma" codeSystem="2.16.840.1.113883.6.96"/></pre>

Post-coordinated expression	A SNOMED CT expression containing more than one SNOMED identifier. In an HL7 attribute the Concept Descriptor (CD) data type is used to represent a post-coordinated expression.	<pre> <code code="195967001" displayName="Asthma" codeSystem= "2.16.840.1.113883.6.96"> <qualifier> <name code="246112005" displayName="Severity" codeSystem= "2.16.840.1.113883.6.96"/> <value code="24484000" displayName="Severe" codeSystem= "2.16.840.1.113883.6.96"/> </qualifier> </code> </pre>
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2.2 Attributes

2.2.1 Act.classCode

The Act.classCode is a structural code which specifies the general nature of the Act. Its values are drawn from the HL7 ActClass code system.

2.2.1.1 Potential Overlap

The RIM definition of Act.classCode is “The major class of Acts to which an Act-instance belongs”. Accordingly, Act.classCode has the effect of specializing the Act class, and therefore it also necessarily constrains the concept domains that apply to other coded attributes of that class (particularly Act.code). If a SNOMED CT expression is used to encode the value of Act.code or any of the coded attributes of the class, the meaning of the expression must be appropriate to the constrained conceptual space that is established by the value of Act.classCode (which should also be consistent with the vocabulary binding to a particular concept domain or value set).

2.2.1.2 Rules and Guidance

The concept domain constraints applicable to specific SNOMED CT encoded attributes of different HL7 classes are specified in SNOMED CT Concept Domain Constraints ([§ 5](#)).

2.2.1.3 Discussion and Rationale

The rationale for the concept domain constraints applicable to particular HL7 classes are discussed in SNOMED CT Concept Domain Constraints ([§ 5](#)).

2.2.2 Act.code (applicable to all Act class specializations)

The Act.code represents a refinement of the Act.classCode and expresses the specific nature of the Act.

2.2.2.1 Potential Overlap

A SNOMED CT expression can be used in the Act.code to represent the nature of the action (e.g. using concepts from the Procedure hierarchy).

2.2.2.2 Rules and Guidance

The following rules are intended to support validation and consistent interpretation of the Act.code attribute where SNOMED CT is used.

1. In a constrained information model or template that permits or requires the use of SNOMED CT to represent the nature of an Act class clone:
 - a. The Act.code attribute **SHOULD** permit the use of the Concept Descriptor (CD) data type (CONF:1).
 - i. This is required to allow inclusion of post-coordination where appropriate (via qualifiers in CDA R2 using the R1 CD data type, and full compositional grammar expressions with the R2 CD data type).
 - b. The Act.code attribute **MAY** be constrained to an HL7 data type that prohibits qualifiers, only if there is known to be no requirement for representation of meanings that might require the use of post-coordinated expressions (CONF:2).
2. In an Act class instance where the Act.code attribute is a SNOMED CT expression:
 - a. The expression **SHOULD** represent a <363787002 | Observable entity | or <71388002 | Procedure |, with application of the SNOMED CT Context Model when appropriate (CONF:3).

2.2.2.3 Discussion and Rationale

The use of Act.code in Act class specializations other than Observation is generally straightforward, as described above.

Note: Additional guidance for the Observation class (a specialization of Act) is provided below in section [2.2.3](#).

2.2.3 Observation.code and Observation.value

Follow section [2.2.2.2 Rules and Guidance](#) when using SNOMED CT in the Act.code attribute of Act class specializations other than Observation. This section (2.2.3) provides additional guidance for using SNOMED CT in the Observation.code and Observation.value attributes.

2.2.3.1 Potential Overlap

A SNOMED CT expression (a single concept identifier, or, when required, a post-coordinated expression) can be used in Observation.code to represent the nature of the observation (using concepts from the Observable entity or Procedure hierarchy). For specific implementations it is often preferred to constrain the Observation.code value set to a predefined set of pre-coordinated concepts.

In cases where an observation results in a non-numeric result this can also be represented using a SNOMED CT expression. Actions involving measurement of a quantity or observation of a specified quality can readily be represented using this pair of attributes. The SNOMED CT context model may be applied to Clinical findings.

Some kinds of observation are typically expressed in a way that does not specify the observation action but merely asserts a result (or finding). In these cases the asserted result is fully specified and does not require a detailed indication of the action taken (e.g. "abdomen tender", "past history of renal colic", etc.). SNOMED CT supports representation of these assertions in a single expression using concepts from the [<404684003 | Clinical finding |](#) and [<413350009 | Finding with explicit context |](#) hierarchies.

Several different ways of representing the same information exist using different combinations of the Observation.code and Observation.value. Unconstrained use of the alternatives presents a major challenge for computation of semantic equivalence and for safe interpretation of observations originating from different applications and users. For example the following instances could reasonably represent the same case:

- `<observation>`
 `<code code=[Examination]/>`
 `<value code=[Abdomen tender]/>`
 ...
`</observation>`
- `<observation>`
 `<code code=[Abdominal examination]/>`
 `<value code=[Tenderness]/>`
 ...
`</observation>`
- `<observation>`
 `<code code=[Abdominal tenderness]/>`
 `<value code=[found]/>`
 ...
`</observation>`

Note: this last example is violating TermInfo recommendations.

2.2.3.2 Rules and Guidance

The following rules are intended to support validation and consistent interpretation of particular combinations of the Observation.code and Observation.value attributes where SNOMED CT is used. The general rules and guidance for the use of Act.code also apply, as described above in section [2.2.2.2](#).

The guidance is divided into separate “Recommended (normative) rules” and “Deprecated or non-recommended forms” sub-sections. Complying with the “recommended” rules is expected (and certainly preferred) for new implementations. For existing implementations, it may be necessary to continue use of one or more of the “deprecated or non-recommended” rules for various reasons – including, for example, backward compatibility and/or regulatory requirements.

2.2.3.2.1 Recommended (normative) rules

1. In a constrained information model or template that permits or requires the use of SNOMED CT to represent the result of an Observation class clone:

- a. The vocabulary constraint contained in the vocabulary declaration of the Observation.code attribute **SHALL** permit the use of the code "ASSERTION" (from the HL7 ActCode code system [2.16.840.1.113883.5.4]) (CONF:4) (see *Example 10*).
 - b. The Observation.value attribute **SHOULD** permit the use of the Concept Descriptor (CD) data type (CONF:5) (see *Example 10*).
 - i. This is required to allow inclusion of post-coordination where appropriate (via qualifiers in CDA R2 using the R1 CD data type, and full compositional grammar expressions with the R2 CD data type).
 - c. The Observation.code and Observation.value attributes **MAY** be constrained to a data type that prohibits qualifiers, only if there is known to be no requirement for representation of meanings that might require the use of post-coordinated expressions (CONF:6).
2. In an Observation class instance where the Observation.code attribute is a SNOMED CT expression:
 - a. The expression **SHOULD** represent a [<363787002 | Observable entity |](#) or [<386053000 | Evaluation procedure |](#), with application of the SNOMED CT Context Model when appropriate (CONF:7) (see *Example 9*)⁶.
 3. In an Observation class instance where the Observation.code is the HL7 code "ASSERTION" and the Observation.value is represented by a SNOMED CT expression:
 - a. The value concept represented **SHALL** be a [<404684003 | Clinical finding |](#), [<413350009 | Finding with explicit context |](#) or [<272379006 | Event |](#), with application of the SNOMED CT Context Model when appropriate (CONF:8) (see *Example 10*).
 4. An Observation class instance in which the Observation.value is a SNOMED CT expression representing a [<404684003 | Clinical finding |](#) or a [<413350009 | Finding with explicit context |](#) **SHALL NOT** contain an Observation.code which when interpreted with the Observation.value yields a meaning that is substantially different from the meaning implied if the Observation.code was "ASSERTION" (CONF:9).
 - a. For example, an Observation.code meaning "Past history" or "Family history" may substantially alter the interpretation of a [<404684003 | Clinical finding |](#) and should not be used in this way. Instead the SNOMED CT context model should be used to capture these significant differences in meaning.

⁶ Although C-CDA is technically out of scope for this document, it is worth noting that the Consolidated CDA (C-CDA) R1.1 Problem Observation template requires that Observation.code be chosen from the Problem Type value set (2.16.840.1.113883.3.88.12.3221.7.2), which violates this rule by including mostly SNOMED CT "finding" and "disorder" concepts from the "Clinical findings" hierarchy.

2.2.3.2.2 Deprecated or non-recommended forms

1. In an Observation class instance where the Observation.code attribute is a SNOMED CT expression representing a [<404684003 | Clinical finding |](#) or [<413350009 | Finding with explicit context |](#), if the Observation.value is omitted, the Observation **SHALL** be interpreted as semantically equivalent to the same SNOMED CT expression in the Observation.value attribute with the Observation.code "ASSERTION" (see point 3 above) (CONF:10).
 - a. This deprecated form of representation is permitted to support backward compatibility with existing implementations.
 - b. For example:
 - i. `<observation><code code="195967001 | Asthma |"/>...</observation>`
 - ii. is treated as equivalent to
 - iii. `<observation><code code="ASSERTION"/><value code="195967001 | Asthma |"/>...</observation>`
2. An Observation class instance in which the Observation.code is a SNOMED CT expression representing a [<404684003 | Clinical finding |](#) or [<413350009 | Finding with explicit context |](#) **SHALL NOT** contain an Observation.value attribute (CONF:11).
 - a. If a value attribute is applied to a [<404684003 | Clinical finding |](#) there are multiple possible interpretations of what that value means. For example, the possible meanings of a value applied to a clinical finding such as [195967001 | Asthma |](#), [195114002 | Acute left ventricular failure |](#) or [254838004 | Carcinoma of breast |](#) might include severity, stage, duration, certainty, presence or absence. Thus in this context, the meaning of the value is ambiguous and open to misinterpretation. Furthermore, such misinterpretation might fundamentally alter the intended meaning. The SNOMED CT Concept Model and HL7 attributes provide ways to explicitly state these nuances of meaning. Therefore use of the non-specific value attribute is not appropriate.
 - b. In contrast, a value applied to an [<363787002 | Observable entity |](#) clearly represents the observed quantitative or qualitative value of the specified entity. Similarly a value applied to a [<386053000 | Evaluation procedure |](#) clearly represents the quantitative or qualitative result of that measurement.
3. An Observation class instance in which the Observation.value is a SNOMED CT expression representing a [<404684003 | Clinical finding |](#) or a [<413350009 | Finding with explicit context |](#) **MAY** contain an Observation.code other than "ASSERTION" provided that the interpretation of the Observation.code together with the Observation.value does not yield a meaning that is substantially different from the meaning implied if the Observation.code was "ASSERTION" (CONF:12).

- a. Observations of this type **SHOULD** be interpreted as having a meaning that is equivalent to the meaning of the same Observation.value when used with the Observation.code "ASSERTION" (CONF:13).
- b. This deprecated form of representation is permitted to support backward compatibility with existing implementations.
- c. For example:
 - i. `<observation><code code="225162003 | Examination of abdomen |"/><value code="43478001 | Abdominal tenderness |"/>...</observation>`
 - ii. does **not** differ significantly from the asserted observation ...
 - iii. `<observation><code code="ASSERTION"/><value code="43478001 | Abdominal tenderness |"/>...</observation>`
- d. In addition, the same Observation class instance can separately be interpreted to determine that an "abdominal examination" was carried out.
 - i. In the preferred representation this information would be expressed in a separate Observation class instance because it relates to a general examination procedure which may have resulted in several distinct assertions.

2.2.3.3 Discussion and Rationale

In some cases the way that the Observation.code and Observation.value attributes are populated and interpreted has led to extensive discussions which are summarized below.

A clinical record consists of statements related directly or indirectly to the health of a patient. Some statements relate to actions taken or requested as part of the provision of care. These actions may include procedures, investigations, referrals, encounters, supply and administration of medication. In the case of these statements, SNOMED CT expressions representing `<71388002 | Procedure |` concepts provide appropriate content for the Observation.code attribute of the relevant Observation class specialization.

Other statements in a clinical record relate to information found or derived in a variety of ways during the delivery of care. These statements can be referred to as "statements about clinical findings". The way in which "statements about clinical findings" are represented has been a source of considerable discussion within HL7. This discussion focuses on the way in which the coded representation of such statements is expressed in the Observation.code and Observation.value attributes of the Observation class.

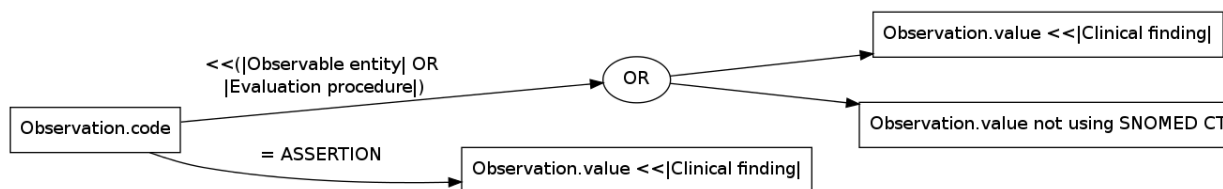


Figure 1: Options for Observation.code

Statements about clinical findings can be divided into two categories.

A) Statements about findings in which two facets are clearly distinct

- (1) The action taken to make the finding (and/or the property about which the property was observed)
- (2) The result of the observation

Examples:

- *Measurement of blood hemoglobin (1) = 14 g/dl (2)*
 - This example follows the formal RIM semantics.
- *Body weight (1) = 75 Kg (2)*
 - This example is not in line with strict interpretation of the formal RIM definition in which the Observation.code is the action taken to make the observation. However, it is a more familiar form in real-world clinical statements about many observations. A possible bridge between these two views is to regard the name of the property observed (e.g. [27113001 | Body weight |](#)) as implying the action to measure or observe that property (e.g. [39857003 | Weighing patient |](#)).

B) Statements about findings that are often captured as a single “nominalized” expression

- The term "nominalized" is used to indicate a statement reduced to a single name (or term) which can then be coded as a single expression.
- The fact that a statement is often nominalized does not mean it consists of a single atomic item of information. Many such statements can be readily divided into several identifiable facets. However, unlike statements of type A, there are different views on how the semantics of the facets of these statements might be divided between the “code” and/or “value” attributes of the observation class.

Examples: The following examples are statements that might appear in clinical records. In each case they assert a finding in relation to the “record target”. Each of these examples illustrates a particular aspect of the potential for nominalizing a statement.

Record target ...

- has a fracture of her left femur
- is complaining of pain in his right knee for the last two days
- reports that she had a heart attack in January 2001
- may have pernicious anemia

- has an aortic ejection murmur
- has normal visual acuity

Type (A) statements can be readily represented using the Observation class as documented in the RIM. However, a variety of options have been considered for type (B) "nominalized" statements. These options vary in the use they make of the Observation.code and Observation.value attributes.

In summary the options considered included

- Using only one of the attributes to represent the nominalized meaning of the statement and omitting the other attribute.
- Applying a fixed value to one of the attributes and using the other one to represent the nominalized meaning of the statement.
- Using the value to represent the nominalized meaning of the statement while allowing the other code to operate independently to track the question or process without affecting the meaning of the result to the observation.
- Creating a separate class for nominalized statement rather than using the Observation class.

A joint meeting of the HL7 Modeling and Methodology and Vocabulary Technical Committees was asked to rule on the validity of these options. The discussions of these committees led to a decision to clarify the RIM definition of the Observation class. The clarification made clear that both Observation.code and Observation.value should be present and should be interpreted together rather than independently.

As a result the preferred option is for a fixed Observation.code value "ASSERTION" to be used and for the meaning of the nominalized statement to be conveyed in the Observation.value. All other options are deprecated but some of these are permitted for backward compatibility.

The options permitted for backward compatibility are those that are known to be in use and these are supported as far as possible with transformation rules to allow the preferred form to be derived for comparison. There is a practical limitation to the transformation rules where code and value are used independently because it may not be possible to confirm computationally whether the code was intended to significantly modify the meaning of the value.

2.2.4 Act.moodCode

The Act.moodCode is a structural code which is defined as "a code distinguishing whether an Act is conceived of as a factual statement or in some other manner as a command, possibility, goal, etc.". Its values are drawn from the HL7 ActMood vocabulary table.

2.2.4.1 Potential Overlap

The values specified in the ActMood vocabulary partially overlap with SNOMED CT representations of [408729009 | Finding context |](#) and [408730004 | Procedure context |](#).

- SNOMED CT [408729009 | Finding context |](#):

- Represents an assertion that the [246090004 | Associated finding](#) | is: present, absent, a goal, a risk or an expectation.
- May also represent an assertion that the presence or absence of a finding is unknown, possible or probable.
- Applies to:
 - any SNOMED CT expression that represents a [<404684003 | Clinical finding](#) |.
 - any SNOMED CT expression that represents either a [<71388002 | Procedure](#) | or an [<363787002 | Observable entity](#) | provided that the expression is combined with a relevant result or value.
- Is relevant to instances of HL7 Observation classes expressed in "event", "goal", "expectation" and "risk" moods.
- SNOMED CT [408730004 | Procedure context](#) |
 - Represents an assertion that the [363589002 | Associated procedure](#) | is: "requested", "planned", "started", "done", "cancelled", "not done", "not to be done" or one of several more specific [408730004 | Procedure context](#) | values.
 - May also represent an assertion that it is not known whether the procedure has been done.
 - Applies to any SNOMED CT expression that represents a [<71388002 | Procedure](#) | (except where that expression is combined with a relevant result value).
 - Is relevant to:
 - instances of various HL7 Act classes including Procedure, SubstanceAdministration and Supply.
 - instances of the HL7 Observation class except in "intent" moods (including "request" and other subtype of "intent").

2.2.4.2 Rules and Guidance

The following rules ensure validation and consistent interpretation of particular combinations of moodCode and SNOMED CT context. They also specify the context a particular moodCode value applies to a SNOMED CT expression that does not include an explicit representation of context (explicit representations of context can be made either in pre-coordinated concepts or post-coordinated expressions).

1. The moodCode **SHALL** be present in all Act class instances⁷ (CONF:14).
2. If the *code* attribute of an instance of the Observation class, with a moodCode that is neither "intent" (INT) nor a subtype of "intent", is populated with a SNOMED CT expression, this expression **MAY** include an explicit representation of [408729009 | Finding context](#) | (CONF:15).

⁷ The requirement for moodCode to be present may be met either by explicit inclusion or by a default specified in an HL7 model.

- If the expression does not include an explicit [408729009 | Finding context |](#), it **SHALL** be interpreted as having the context specified for the relevant moodCode in [Table 2](#) (CONF:16).
 - If the expression includes an explicit [408729009 | Finding context |](#), the context **SHALL** be compatible with the constraints specified for the relevant moodCode in [Table 3](#). Any Act class instance that does not conform to these constraints **SHALL** be regarded as an error (CONF:17).
3. If the *value* attribute of an instance of the Observation class is populated with a SNOMED CT expression, this expression **MAY** include an explicit representation of [408729009 | Finding context |](#) (CONF:18).
 - If the expression does not include an explicit [408729009 | Finding context |](#), it **SHALL** be interpreted as having the context specified for the relevant moodCode in [Table 2](#) (CONF:19).
 - If the expression includes an explicit [408729009 | Finding context |](#), the context **SHALL** be compatible with the constraints specified for the relevant moodCode in [Table 3](#) (CONF:20).
 - a. Any Act class instance that does not conform to these constraints **SHALL** be regarded as an error (CONF:21).
 4. If the *code* attribute of an instance of any Act class (except Observations included in points 2 or 3 above) is populated with a SNOMED CT expression, this expression **MAY** include an explicit representation of [408730004 | Procedure context |](#) (CONF:22).
 - If the expression does not include an explicit [408730004 | Procedure context |](#), it **SHALL** be interpreted as having the context specified for the relevant moodCode in [Table 4](#) (CONF:23).
 - If the expression includes an explicit [408730004 | Procedure context |](#), the context **SHALL** be compatible with the constraints specified for the relevant moodCode in [Table 5](#) (CONF:24).
 - a. Any Act class instance that does not conform to these constraints **SHALL** be regarded as an error (CONF:25).
 5. If a SNOMED CT expression includes an explicit statement of context, this **SHALL** be validated by the rules stated above and **SHALL** be interpreted as a restatement or refinement of the meaning specified by the moodCode (CONF:26).
 - a. The meaning of the SNOMED CT context **SHALL NOT** be interpreted as an independent compounding semantic modifier (CONF:27).

For example:

moodCode="RQO" and Act.code <[129125009 | Procedure with explicit context \(situation\) |](#): [408730004 | Procedure context |](#) = [385644000 | Requested |](#)
 This means "requested". It does not mean a "request to request".

moodCode="INT" and code=[408730004 | Procedure context |](#) = [385650005 | Organized |](#)
 This means "organized". It does not mean an "intention to organize".

moodCode="INT" and value= [408729009 | Finding context |](#) = [410518001 | Goal |](#)
 This is an error. It does not mean an "intention to set a goal".

moodCode="GOL" and value= [408729009 | Finding context |](#) = [410518001 | Goal |](#)
 This means that a goal is set. It does not mean a "goal to set a goal".

[Table 2](#) shows the mapping from moodCode to the default [408729009 | Finding context |](#) for concepts that are [<404684003 | Clinical finding |](#).

[Table 3](#) shows the [408729009 | Finding context |](#) validation constraints for SNOMED CT expressions based on the moodCode of the containing Act class instance.

[Table 4](#) shows the mapping from moodCode to default [408730004 | Procedure context |](#) for concepts that are [<71388002 | Procedure |](#).

[Table 5](#) shows the [408730004 | Procedure context |](#) validation constraints for SNOMED CT expressions based on the moodCode of the containing Act class instance.

The context values in these tables are based on the following assumptions about other attributes in the same Act class instance:

- the HL7 negationInd is omitted from the Act class instance (see Act.negationInd ([§ 2.2.10](#)))
- the HL7 uncertaintyCode is omitted from the Act class instance (see Act.uncertaintyCode ([§ 2.2.11](#)))
- the HL7 statusCode in the Act class instance has a value that does not influence the context (see Act.statusCode ([§ 2.2.5](#)))

If any of these assumptions do not apply then refer to the referenced sections for further information.

Note: For more information on statusCode dependent values see [Table 7](#).

Table 2: HL7 Act.moodCode mapping to context values for SNOMED CT findings

moodCode	Mood Name	Finding context
EVN	Event	410515003 Known present
GOL	Goal	410518001 Goal
RSK	Risk	410519009 At risk
EXPEC	Expectation	410517006 Expectation

Table 3: HL7 Act.moodCode constraints on explicit context for SNOMED CT findings

moodCode	Mood name	Finding context
EVN	Event	<<36692007 Known OR <<261665006 Unknown
GOL	Goal	<<410518001 Goal
RSK	Risk	<<410519009 At risk
EXPEC	Expectation	<<410517006 Expectation

Table 4: HL7 Act.moodCode mapping to context values for SNOMED CT procedures

moodCode	Mood name	Procedure context
EVN	Event	385658003 Done OR (values dependent on Act.statusCode - see note)
INT	Intent	410522006 Pre-starting action status
RQO	Request	385644000 Requested
PRP	Proposal	385643006 To be done
PRMS	Promise	385645004 Accepted
ARQ	Appointment request	385644000 Requested
APT	Appointment	416151008 Scheduled

Table 5: HL7 Act.moodCode constraints on explicit context for SNOMED CT procedures

moodCode	Mood name	Procedure context
EVN	Event	<<410523001 Post-starting action status OR (values dependent on Act.statusCode - see note)
INT	Intent	<<410522006 Pre-starting action status
RQO	Request	<<385644000 Requested
PRP	Proposal	<<385649005 Being organized OR <<385643006 To be done
PRMS	Promise	<<385649005 Being organized
ARQ	Appointment request	<<385644000 Requested
APT	Appointment	<<385649005 Being organized

Table 6 lists Act.moodCodes that have no direct relationship to SNOMED CT context attributes. This assertion is made based on knowledge of the definitions in the HL7 RIM for these mood codes and of the SNOMED CT qualifier values for context model attributes. Based on those definitions (in both standards) there are, in fact, no SNOMED CT concepts which directly correspond to the meaning of these specific mood codes. While no constraints are specified for these moodCodes, some combinations may be irrational or open to misinterpretation. Therefore, caution should be used when combining these moodCodes with explicit representations of SNOMED CT context.

Table 6: HL7 MoodCodes that have no direct relationship to finding or procedure context

moodCode	Name
DEF	Definition
SLOT	Resource slot
EVN.CRT	Event criterion
OPT	Option

Example:

moodCode="DEF" and value= 404684003 | Clinical finding | : 408729009 | Finding context | = 410517006 | Expectation |

This would be an "irrational" combination. It does not mean the "definition of an expectation".

2.2.4.3 Discussion and Rationale

The Act.moodCode is a mandatory component of all HL7 Act classes. Therefore this HL7 representation is required irrespective of whether SNOMED CT context representations are used.

SNOMED CT [408729009 | Finding context |](#) and [408730004 | Procedure context |](#) value hierarchies include more specific meanings than those associated with the Act.moodCode. Therefore, the SNOMED CT representation cannot be prohibited without resulting in loss of information.

For example, Act.moodCode cannot be used to express various:

- SNOMED CT [408730004 | Procedure context |](#) values, including [410536001 | Contraindicated |](#) and [385661002 | Considered and not done |](#).
- SNOMED CT [408729009 | Finding context |](#) values, including [410596003 | Likely outcome |](#) and [410605003 | Confirmed present |](#).

The SNOMED CT context model permits default context values to be applied, based on the surrounding information model. Therefore, inclusion of SNOMED CT context can be specified as optional, provided there are explicit rules (such as those in [Table 2](#) and [Table 4](#)) for deriving default context values from the moodCode and, where relevant, from other HL7 Act class attributes.

2.2.5 Act.statusCode

The Act.statusCode is defined as "a code specifying the state of the Act". This definition is further elaborated by the state-machine diagram for the Act class in the RIM documentation and the ActStatus vocabulary.

2.2.5.1 Potential Overlap

The interaction between statusCode and SNOMED CT semantics varies according to the nature of the statusCode and the value of the Act.moodCode.

- The most general HL7 Act.statusCode values ("normal", "obsolete" and "nullified") relate to whether the Act class instance is currently valid. These states do not result in any overlaps with SNOMED CT semantics.
- Other states overlap with aspects of SNOMED CT semantics in a manner that is to some extent dependent on the mood of the Act.

Unlike the other attributes discussed in this section the value of the statusCode may progress over time. Thus the fact that a "request" was aborted implies that a request was made, as well as indicating that the request was not acted upon. Therefore, the impact of an Act.statusCode on SNOMED CT semantics depends on whether the concern is to know what steps were taken or to know whether a step was completed.

The relevance of statusCode is fairly clear cut when the Act.moodCode value is "EVN", since this implies an actual occurrence. In these cases, the statusCode pertains to whether the event is complete and thus directly to the SNOMED CT [408730004 | Procedure context |](#).

In other moods, this relationship is less clear. For example, the Act.statusCode applied to an Act with moodCode "RQO" refers to the status of the request, whereas the

408730004 | Procedure context | refers to the progress of the concept specified by the 363589002 | Associated procedure |.

2.2.5.2 Rules and Guidance

The following rules deal only with cases where the Act.statusCode has a clear effect on the meaning of an Act class instance in a particular mood. Other rules or guidelines, based on similar principles, may be added in the future.

1. Act class instances **SHALL** be interpreted taking into account the Act.statusCode and the way particular values of this attribute when combined with the Act.moodCode may alter the mapped or permitted 408730004 | Procedure context | values (CONF:28).
2. In the case of an Act in "EVENT" mood the defaults and constraints specified in Act.code (§ 2.2.2) and Act.moodCode (§ 2.2.4) **SHOULD** be modified in accordance with statusCode as shown in *Table 7* (CONF:29).

Table 7: HL7 statusCode impact of mapping and constraints applicable to procedure context for Acts in "event" mood

statusCode	Default procedure context	Procedure context constraints
new	410522006 Pre-starting action status	<<410522006 Pre-starting action status
active	410523001 Post-starting action status	<<410523001 Post-starting action status
completed	385658003 Done	<<385658003 Done
held	385642001 Under consideration	<<385642001 Under consideration
cancelled	89925002 Cancelled	<<89925002 Cancelled
suspended	385655000 Suspended	<<385655000 Suspended
aborted	385657008 Abandoned	<<385657008 Abandoned

2.2.5.3 Discussion and Rationale

The HL7 statusCode changes throughout the life cycle of an Act in its specified mood, until it reaches an end-state. Consideration of the impact of a statusCode on aspects of semantics depends on whether the requirement is to know 'what steps were taken' or 'whether a step was completed'. Thus the fact that a "request" was aborted implies that a request was made, as well as indicating that the request was not taken through to normal completion.

The statusCode values "new", "active", "held", "completed", "cancelled", "suspended", "nullified" and "obsolete" track the progress of the Act in its specified mood. The semantic relevance of statusCode in "event" mood is more clear cut than in other moods.

- For example, statusCode="completed"
 - when applied to an Act with moodCode="ENV" implies [408730004 | Procedure context | = 385658003 | Done |](#)
 - when applied to an Act with moodCode="RQO" implies that the act of request has been completed. It does *not* mean that the requested action has been completed.

The statusCode values "normal", "obsolete" and "nullified" relate to the validity of a particular representation of an Act class instance. These states do not result in any overlaps with SNOMED CT semantics because the meaning of an Act class instance is no longer relevant if it has been "nullified" or marked as "obsolete".

2.2.6 Procedure.targetSiteCode and Observation.targetSiteCode

The Procedure.targetSiteCode is defined by HL7 as “the anatomical site or system that is the focus of the procedure.” The Observation.targetSiteCode is defined as "a code specifying detail about the anatomical site or system that is the focus of the observation if this information is not already implied by the observation definition or Act.code."

2.2.6.1 Potential Overlap

SNOMED CT finding concepts have a defining attribute that specifies the [363698007 | Finding site |](#) and similarly SNOMED CT procedure concepts have a defining attribute that specifies the [363704007 | Procedure site |](#). The post-coordination rules that apply to SNOMED CT permit refinement of these defining attributes. The resulting post-coordinated expressions can be represented in a single coded attribute using the HL7 Concept Descriptor (CD) data type.

The result of this is that there are two completely overlapping approaches to the representation of sites associated with observations and procedures.

2.2.6.2 Rules and Guidance

The following rules avoid redundancy and the risk of misinterpretation by restricting the use of targetSiteCode in Act class instances. There are two sections dealing with information models which 1) contain only SNOMED content and 2) allow multiple terminologies to be used.

If an Act.code or Observation.value contains only SNOMED CT content then the following shall apply:

1. The targetSiteCode attribute **SHOULD** be omitted from any Act instance (CONF:30).
2. If necessary the specific applicable site **SHOULD** be represented (in Act.code or Observation.value) as a refined relevant site attribute, either as part of a SNOMED CT pre-coordinated concept or a post-coordinated expression (CONF:31).

Procedure example using SNOMED CT only:

```
<procedure classCode="PROC" moodCode="EVN">
  <code code="287742007" displayName="Ureter calculus removal"
    codeSystem="2.16.840.1.113883.6.96"
```

```

codeSystemName="SNOMED CT">
<qualifier>
  <name code="405814001" displayName=" Procedure site -
    Indirect"
    codeSystem="2.16.840.1.113883.6.96"
    codeSystemName="SNOMED CT" />
  <value code="26559004"
    displayName="Structure of left ureter"
    codeSystem="2.16.840.1.113883.6.96"
    codeSystemName="SNOMED CT" />
</qualifier>
</code>
<statusCode code="completed" />
</procedure>

```

If an Act.code or Observation.value contains SNOMED CT content as one permitted code system then the following shall apply:

1. The targetSiteCode attribute **SHALL** be optional in any Act instance (CONF:32).
2. If the targetSiteCode attribute is present in an Observation or Procedure class instance in which the Act.code or Observation.value is expressed using SNOMED CT then:
 - o The targetSiteCode **SHALL** also be represented using SNOMED CT (CONF:33).
 - o The targetSiteCode **SHALL** be the same as, or a subtype of, the value of the relevant site attribute as specified in the SNOMED CT expression (CONF:34).
 - o The targetSiteCode **SHALL** be treated as equivalent to a restatement or refinement of the relevant site attribute in the SNOMED CT expression (CONF:35).
 - o If the value of the targetSiteCode attribute is incompatible with the above rules then this **SHALL** be interpreted as an error (CONF:36).

Procedure example using SNOMED CT and targetSiteCode:

```

<procedure classCode="PROC" moodCode="EVN">
  <code code="287742007" displayName="Ureter calculus removal"
    codeSystem="2.16.840.1.113883.6.96"
    codeSystemName="SNOMED CT" />
  <statusCode code="completed" />
  <targetSiteCode code="26559004"
    displayName="Structure of left ureter"
    codeSystem="2.16.840.1.113883.6.96"
    codeSystemName="SNOMED CT" />
</procedure>

```

Note: The *relevant site attribute* depends on the SNOMED CT Concept Model for the type of procedure or finding. It may be one of the following: [363698007 | Finding site](#) |, [363704007 | Procedure site](#) |, [405813007 | Procedure site - Direct](#) | or [405814001 | Procedure site - Indirect](#) |. In some cases, [405816004 | Procedure](#)

[morphology |, 363700003 | Direct morphology |](#) or [363709002 | Indirect morphology |](#) may also provide more specific site related information.

2.2.6.3 Discussion and Rationale

The notes following the definition of `Observation.targetSiteCode` make it clear that the intent is not to repeat a site implied by the `Act.code`.

Most observation target sites are implied by the observation definition and `Act.code`, or `Observation.value`. For example, "heart murmur" always has the heart as target. This attribute is used only when the observation target site needs to be refined, to distinguish right and left etc.

The notes following the `Procedure.targetSiteCode` definition are perhaps a little less clear cut. However, they convey a similar general sense.

Some target sites can also be "pre-coordinated" in the Act definition, so that there is never an option to select different body sites. The same information structure can handle both the pre-coordinated and the post-coordinated approach.

Therefore, if the `Procedure.code` or `Observation.code` specifies the site to a sufficient level of detail, there is no requirement to include a separate `targetSiteCode` attribute. When using SNOMED CT post-coordination to refine the site, the `Act.code` specifies the site to the same level of detail as can be achieved using the `targetSiteCode`.

SNOMED CT offers additional features which make it significantly more expressive than the `targetSiteCode`:

- The [<363704007 | Procedure site |](#) attributes distinguish between the direct and indirect targets of a procedure. One use of this is to ensure that removal of a something from an organ does not classify as a type of removal of that organ.
 - For example:
 - ([287742007 |Ureter calculus removal |](#)) ===
([229931005 | Procedure on ureter \(procedure\) |](#) :
{ [260686004|Method|](#) = [129303008|Removal - action|](#),
[363700003|Direct morphology|](#) = [56381008|Calculus|](#),
[405814001|Procedure site - Indirect|](#) = [87953007|Ureteric structure|](#) })
 - ([51607004|Total ureterectomy |](#)) ===
([108028005 |Ureter excision \(procedure\) |](#) :
{ [260686004|Method|](#) = [129304002|Excision - action|](#),
[405813007|Procedure site - Direct|](#) = [302511008|Entire ureter|](#) })
- Explicit grouping of attributes allows representation of multiple sites to be associated with different actions in a single procedure.
 - For example:
 - The procedure [11401008 | Dilation and curettage of uterus |](#) involves dilatation of one site (cervix uteri) and curettage of another (endometrium) so it is defined as a procedure with the following two relationship groups ...

- {260686004 | Method | = 129319001 | Curettage - action | ,405813007 | Procedure site - Direct | = 2739003 | Endometrial structure | }
{260686004 | Method | = 129419002 | Dilation - action | ,405813007 | Procedure site - Direct | = 71252005 | Cervix uteri structure | }

The recommendation to use the SNOMED CT representation of site is based on its added expressivity. Omission of the HL7 targetSiteCode attribute is recommended to avoid the redundancy and the potential for conflicts between the two forms of representation of site. However, while the use of these HL7 attributes is deprecated, it is permitted to support use in environments that do not support SNOMED CT post-coordination. In this case, requiring these attributes to be encoded using SNOMED CT and interpreted as refinements of the relevant SNOMED CT attributes enables a simple transformation to the recommended form.

2.2.7 Procedure.approachSiteCode and SubstanceAdministration.approachSiteCode

The Procedure.approachSiteCode is defined by HL7 as "the anatomical site or system through which the procedure reaches its target (see targetSiteCode)." The SubstanceAdministration.approachSiteCode works similar to the Procedure.approachSiteCode.

2.2.7.1 Potential Overlap

SNOMED CT procedure concepts have a defining attribute that specifies the [424876005 | Surgical approach |](#) which has a comparable meaning to the HL7 approachSiteCode. The post-coordination rules that apply to SNOMED CT permit refinement of this defining attribute. The resulting post-coordinated expressions can be represented in a single coded attribute using the HL7 Concept Descriptor (CD) data type. The result of this is that there are two completely overlapping methods for representing approaches associated with procedures.

While HL7 models SubstanceAdministration as a separate class from Procedure, the SNOMED CT concept [432102000 | Administration of substance |](#) is a subtype of procedure. Therefore the [424876005 | Surgical approach |](#) attribute can also be applied to refine SNOMED expressions that encode the action associated with SubstanceAdministration. Therefore, this overlap also applies to that class.

2.2.7.2 Rules and Guidance

The following rules avoid redundancy and the risk of misinterpretation by restricting the use of the approachSiteCode in Procedure and SubstanceAdministration class instances. There are two sections dealing with information models which 1) contain only SNOMED content and 2) allow multiple terminologies to be used.

If a Procedure.code or SubstanceAdministration.code contains only SNOMED CT content then the following shall apply:

1. The approachSiteCode attribute **SHOULD** be omitted from any Act instance (CONF:37).

2. If necessary the specific applicable site **SHOULD** be represented as part of the SNOMED CT expression (in Procedure.code or SubstanceAdministration.code) by refining the relevant site attribute as part of a pre or post-coordinated expression (CONF:38).

If a Procedure.code or SubstanceAdministration.code contains SNOMED CT content as one permitted code system then the following shall apply:

1. The approachSiteCode **SHALL** be optional in any Act instance (CONF:39).
2. If the approachSiteCode attribute is present in a SubstanceAdministration or Procedure class instance in which the Act.code is expressed using SNOMED-CT then:
 - o The approachSiteCode **SHALL** also be represented using SNOMED CT (CONF:40).
 - o The approachSiteCode **SHALL** be the same as, or a subtype of, the value of the relevant site attribute as specified in the SNOMED CT expression (CONF:41).
 - o The approachSiteCode **SHALL** be treated as equivalent to a restatement or refinement of the relevant site attribute in the SNOMED CT expression (CONF:42).
 - o If the value of the approachSiteCode attribute is incompatible with the above rules then this **SHALL** be interpreted as an error (CONF:43).

2.2.7.3 Discussion and Rationale

The notes following the Procedure.approachSiteCode definition suggest that the intent is not to repeat the approach if it is fixed by the nature of the procedure specified by the Act.code.

Some [424876005 | Surgical approach |](#) sites can also be "pre-coordinated" in the Act definition, so that there is never an option to select different body sites. The same information structure can handle both the pre-coordinated and the post-coordinated approach.

Therefore, if the Procedure.code or SubstanceAdministration.code specifies the [424876005 | Surgical approach |](#) to a sufficient level of detail, there is no requirement to include a separate approachSiteCode attribute. When using SNOMED CT post-coordination to refine the [424876005 | Surgical approach |](#), the Act.code can specify the approach to the same level of detail as can be achieved using the approachSiteCode attribute.

The concept domain specified for approachSiteCode is ActSite which is the same as the concept domain for targetSiteCode. In contrast, SNOMED CT uses the procedure approach hierarchy for approaches, and this is different from the anatomy hierarchy used for [363698007 | Finding site |](#) or [<<363704007 | Procedure site |](#). The distinction is that an approach is a route used to reach a target site rather than a specific structural landmark that represents a point on or part of that route.

The example values in the approachSiteCode include a mixture of approaches (e.g. "trans-abdominal approach" and "retroperitoneal approach") which fit the idea of approach as used by SNOMED CT. However, references to the punctured area of skin or

structural landmarks have a significantly different semantic quality. Many sites are never the names of routes, several routes may pass through a single site and a route may pass through several sites. Therefore attempts to combine SNOMED CT and HL7 representations of approach may result in confusion rather than clarity.

The recommendation to use the SNOMED CT representation of [424876005 | Surgical approach |](#) is based on the more appropriate range of values available for this attribute, and on the fact that many procedure concepts pre-coordinate an implied or explicitly stated approach. Omission of the HL7 approachSiteCode attribute is recommended to avoid the redundancy and the potential for conflicts between the two forms of representation of site. However, while the use of these HL7 attributes is deprecated, it is permitted to support use in environments that do not support SNOMED CT post-coordination. In this case, requiring the approachSiteCode attributes to be encoded using SNOMED CT and interpreted as refinements of the SNOMED CT [424876005 | Surgical approach |](#), enables a simple transformation to the recommended form.

2.2.8 Procedure.methodCode and Observation.methodCode

The Procedure.methodCode is defined by HL7 as “identifies the means or technique used to perform the procedure”. The Observation.methodCode is defined as “a code that provides additional detail about the means or technique used to ascertain the observation.”

2.2.8.1 Potential Overlap

SNOMED CT Procedure concepts have a defining attribute that specifies the [260686004 | Method |](#) used. SNOMED CT "evaluation procedure" concepts, which may be used to specify the nature of an observation, have a defining attribute that specifies the [370129005 | Measurement method |](#). SNOMED CT [404684003 | Clinical finding |](#) concepts, which may be used as values of a nominalized observation or assertion, have a defining attribute that specifies the [418775008 | Finding method |](#). The post-coordination rules that apply to SNOMED CT permit refinement of this defining attribute. The resulting post-coordinated expressions can be represented in a single coded attribute using the HL7 Concept Descriptor (CD) data type.

The result of this is that there are two overlapping approaches to the representation of methods associated with observations and procedures.

2.2.8.2 Rules and Guidance

The following rules avoid redundancy and the risk of misinterpretation by restricting the use of the methodCode in Procedure and Observation class instances. There are two sections dealing with information models which 1) contain only SNOMED CT content and 2) allow multiple terminologies to be used.

If an Act.code or Observation.value contains only SNOMED CT content then the following shall apply:

1. The methodCode attribute **SHOULD** be omitted from any Act instance (CONF:44).
2. If necessary the method applicable **SHOULD** be represented as part of the SNOMED CT expression (in Act.code or Observation.value) by refining the relevant method attribute as part of a post-coordinated expression (CONF:45).

If an Act.code or Observation.value contains SNOMED CT content as one permitted code system then the following shall apply:

1. The methodCode attribute **SHALL** be optional in any Act instance (CONF:46).
2. If the methodCode attribute is present in an Observation or Procedure class instance in which the Act.code or Observation.value is expressed using SNOMED CT then:
 - o The methodCode **SHALL** also be represented using SNOMED CT (CONF:47).
 - o The methodCode **SHALL** be the same as, or a subtype of, the value of the relevant method attribute as specified in the SNOMED CT expression (CONF:48).
 - o The methodCode **SHALL** be treated as equivalent to a restatement or refinement of the relevant method attribute in the SNOMED CT expression (CONF:49).
 - o If the value of the methodCode attribute is incompatible with the above rules then this **SHALL** be interpreted as an error (CONF:50).

Note: The *relevant method attribute* depends on the SNOMED CT Concept Model in respect of the type of procedure or finding. It may be one of the following: [260686004 | Method |](#), [418775008 | Finding method |](#) or [370129005 | Measurement method |](#).

2.2.8.3 Discussion and Rationale

The notes following the definition of Observation.methodCode make it clear that the intent is not to repeat a method implied by the Act.code.

In all observations the method is already partially specified by simply knowing the kind of observation (observation definition, Act.code) and this implicit information about the method does not need to be specified in Observation.methodCode.

The notes following the Procedure.methodCode are less explicit about avoidance of duplication. However, they do suggest that code systems might be designed with relationships between procedures and possible method – which is exactly how SNOMED CT is designed. What the note does not take into account is that the terminology may also specify a way to represent a specific method with the procedure in a single code or expression.

'... a code system might be designed such that it specifies a set of available methods for each defined Procedure concept'

Therefore, if the Act.code or Observation.value specifies the method to a sufficient level of detail, there is no requirement to include a separate methodCode attribute. When using SNOMED CT post-coordination to refine the method, the Act.code or Observation.value specifies the method to the same level of detail as can be achieved using the methodCode.

The notes on methodCode use "open" and "laparoscopic" procedures as examples of differences in method. SNOMED CT makes this same differentiation using another defining attribute [260507000 | Access |](#). This highlights the potential for confusion from using both SNOMED and HL7 representations of method.

2.2.9 Act.priorityCode

The Act.priorityCode is defined by HL7 as “a code or set of codes (e.g., for routine, emergency), specifying the urgency under which the Act happened, can happen, is happening, is intended to happen, or is requested/demanded to happen.”

2.2.9.1 Potential Overlap

The semantics of this attribute potentially overlaps with SNOMED CT [260870009 | Priority](#) | attribute which "... refers to the priority assigned to a procedure".

2.2.9.2 Rules and Guidance

The following rules recommend specific uses for the HL7 and SNOMED CT representations of priority. There are two sections dealing with information models which 1) contain SNOMED content and 2) allow multiple terminologies to be used.

2.2.9.2.1 In all cases:

1. Act class clones **SHALL** include the priorityCode attribute if there is a requirement for expressing the urgency of a request, tracking and auditing services based on requested prioritization or any other aspects of workflow management related to priority (CONF:51).
2. Act class clones **NEED NOT** include the priorityCode attribute if the only requirement for indicating priority relates to distinguishing differences between the nature of procedures themselves based on priority (see [Example 8](#) below) (CONF:52).
3. In Act class instances the Act.priorityCode attribute **SHALL** be used where it has a specific functional role in relation to the purpose of a communication (CONF:53).
 - o For example, to prioritize a request for a service or to track the priority under which a service was scheduled and carried out.

2.2.9.2.2 In cases where SNOMED CT is used:

1. In Act class instances, the relevant SNOMED CT priority attribute **SHOULD** be included in the expression in the Act.code or Observation.value if the priority significantly alters the nature of the statement (CONF:54).
 - o The priorityCode **SHALL** be the same as, or a subtype of, the value of the relevant priority attribute as specified in the SNOMED CT expression (CONF:55).

Example 8: Procedures with Differing Priority Attribute Values

[274130007 | Emergency cesarean section](#) |

is a significantly different procedure when compared with:

[177141003 | Elective caesarean delivery](#) |

2.2.9.3 Discussion and Rationale

At face value the Act.priorityCode and the SNOMED CT [260870009 | Priority |](#) attribute appear to have similar meanings. However, the way in which these are used appears to differ significantly.

- The SNOMED CT attribute is used to specify the defining characteristic that distinguishes an elective procedure from an emergency procedure. Like any defining attribute it can also be used to refine or qualify a procedure that is specified without references to its urgency.
- The HL7 priorityCode is generally used to communicate priority in relation to workflow management and audit. One obvious use case for this is to allow request for a service to indicate the priority assigned to it by the requester.

These aspects of priority can vary independently of one another. Two requests for the same procedure can assert different priorities for processing them based on perceived clinical need or other factors. On the other hand, some emergency procedures are carried out directly without a specific request and thus without the normal workflow associated with prioritization.

The use of a distinct information model attribute (i.e. Act.priorityCode), which is applicable to all services, makes the priority more readily accessible to workflow management. It does not require the SNOMED CT expression to be parsed to determine the priority of a request or action. In addition, it allows consistent handling of priority when some services are represented using SNOMED CT while others are represented using different code systems.

The use of a representation of priority that is integrated with the definition model of the associated concept is more useful from the perspective of clinical record retrieval. The description logic model of SNOMED CT ensures the computational equivalence of a procedure concept defined as an emergency and a post-coordinated expression in which [260870009 | Priority | = 25876001 | Emergency |](#) is added to the more general procedure concept.

2.2.10 Act.negationInd

The Act.negationInd is defined by HL7 as “An indicator specifying that the Act statement is a negation of the Act as described by the descriptive attributes”.

Note: The Act.negationInd attribute has been deprecated in recent releases of the RIM (since Sept. 2008) and has been replaced by the two new attributes of Act.actionNegationInd and Observation.valueNegationInd (see [Core Principles and Properties of V3 Models](#) for details). However, the original Act.negationInd has not been deprecated and continues to be in use in CDA R2 (RIM v2.07). It is anticipated that a future release of CDA will update this to be consistent with the current RIM, but at present the following guidance is applicable for the use of Act.negationInd in CDA R2.

2.2.10.1 Potential Overlap

The semantics of this attribute overlaps with:

- SNOMED [408729009 | Finding context |](#) values indicating absence of a specified finding.

- SNOMED CT [408730004 | Procedure context](#) | values indicating that a specified procedure was not done.

This overlap must be avoided. If not avoided, it leads to ambiguity. For example, a combination of negationInd with a contextual representation of absence in SNOMED CT results in different interpretations based on the approach taken, as:

- double negation (i.e. "not finding X is absent" - which may mean "finding X is present") [**Note:** Interpretations based on formal logic may not always be intuitive for humans, and using machine reasoning in this way may have patient safety implications.]
- restatement or emphasis of the negative resulting from a mapping between the two ways to indicate negation or absence (i.e. "negative observation: finding X is absent" - which still means that "finding X is absent").

2.2.10.2 Rules and Guidance

The following rules avoid the risk of misinterpretation by prohibiting use of the negationInd in Act class instances that are encoded using SNOMED CT.

1. In a constrained information model or template the negationInd attribute:
 - **SHOULD** be omitted from any Act class clone in which SNOMED CT is the only permitted code system for the Act.code attribute (CONF:56).
 - **SHOULD** be omitted from any Observation class clone in which SNOMED CT is the only permitted code system for the Observation.value attribute (CONF:57).
2. In a constrained information model or template, the negationInd attribute:
 - **SHALL** be optional if it is included in an Act class clone in which SNOMED CT is one of the permitted code systems for the Act.code attribute (CONF:58).
 - **SHALL** be optional if it is included in any Observation class clone in which SNOMED CT is one of the permitted code systems for the Observation.value attribute (CONF:59).
3. The negationInd attribute **SHOULD** be omitted from any Act class instance in which the Act.code attribute is expressed using SNOMED CT (CONF:60).
 - Negative assertions about an Act (e.g. "procedure not done", "substance not to be administered") **SHOULD** be represented, as part of the SNOMED CT expression in the Act.code attribute, by including the appropriate explicit [408730004 | Procedure context](#) | (e.g. [385660001 | Not done](#) | or [410521004 | Not to be done](#) |) (CONF:61).
4. The negationInd attribute **SHOULD** be omitted from any Observation class instance in which the Observation.value attribute is expressed using SNOMED CT (CONF:62).
 - Assertions of negative Observations (e.g. absence of a specified finding) **SHOULD** be represented, as part of the SNOMED CT expression in the Observation.value attribute, by including the appropriate explicit [408729009 | Finding context](#) | (CONF:63).

5. The negationInd attribute **MAY** be included in an Act class instance where the SNOMED CT expression represents a <71388002 | Procedure | with no explicit 408730004 | Procedure context | or a <129125009 | Procedure with explicit context | with 408730004 | Procedure context | = 385658003 | Done | (CONF:64).
 - This approach is not recommended but is permitted to allow simple negation in systems that do not support the SNOMED CT context model. If it is used, it **SHALL** be interpreted as equivalent to the specified 363589002 | Associated procedure | with 408730004 | Procedure context | = 385660001 | Not done | (CONF:65).
6. The negationInd attribute **MAY** be included in an Observation class instance where the SNOMED CT expression represents a <404684003 | Clinical finding | with no explicit 408729009 | Finding context | or a <413350009 | Finding with explicit context | with the 408729009 | Finding context | = 410515003 | Known present | (CONF:66).
 - This approach is not recommended but is permitted to allow simple negation in systems that do not support the SNOMED CT context model. If it is used, it **SHALL** be interpreted as equivalent to the specified 246090004 | Associated finding | with a 408729009 | Finding context | = 410516002 | Known absent | (CONF:67).
7. If the negationInd attribute is present in an Act class instance in which either the Act.code or Observation.value is expressed using SNOMED CT, it **SHALL** be interpreted as an error unless the conditions noted in points 5 and 6 above apply (CONF:68).

2.2.10.3 Discussion and Rationale

The Act.negationInd is an optional RIM attribute which negates the meaning of an Act. This negation is unnecessary in cases where SNOMED CT is used because the context attributes can be used to specify the absence of a finding or the fact that a procedure has not been done. Including both representations introduces potential for serious misinterpretation of combinations including the following:

- Double negative
 - If negationInd is true and the SNOMED CT 408729009 | Finding context | = 410516002 | Known absent | the double negative would be “not known absent” (i.e. “present”).
 - If negationInd is true and the SNOMED CT 408730004 | Procedure context | = 385660001 | Not done | the double negative would be “not not done” (i.e. “done”).
 - For the avoidance of potential ambiguity this option is explicitly prohibited by rules in this document.
- Indication or emphasis of negation
 - HL7 negationInd indicates the presence of negation and the SNOMED CT context provides more details of the nature of the negation.

- Implies that if negationInd is true and the Act is coded with SNOMED CT an appropriate negated SNOMED CT finding or procedure context value (e.g. [410516002 | Known absent |](#) or [385660001 | Not done |](#)) should also apply.
- Might imply that if a negated SNOMED CT finding or procedure context value (e.g. [410516002 | Known absent |](#) or [385660001 | Not done |](#)) is applied the negationInd should be true.
- Restatement of negation
 - HL7 negationInd and SNOMED CT negative contexts apply as alternatives and when combined serve to restate the negation
 - Implies that if only negationInd is present a mapping table is required to the relevant SNOMED CT context to enable consistent interpretation. This mapping table would need to specify combinations of moodCode and negationInd. For example, negationInd=true with moodCode="EVN" the would imply [408730004 | Procedure context | = 385660001 | Not done |](#), whereas negationInd=true with moodCode="RQO" might imply [408730004 | Procedure context | = 410521004 | Not to be done |](#).

To meet requirements to support some simple negation in systems that do not support the SNOMED CT context model, use of negationInd is permitted where it cannot be misinterpreted. The only cases where no risk of misinterpretation are where the SNOMED CT context is either unspecified or explicitly states the default values [410515003 | Known present |](#) or [385658003 | Done |](#). The negationInd can be used to switch these defaults to the appropriate negated values such as [410516002 | Known absent |](#) and [385660001 | Not done |](#).

2.2.11 Act.uncertaintyCode

Act.uncertaintyCode is not used in CDA R2.

The Act.uncertaintyCode is defined by HL7 as "a code indicating whether the Act statement as a whole, with its subordinate components has been asserted to be uncertain in any way." The values of this attribute in the HL7 vocabulary are "stated with no assertion of uncertainty" (N) and "stated with uncertainty" (U).

2.2.11.1 Potential Overlap

The semantics of this attribute overlaps with SNOMED CT [408729009 | Finding context |](#) values <<[410590009 | Known possible |](#), including [410592001 | Probably present |](#) and [410593006 | Probably not present |](#). This provides different ways to express the uncertainty of a finding and ambiguity about the impact of combining these two representations in a single Act class instance.

2.2.11.2 Rules and Guidance

The following rules avoid the risk of misinterpretation by prohibiting use of the uncertaintyCode in Act class instances that are encoded using SNOMED CT. There are two sections dealing with information models which 1) contain only SNOMED content and 2) allow multiple terminologies to be used.

2.2.11.2.1 SNOMED CT content only

If an Act.code or Observation.value contains only SNOMED CT content then the following shall apply:

1. The uncertaintyCode attribute **SHOULD** be omitted from any Act instance (CONF:69).
2. If necessary the uncertainty applicable **SHOULD** be represented as part of the SNOMED CT expression by refining the relevant context attribute as part of a post-coordinated expression (CONF:70).

2.2.11.2.2 SNOMED CT content as one permitted code system

If an Act.code or Observation.value contains SNOMED CT content as one permitted code system then the following shall apply:

1. The uncertaintyCode attribute **SHALL** be optional in any Act instance (CONF:71).
2. If the uncertaintyCode attribute is present in an Act class instance in which the Act.code or Observation.value is expressed using SNOMED CT then:
 - o The uncertaintyCode **SHALL** also be represented using SNOMED CT (CONF:72).
 - o The uncertaintyCode **SHALL** be the same as, or a subtype of, the value of the relevant context attribute as specified in the SNOMED CT expression (CONF:73).
 - o The uncertaintyCode **SHALL** be treated as equivalent to a restatement or refinement of the relevant context attribute in the SNOMED CT expression (CONF:74).
 - o If the value of the uncertaintyCode attribute is incompatible with the above rules then this **SHALL** be interpreted as an error (CONF:75).

2.2.11.3 Discussion and Rationale

The SNOMED CT [408729009 | Finding context](#) | values provide a more specific way to express uncertainty about the presence or absence of a finding. This is therefore preferred over the use of the optional uncertaintyCode attribute.

The SNOMED CT [408730004 | Procedure context](#) | does not contain values to represent "possibly done" or "probably done". As a result there is no obvious way to express uncertainty about whether a procedure has been done. This may be relevant if an informer reports something like "I think I had a tetanus vaccination but I am not sure". The current advice is to treat such information as an Observation about past history, rather than adding uncertainty value to the [408730004 | Procedure context](#) | value hierarchy. However, this issue has been raised with the SNOMED Concept Model Working Group and the advice may be revised if after further consideration the [408730004 | Procedure context](#) | value set is expanded.

The HL7 UVP (Uncertain Value - Probabilistic) data type was considered as this is another HL7 approach to representation of uncertainty. The UVP data type is defined as "A generic data type extension used to specify a probability expressing the information producer's belief that the given value holds." The data types specification adds that

"How the probability number was arrived at is outside the scope of this specification." There is some potential for overlap as the UVP data type is a "generic data type extension". This means it can be applied to any other data type, and hence to any HL7 attribute. This data type may be applied to attribute values associated with a SNOMED CT code (for example, to express uncertainty associated with the value of a particular measurement). However, use of UVP to apply a specific level of uncertainty to a SNOMED CT concept in an Act should be avoided.

2.2.12 Observation.interpretationCode

The HL7 RIM defines Observation.interpretationCode as:

A qualitative interpretation of the observation.

Examples: Normal, abnormal, below normal, change up, resistant.

Usage Notes: These interpretation codes are sometimes called "abnormal flags," however, the judgment of normalcy is just one of the interpretations, and is often not relevant. For example, the susceptibility interpretations are not about "normalcy," and for any observation of a pathologic condition, it does not make sense to state the normalcy, since pathologic conditions are never considered "normal."

The value of including an observation interpretation is to be able to say:

(a) "The hemoglobin measurement is 18g/dl and this is abnormally high (when compared with the reference range)."

or

(b) "This Streptococcus pneumoniae isolate has been tested for susceptibility to Penicillin G and has been found to be resistant."

2.2.12.1 Potential Overlap

There are multiple scenarios that may result in overlap, particularly with data recorded in Observation.code or Observation.value.

1. Within HL7 V3

- From a modeling perspective, the "interpretation" of a value (i.e. laboratory test result, etc.) is an additional "higher level" observation that is made on the results (raw data) from a particular investigation. This additional observation can, and likely in some cases does, carry the full semantics of an "observation" (including author, author time, etc.), and thus may be represented by an additional instance of an Observation class. Alternatively, and more commonly, the result of this additional observation is represented using the interpretationCode attribute within the original Observation class (which is essentially a lightweight or "shortcut" method for representing this data). There is the potential for conflict and/or ambiguity between these two approaches.
- In some situations, current practice in V3 laboratory messaging (parallel to the common usage in V2) has been to use the Observation.interpretationCode in place of, rather than in conjunction with Observation.value. This typically occurs in laboratory antimicrobial susceptibility messaging (see the Streptococcus susceptibility to Penicillin G example above).

2. Between HL7 V3 and SNOMED CT

- o The SNOMED CT concept model for Clinical Findings provides the [363714003 | Interprets |](#) and [363713009 | Has interpretation |](#) attributes⁸. The latter represents similar notions to those intended for use by the HL7 Observation.interpretationCode attribute. An example of the use of these attributes is:

[165558001 | Platelet count abnormal |](#)

Includes, in its reference definition:

[363714003 | Interprets |=61928009 | Platelet count |](#),
[363713009 | Has interpretation |=263654008 | Abnormal |](#)

- o Whether primitively represented or defined according to the above scheme, SNOMED CT contains many pre-coordinated ‘Finding’ concepts, that include notions similar to those expressed as ‘interpretations’, for example:

[110368006 | Decreased estrogen level |](#)
[102659003 | Normal glucose level |](#)

It is therefore possible to represent, using a SNOMED CT ‘Finding’ in Observation.value, notions such as ‘normality’, ‘abnormality’, ‘resistance’.

2.2.12.2 Rules and Guidance

Given the complexities described in ‘discussion and rationale’, it is not currently possible to provide normative guidance on the use of Observation.interpretationCode. In particular, it is not possible to provide guidance on the prohibition of Observation.interpretationCode where SNOMED CT is the only permitted code system for the Act.code.

However, the following guidance (with caveats) can be provided:

- In a constrained information model or template that permits or requires the use of SNOMED CT to represent the nature of an Observation class clone, or in which SNOMED CT is one of the permitted code systems for the Observation.value attribute, Observation.interpretationCode **SHALL** be optional (CONF:76).
- In any Observation class instance in which the Act.code or Observation.value attribute is expressed using SNOMED CT, and if Observation.interpretationCode is present and also is expressed using SNOMED CT, then Observation.interpretationCode **SHALL** take its value from the following range in SNOMED CT (CONF:77):

[<281296001 | Result comments |](#) OR [<260245000 | Findings values |](#)

⁸ www.snomed.org/eg?t=att_findings_has_interpretation

- Unless explicitly specified by model designers or communicating parties, SNOMED CT findings that represent ‘interpretation’ notions are not prohibited from use. It is possible, therefore, that receiving systems and analytic queries that wish to detect ‘interpretation’ notions may also need to test the SNOMED CT concept carried as Observation.value.

2.2.12.3 Discussion and Rationale

Relevant to this topic, an HL7 Observation will currently support the representation of three notions:

- The thing being observed (in Observation.code)
- The result of the observation (in Observation.value)
- The interpretation of the result of the observation (in Observation.interpretationCode)

Either primitively represented or modeled using the ‘has interpretation’ attribute, SNOMED CT will support the representation of the following notions:

- The thing being observed (in Observation.code)
- The thing being observed and interpretation of the result of the observation (in Observation.value)

There is therefore incomplete overlap in ‘interpretation’ representation, and incomplete expressivity of SNOMED CT to support all aspects of representation (a SNOMED CT expression cannot exhaustively communicate the result of an observation and its interpretation).

Evidence suggests that Observation.interpretationCode is currently used, and it is not possible currently to provide a SNOMED CT-only representation to allow its prohibition.

Neither is it possible, currently, to enhance normalization rules to support equivalence detection between ‘interpretations’ communicated in Observation.value or in Observation.interpretationCode.

2.3 Representation of Units

The HL7 Observation.value attribute allows units to be applied to a physical quantity, range or ratio. The HL7 data types specification requires the use of UCUM (Unified Code for Units of Measure⁹) to express units in the PQ (physical quantity) data type.

2.3.1 Potential Overlap

SNOMED CT contains concepts that represent most of the widely used units and these overlap with the UCUM representation. These SNOMED CT concepts could be represented in the translation element of the PQ data type. However, this would introduce redundancy and the potential for conflict between the alternative representations.

⁹ <http://aurora.rg.iupui.edu/UCUM>

2.3.2 Rules and Guidance

The following guidance is intended to reduce the need for redundant representation of units and maximize the opportunity for automated unit conversion.

1. Consistent with the Data Types: Abstract specification (both the R1 release, as used in CDA R2, and the R2 release), the unit attribute of the HL7 PQ (physical quantity) data type **SHALL** be encoded using the appropriate UCUM representation and not using a SNOMED CT concept identifier (CONF:78).
 - a) If a SNOMED CT concept identifier is used to populate the unit attribute of the PQ data type, this is a non-standard use which will result in an invalid CDA R2 or V3 instance.
 - b) It is valid in CDA R2 and V3 to use a SNOMED CT concept identifier to populate the translation element of the PQ data type, but this is not recommended in cases where a standard UCUM representation exists, in order to avoid introducing redundancy and the potential for conflict between the alternative representations.
2. In the case of "informal units", which have no standard UCUM representation, a SNOMED CT concept identifier **MAY** be used in the translation element of the PQ data type (CONF:79).
 - Examples of "informal units" may include counted items (such as tablets or capsules). Items such as these are frequently encountered in the role of a "unit", but are not true units at all (as they include dose form or other information). The use of these "informal units", although common, is discouraged. The nature of the counted items should be captured in the appropriate information model or terminology structures. In these cases the unit "1" (the UCUM symbol meaning "the unity") or the "informal unit" enclosed in curly braces ({}) SHALL be used and the SNOMED CT representation of the nature of the counted unit MAY then be used in the translation element.

2.3.3 Discussion and Rationale

Use of UCUM representation simplifies interoperability using HL7 messages. The UCUM specification also supports translation between different types of units. It is possible to map from SNOMED CT concepts to UCUM in all cases except those where an informal unit is specified. On the other hand, since the UCUM representation is an expression syntax it can be used to represent an almost unlimited range of complex units in a formal mathematical manner. Many of the units that can potentially be represented in UCUM have no pre-coordinated equivalent in SNOMED CT. SNOMED post-coordination does not currently support the type of mathematical formalism that UCUM offers.

2.4 Dates and Times

In the RIM the HL7 Act class includes two attributes related to the temporal situation of an action (Act.effectiveTime, Act.activityTime). In CDA R2 this has been constrained to allow only the effectiveTime attribute. Each participation in an Act may also have an

associated time (for example, author.time or performed.time). Each of these times can be expressed either as a point-in-time or a period of time.

2.4.1 Potential Overlap

The SNOMED CT [408731000 | Temporal context |](#) distinguishes between findings or procedures that are recorded as part of "past" history and those that are recorded as [15240007 | Current |](#). It also allows a distinction to be made between a specified point or period in time (e.g. [410588008 | Past - unspecified |](#)). The [408731000 | Temporal context |](#) potentially affects the interpretation HL7 date and time attributes.

When a SNOMED CT expression (or concept definition) includes an explicit representation of [408731000 | Temporal context |](#), the effectiveTime might be interpreted either as "the time at which the *situation* applied" or "the time at which the *focus concept* applied". Guidance is needed to avoid this potentially misleading ambiguity.

- For example, the definition of the concept [407553003 | History of - glandular fever |](#) includes:
 - [246090004 | Associated finding | = 271558008 | Glandular fever |](#), [408731000 | Temporal context | = 410513005 | Past |](#)
 - The concept [407553003 | History of - glandular fever |](#) represents a *situation*.
 - The value of the associated finding attribute is the *focus concept* (i.e. the concept [271558008 | Glandular fever |](#)).
 - When an Observation asserts the value [407553003 | History of - glandular fever |](#), the effectiveTime might be interpreted as:
 - The time when the *focus concept* applied (i.e. the time in the past when they actually had glandular fever);
 - The period of time during which the *situation* applied (i.e. the period of time during which they had a "history of glandular fever" (i.e. a period of time from when they first had glandular fever with no upper bound or extending until death);
 - The time during an episode of care when the *situation* was recognized (i.e. a period starting when "history of glandular fever" was first recorded as part of the record of this episode of care);
 - The time during which the *situation* was considered clinically relevant (i.e. a period of time based on a clinical judgment of the significance of a past history of glandular fever to the current longer term health).

2.4.2 Rules and Guidance

The following rules clarify the impact of [408731000 | Temporal context |](#) on interpretation of HL7 date and time attributes associated with an Act class instance.

1. If a SNOMED CT expression includes an explicit [408731000 | Temporal context](#) value, the effectiveTime **SHALL** be interpreted as applying to the time at which the focus concept applied (CONF:80).
 - The focus concept is the value of the [246090004 | Associated finding](#) or [363589002 | Associated procedure](#) in the SNOMED CT expression or concept definition.
 - For example, the Act.effectiveTime for [407553003 | History of - glandular fever](#) is the time, in the past, when they had glandular fever.
 - If the [408729009 | Finding context](#) indicates negation (e.g. [408729009 | Finding context](#) = [410516002 | Known absent](#)), the Act.effectiveTime refers to the point in time or period or time during which the focus concept was known to be absent
 - Similarly, if the [408730004 | Procedure context](#) has a negative value such as [385660001 | Not done](#) the Act.effectiveTime refers to the point in time or period or time during which the focus concept was not done.
 - For example, the Act.effectiveTime for [165139002 | Endoscopy not carried out](#) represents the time at which, or period during which, an endoscopy was not done.
2. If the SNOMED CT expression in an Act class instance specifies [408731000 | Temporal context](#) = ([410584005 | Current - specified](#) | OR [410587003 | Past - specified](#) |):
 - the Act.effectiveTime attribute **SHALL** be present and its value SHALL be interpreted as the clinically relevant point or period in time at which the focus concept applied or is intended to apply (CONF:81).
3. If the SNOMED CT expression in an Act class instance does not explicitly specify [408731000 | Temporal context](#) or explicitly specifies [408731000 | Temporal context](#) = ([410512000 | Current or specified](#) | OR [15240007 | Current](#) | OR [410585006 | Current - unspecified](#) |):
 - the Act.effectiveTime attribute **SHOULD** be included and, if present, its value SHALL be interpreted as the clinically relevant point in time or period during which the associated finding procedure applied or is intended to apply (CONF:82).
 - If the Act.effectiveTime represents a period of time with an upper bound either set in the future or omitted, this indicates that the focus concept continues (or is expected to continue) to apply beyond the time when it was recorded.
 - If the Act.effectiveTime attribute is omitted (or contains a null flavor), the Participation.time value stated for a performer **MAY** be regarded as an approximation to the clinically relevant time (CONF:83).
4. If the SNOMED CT expression in an Act class explicitly specifies [408731000 | Temporal context](#) = ([410513005 | Past](#) | OR [6493001 | Recent](#) |):

- the Act.effectiveTime attribute **MAY** be included and, if present, its value **SHALL** be interpreted as the clinically relevant point or period in time to which the focus concept applied or is intended to apply (CONF:84).
 - the Participation.time value stated for an author **SHALL** be regarded as the time at which it was asserted that this procedure or observation was carried out in the past (CONF:85).
5. If the SNOMED CT expression in an Act class instance explicitly specifies `408731000 | Temporal context | = 410588008 | Past - unspecified |`:
- the Act.effectiveTime attribute **SHALL NOT** be included as this would contradict the asserted `408731000 | Temporal context |` (CONF:86).
 - the Participation.time value stated for an author **SHALL** be interpreted as the time at which it was asserted that this procedure or observation was carried out in the past (CONF:87).
6. If the SNOMED CT expression in an Act class explicitly specifies `408731000 | Temporal context | = 410589000 | All times past |`:
- the Act.effectiveTime attribute **SHOULD NOT** be included but, if present, it **SHALL** only specify the upper bound of a period of time (CONF:88).
 - **Note:** The `408731000 | Temporal context | = 410589000 | All times past |` is used with `408729009 | Finding context | = 410516002 | Known absent |` to assert a negative past history or a negative family history (e.g. `266882009 | No family history of ischemic heart disease |`). Negative assertions of this type imply that at `410589000 | All times past |` the focus concept did not apply. It is reasonable to combine this with the upper bound of a period of time, as the finding may be true at some future point in time (e.g. the patient may now be diagnosed as having asthma, although they have no past history of asthma). However, it would be contradictory to specify a point in time value or a lower bound for a period of time.
 - the Participation.time value stated for an author **SHALL** be interpreted as the time at which it was asserted that at all times past this Observation applied (CONF:89).

2.4.3 Discussion and Rationale

In most cases, following the general rules specified by the HL7 RIM allow unequivocal interpretation of the meaning of the Act.effectiveTime and associated Participation.time values. However, there are several possible interpretations of Act.effectiveTime, in relation to a SNOMED CT expression which includes an explicit past history temporal context (i.e. `408731000 | Temporal context | = <<410513005 | Past |`). Therefore, the rules specified above require that the relative time as specified by the SNOMED CT `408731000 | Temporal context |` and any specific point or period of time expressed in Act.effectiveTime should be consistent with one another. The rules do not permit the effectiveTime and `408731000 | Temporal context |` to be interpreted in a combinatorial manner. Thus if the `408731000 | Temporal context | = 410513005 | Past |` the

Act.effectiveTime, if stated, must be the point or period in the past when the finding applied.

2.5 ActRelationships

2.5.1 Observation Qualification Using ActRelationships

Constrained information models specified by some Domain committees use an ActRelationship to allow one Observation to qualify the meaning of another Observation. For example, to specify the severity of an abnormal observation.

2.5.1.1 Potential Overlap

SNOMED CT includes qualifiers that allow refinement of meaning using post-coordinated expressions. As a result, the use of an additional Observation class is unnecessary and introduces alternative ways to represent the same meaning.

2.5.1.2 Rules and Guidance

The following rules are specified to simplify interpretation by minimizing unnecessary variability in representation.

1. A constrained information model or template that permits use of SNOMED CT as one of the permitted ways to represent the result of an Observation **MAY** include related Observation classes included to permit qualification of the meaning of an Observation, but inclusion of these qualifying class **SHALL NOT** be required (CONF:90).
2. A constrained information model or template that requires use of SNOMED CT to represent the result of an Observation **SHALL NOT** include any related Observation classes included to permit qualification of the meaning of an Observation (CONF:91).
3. An Observation class instance in which the Observation.value is represented by a SNOMED CT expression **SHALL NOT** include any related qualifying classes but **SHOULD** encode the relevant qualifications as part of the expression (CONF:92).

2.5.1.3 Discussion and Rationale

It is important to reduce the scope for unnecessary alternative representation of the same information. Tight coupling of the qualification to the primary result of the observation is likely to reduce the risk of misinterpretation.

2.5.2 Representing Compound Statements and Relationships Between Statements

In the HL7 Clinical Statement Pattern the ActRelationship class is used to express links or associations between different clinical statements. These linkages may be of different types expressed using the typeCode attribute. Examples of typeCode values include "contains", "pertain to", "caused by", and "reason for".

2.5.2.1 Potential Overlap

SNOMED CT provides a variety of attributes that can be used to represent relationships between different concepts in a post-coordinated expression. These post-coordinated expressions have the potential to represent some association that might alternatively be represented using ActRelationships. For example, the attributes [42752001 | Due to |](#) could be used to construct expressions such as [49218002 | Hip pain | : 42752001 | Due to | = 396275006 | Osteoarthritis |](#), which could also be represented using two separate Observations linked by an ActRelationship with the typeCode "caused by".

2.5.2.2 Rules and Guidance

There is no absolute rule about when to express linkage in the terminology and when to use linkage mechanisms in the RIM (e.g. ActRelationships). However, the following guidance should be followed:

- A single identifiable observation, assertion or procedure **SHOULD** usually be represented by a single Act class instance containing an appropriate SNOMED CT expression (CONF:93).
- A single Act class instance **SHOULD** be used to represent an integral combination of facets applicable to a single identifiable observation, assertion or procedure (CONF:94).

Some examples of integral combinations are shown below. The common feature of these is that together they represent a finding with a distinct pattern and a shared life history.

- A combination of findings is a part of a single recognizable condition
 - E.g. "Headache preceded by visual disturbance".
- A disorder is specialized by a specific cause
 - E.g. "Pneumonia due to streptococcus pneumoniae".
- The nature of a disorder is determined by another condition
 - E.g. [4855003 | Diabetic retinopathy |](#).
- A temporal or causative relationship between two concepts in which one is a specific symptom or diagnostic criterion for the other.
 - E.g. [51771007 | Postviral fatigue syndrome |](#).
- A single recognized procedure involves two or more distinct but related actions:
 - E.g. [86477000 | Total hysterectomy with removal of both tubes and ovaries |](#).
 - E.g. [118468006 | Open reduction of fracture with fixation |](#).
- Post-coordinated SNOMED CT expressions **SHOULD NOT** be used to artificially combine distinct observations, assertions and procedures into a single Act class instance (CONF:95).

- The line between integral combinations of items and distinct items is not clear-cut. However, as a general rule two items **SHOULD** be considered to be distinct if:
 - they are capable of being independently validated (i.e. the accuracy of one statement is not dependent on the accuracy of the other)
 - their life histories differ and are independent of one another
 - the relationship between them is a matter of judgment rather than fact
 (CONF:96)
- Distinct observations, assertions and procedures **SHOULD** be represented by separate Act class instances related to one another by appropriate ActRelationships (CONF:97).
 - Multiple distinct findings in a patient that may or may not be associated with one another or with some more general problem.
 - E.g. A collection such as "chest pain" with "shortness of breath" finding of "tachycardia" and "ECG abnormality" interpreted as "Myocardial infarction".
 - Multiple conditions occur contemporaneously (or in sequence) where the nature of individual conditions is specific to the presence of the other condition.
 - E.g. "AIDS" and "gastro-enteritis"
 - Multiple distinct procedures incidentally performed at the same time or during the same hospital stay.

2.5.2.3 Discussion and Rationale

In general SNOMED CT expressions (whether pre-coordinated or post-coordinated) are most appropriate for expressing multiple facets of a single logical concept. On the other hand, HL7 ActRelationships are more appropriate for making associations between multiple distinct observations or procedures. However, this boundary is fuzzy and there are many situations in which either approach may have equal merit.

The use of SNOMED CT attributes may result in arbitrarily complex statements that wrap multiple distinct findings within a single terminological expression. In these cases, the use of separate coded statements linked by Act Relationships is preferable. On the other hand, use of multiple statements linked by ActRelationships to represent a single composite finding or procedure may result in loss of the natural clinical term used by a clinician within a collection or linked classes.

Even when the guidelines above are followed, there will be grey areas. In an ideal world a rule would be devised to compute equivalence between single Act class instances containing a post-coordinated SNOMED CT expression and multiple Act class instances. While this is theoretically possible, there are several practical obstacles. The HL7 vocabulary for the ActRelationship.typeCode attribute differs from the range of values for linkage attributes in SNOMED CT. Simple precise or close mappings exist for some values but more work is needed before we can assert full semantic interoperability

between the two representations. In addition, while a single instance of a post-coordinated representation has a single life-history, the individual instances in a multiple class representation may have separate life histories and separate associations with other contextual information.

2.6 Participations

2.6.1 Subject Participation and Subject Relationship Context

The HL7 participation type “subject” relates a finding or procedure to a subject who may or may not be the subject of the record. This allows specific named individuals to be identified as the subject of an Act. It can also be used to associate a related person by specifying their relationship rather than by identifying them. For example [303071001 | Person in the family |](#), [72705000 | Mother |](#), [70862002 | Contact person |](#), etc.

2.6.1.1 Potential Overlap

The SNOMED CT [408732007 | Subject relationship context |](#) attribute provides a mechanism for indicating that the subject of a procedure or finding is a person (or other entity) related to the subject of the record. This facility is used to define some SNOMED CT concepts (e.g. "family history of asthma" has [408732007 | Subject relationship context | = 303071001 | Person in the family |](#)). The same attribute can also be used to create post-coordinated expressions. For example, it can be used to express a family history of a disorder without requiring a pre-coordinated concept that expresses a family history of that particular disorder. Unlike the HL7 "subject" participation, the SNOMED CT mechanism does not directly support reference to an identified person.

2.6.1.2 Rules and Guidance

The following rules are specified to encourage explicit recording of the [408732007 | Subject relationship context |](#) in order to minimize risks of overlooking this aspect of the information.

1. When using SNOMED CT to represent an observation or procedure that applies to a subject other than the record target, the appropriate [408732007 | Subject relationship context |](#) **SHOULD** be specified in the SNOMED CT expression (CONF:98).
 - o For example "family history" should be represented using an expression that specifies the [408732007 | Subject relationship context |](#) as [303071001 | Person in the family |](#).
2. The HL7 subject participation **MAY** also be used and **SHALL** be used if there is a requirement to specifically identify an individual subject (CONF:99).
3. If the HL7 subject participation is used in addition to the SNOMED CT representation of [408732007 | Subject relationship context |](#), the Role.code of the role that is the target of the subject **SHOULD** be represented using SNOMED CT with the value applied to the [408732007 | Subject relationship context |](#) or with a subtype of that value (CONF:100).

2.6.1.3 Discussion and Rationale

These recommendations leave some situations in which either approach may be used. Therefore, to compute equivalence, a map between the values used in the code attribute of the associated subject role is required. The simplest option would be to specify that when the classCode attribute of the HL7 Role specifies "personal relationship" the code attribute should have a value from the range specified for the SNOMED CT [408732007 | Subject relationship context |](#) attribute.

Ambiguity may be introduced if the information is coded using a concept with explicit [408732007 | Subject relationship context |](#) and also has an association to a specific subject. For example, if the concept [160303001 | FH: Diabetes mellitus |](#) is stated in an observation linked to a person other than the subject of the record, this could mean either (a) "the patient has a family history of diabetes, in the named family member" or (b) "the identified subject has a family history of diabetes".

Specific recommendations on this should be included in communication specifications. Where a communication pertains to an individual patient interpretation (a) is recommended. However, specific instances of the subject participation in a communication about a group of patients may need to specify interpretation (b).

2.6.2 Specimen Participation in Observations

The HL7 participation type "specimen" relates an observation to the specimen on which an observation was made (or is to be made). The specimen participation allows type of specimen or an actual identifiable specimen to be specified.

2.6.2.1 Potential Overlap

Some SNOMED CT [<386053000 | Evaluation procedure |](#) and [<363787002 | Observable entity |](#) concepts indicate the type of specimen that is the subject of the measurement or observed property. Refinement is possible using the [116686009 | Has specimen |](#) attribute to specify particular specimen types for any relevant procedure. Therefore, there is a potential overlap between two approaches to representation of the nature of the specimen.

2.6.2.2 Rules and Guidance

1. When using SNOMED CT to record an observation that applies to a specimen the nature of the specimen **MAY** be expressed separately using the Entity.code of the entity playing the role that is the target of the specimen participation (CONF:101).
 - o This type of representation may be appropriate in cases where it is also necessary to identify the specimen and where a single specimen is the subject of multiple different observations.
 - o When using this form of representation:
 - The type of specimen **SHOULD** be expressed using an appropriate SNOMED CT concept in the Entity.code attribute (CONF:102).
 - If the SNOMED CT expression used in Observation.code specifies a value for the [116686009 | Has specimen |](#) attribute, the value of this

attribute **SHALL** be either the same as or less specific than the value used in the Entity.code (CONF:103).

2. Alternatively, a specific SNOMED CT concept or expression **MAY** be used to specify the nature of the observation including the type of specimen (CONF:104).
 - a. This form **MAY** be appropriate to simple recording of result in a clinical record but does not allow the specific instance of the specimen to be identified (CONF:105).

2.6.2.3 Discussion and Rationale

The recommendations on representation of specimen take into account the current incomplete set of investigation codes available. Recent experience in the UK suggests that the first approach above, using the Entity.code is a more flexible basis for requesting and reporting laboratory investigation using SNOMED CT.

The guidance on use of SNOMED CT in the Entity.code attribute is intended to avoid conflicts or ambiguity that may result from representing the values of [116686009 | Has specimen](#) | and Entity.code using different code systems.

2.6.3 Product and Consumable Participations in Supply and SubstanceAdministration

The HL7 *product* Participation associates a specified material (via an appropriate Role) with the instance of the Supply class instance that delivers this material to a subject. Similarly the "consumable" associates a specified material (via an appropriate Role) with the instance of the SubstanceAdministration class instance that delivers this material to a subject. In both these cases, the relevant Act class instance itself only needs to specify the action involved and does not need to indicate the nature of the material supplied or administered.

2.6.3.1 Potential Overlap

SNOMED CT [<432102000 | Administration of substance](#) | concepts can also specify the nature of the substance administered. Refinement of any particular type of administration is possible by applying values to the "direct substance" attribute to represent administration of any pharmaceutical product. Therefore, there is a potential overlap between two approaches to representation of the nature of the substance administered.

2.6.3.2 Rules and Guidance

1. When using SNOMED CT to communicate about the supply or administration of a substance the nature of the substance **SHOULD** be specified in the Entity.code of the Entity associated with the Role that is the target of the relevant *product* or *consumable* Participation (CONF:106).

When using this form of representation:

- o The Act.code of the SubstanceAdministration class instance **SHOULD** be coded using a SNOMED CT concept that is a [<432102000 |](#)

[Administration of substance |](#), but which does not specify a [363701004 | Direct substance |](#) (CONF:107).

- o The nature of the substance administered **SHOULD** be expressed using an appropriate SNOMED CT concept in the Entity.code attribute of Entity playing the Role that is the target of the relevant participation (CONF:108).

Example: SubstanceAdministration.code= [36673005 | Intradermal injection |](#) with associated Entity (via a *consumable* Participation and an appropriate *Role*), in which Entity.code= [<<82573000 | Lidocaine |](#)

2. When using SNOMED CT to summarize information about a particular type of medication (e.g. use of a local anesthetic during a procedure), a SNOMED CT expression that includes information about the nature of the substance administered **MAY** be used (CONF:109).
 - a. However, this form **SHOULD NOT** be used for communicating about the prescription, supply or personal administration of medication (CONF:110).
 - b. Example: SubstanceAdministration.code = [36673005 | Intradermal injection |](#); [363701004 | Direct substance |](#) = [<< 82573000 | Lidocaine |](#)

2.6.3.3 Discussion and Rationale

The first approach follows the form recommended by the Pharmacy TC and endorsed by the Clinical Statement Pattern and other domain committees. The alternative approach may be relevant for summary notes related to certain types of treatment but is not appropriate for prescribing or medication management as it does not provide a reference to a specific quantifiable amount of the substances administered nor does it allow reference to batch numbers and detailed product information.

2.7 Context Conduction

2.7.1 Structures which propagate context in HL7 models

CDA R2 includes specific attributes, which indicate whether context propagates across Participation and ActRelationship associations. The rules associated with these attributes determine whether the target Act of an ActRelationship shares the participations and other contextual attributes of the source Act and whether these can be substituted by alternative explicit values within the target Act.

Note: The context conduction model used in earlier versions of the RIM and currently in CDA R2 has been deprecated and replaced in later versions of the RIM by a new “vocabulary-based” context conduction model (as of March 2010 – see [Core Principles and Properties of V3 Models](#) for details). A future release of CDA may update this to be consistent with the current RIM, but at present the following guidance is applicable for use in CDA R2.

2.7.1.1 Potential Overlap

Propagation of context is valuable and in some cases almost essential, as it reduces the need to duplicate contextual information. However, it is not entirely clear whether, and if so how, this propagation of context applies to coded information in each Act instance. Safe interpretation of clinical information requires a common understanding of where contextual information is represented using SNOMED CT, if either Act.code or Observation.value propagates to related Acts based on the context propagation rules. For example, several Observations coded using SNOMED CT disorder concepts might be related as component parts of an Organizer labeled with the SNOMED CT code "family history of disorder". If the coded context propagated it might seem to express a family history, if not these might be part of the personal medical history of the subject of record.

2.7.1.2 Rules and Guidance

The following rules are specified to minimize the risk of ambiguity due to loss of contextual information.

1. SNOMED CT contextual information **SHOULD NOT** be assumed to propagate between Acts and SHOULD therefore be restated in each expression (CONF:111).
 - a. For example, each SNOMED CT expression in a collection of statements representing family history, **SHOULD** represent the relevant [408732007 | Subject relationship context](#) | (CONF:112).
 - i. This context **SHOULD NOT** be assumed to propagate from an Organizer (or other containing Act) to its constituent Observations or from one Observation to another (CONF:113).
2. In specific cases where there is clear advantage in allowing specific aspects of SNOMED CT context to conduct, this behavior **SHALL** be explicitly documented in a manner that ensures reproducible interpretation (CONF:114).

2.7.1.3 Discussion and Rationale

It is not clear how context conduction is intended to apply to contextual information that is represented in concepts within an Act. If this type of context is assumed to propagate it would mean that the meaning of a single Observation might be fundamentally altered by a related Act (or potentially by a chain of several different related Acts). This type of dependency presents significant risks, since different systems may be unable to reproducibly determine the composite meaning. Therefore, it seems safest to recommend restatement of the essential aspects of context as defined by the SNOMED CT context model rather than permitting this context to conduct.

There may be some specific cases, where a tightly coupled set of Acts are expected to behave as a block with regard to the surrounding context and where some or all aspects of context represented using SNOMED CT also need to be conducted. In these cases the potential for misinterpretation needs to be considered and appropriately documented.

3 COMMON PATTERNS

3.1 Introduction

Common patterns are clinical statements that are used frequently, often in many different specifications, for a wide variety of communication use cases. The patterns shown here are based upon the Principles and Guidelines defined above, and represent informative examples, unless otherwise stated.¹⁰

Note: The approach taken in the development of these patterns is to build upon the modeling work being done within HL7 domain committees. In many cases, the patterns presented here are small subsets of more complete domain models, often greatly simplified so as to illustrate certain principles. Actual instances must conform to the particular HL7 V3 specification being communicated.

3.2 Observations vs. Organizers

The RIM defines the abstract ActClass "ActClassRecordOrganizer" as a navigational structure or heading used to group a set of acts sharing a common context. Record organizers include such structures as folders, documents, document sections, and batteries. The Clinical Statement Pattern includes an Organizer class, whose class code can be valued with an ActClassRecordOrganizer subtype. Where the Organizer class is used, the value of Organizer.code may be drawn from the SNOMED CT <[419891008 | Record artifact](#) | OR <[386053000 | Evaluation procedure](#) | hierarchies.¹¹

It is often the case that there is a close correspondence between a particular kind of clinical statement (e.g. a blood pressure reading) and the organizer where the clinical statement is commonly found (e.g. a vital signs section). The patterns presented here are irrespective of and not dependent on the organizer in which they are found. Thus, the pattern for allergies and adverse reactions should be used regardless of any organizers they may or may not be contained in; and any distinction between a finding vs. disorder vs. diagnosis needs to be made explicit in the clinical statement itself, without reliance on the containing organizer. Stated in another way, a clinical statement needs to be a correct assertion by itself, when viewed outside the organizer.¹²

3.3 Observation code and value (in event mood)

A recurring issue for many observation events, regardless of the particular pattern, is determining how to populate observation.code and observation.value. While this is typically straight-forward for laboratory observations, it can get blurry for other types of observations, such as findings and disorders, family history observations, etc.

¹⁰ These patterns assume the use of SNOMED CT. While other code systems (such as LOINC or ICD9) may be required or even preferable in some situations, these situations are outside the scope of this guide.

¹¹ The Organizer class can be used to communicate batteries. Therefore measurement procedures representing batteries can be used.

¹² The organizer may have contextual components (e.g. participants or act relationships) which propagate to nested observations.

The intent of this section is to illustrate the acceptable patterns. Subsequent sections do not include all possible permutations of code/value split, and it should be assumed that any of the acceptable patterns described here would be equally applicable.

3.3.1.1 Acceptable patterns for Observation code/value

Based on these guiding principles come the following acceptable patterns:

PATTERN ONE: Observation.code <363787002 | Observable entity | OR <386053000 | Evaluation procedure |; Observation.value = not null (e.g. numeric, nominal, ordinal, coded result).

Example 9: Observation code/value: observable entity with result

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="50373000"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Height"/>
  <text>Height: 177 cm</text>
  <value xsi:type="PQ" value="1.77" unit="m"/>
</observation>
```

```
<observation classCode="OBS" moodCode="EVN">
  <code code="247030006"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Color of iris"/>
  <text>Green eyes</text>
  <value xsi:type="CD" code="301954005"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Green iris"/>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="50373000|Body height|" codeSystemName="SNOMED CT"
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Height"/>
</code>
  <text>Height: 177 cm</text>
  <value xsi:type="PQ" value="1.77" unit="m"/>
</observation>
```

```
<observation classCode="OBS" moodCode="EVN">
  <code code="247030006 | Color of iris (observable entity) |"
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Color of iris"/>
</code>
  <text>Green eyes</text>
  <value xsi:type="CD" code="301954005 | Green iris (finding) |"
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Green iris"/>
</value>
</observation>
```

PATTERN TWO: Observation.code = "ASSERTION"
(codeSystem="2.16.840.1.113883.5.4"); Observation.value <413350009 | Finding with explicit context | OR <404684003 | Clinical finding | OR <272379006 | Event |.

Example 10: Observation code/value: assertion of a clinical finding

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache</text>
  <value xsi:type="CD" code="25064002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Headache"/>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache</text>
  <value xsi:type="CD" code="25064002 | Headache | "
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Headache"/>
</value>
</observation>
```

In this example, the observation is simply the assertion of a "headache". If there is a need to distinguish between, say, a patient-reported symptom vs. a clinician-asserted diagnosis, more information would need to be present. Thus, while an acceptable pattern is to assert a clinical finding, that may not convey sufficient context for all communication use cases. Likewise, an assertion of a procedure.code (such as for an appendectomy performed 5 years ago) doesn't distinguish between a patient's reported past surgical history vs. information gleaned from chart review, and additional contextual information will be needed in some cases.

Example 11: Observation code/value: assertion of a clinical finding with explicit context

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Presence of headache</text>
  <value xsi:type="CD" code="373573001"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Clinical finding present">
    <qualifier>
      <name code="246090004" displayName="Associated finding"/>
      <value code="25064002" displayName="Headache"/>
    </qualifier>
  </value>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Presence of headache</text>
  <value xsi:type="CD" code="373573001 | Clinical finding present
|:246090004 | Associated finding | =25064002 | Headache |"
codeSystem="2.16.840.1.113883.6.96"/>
</observation>
```

In this example, a finding with explicit context is used to assert the presence of a headache.

An HL7 Observation in event mood is analogous to a SNOMED CT [404684003 | Clinical finding |](#), and an HL7 Observation in event mood with explicit context (such as presence or absence, subject, past or present) is analogous to a SNOMED CT [413350009 | Finding with explicit context |](#). Noting this, and drawing from section "Codes and Values" above, come the following guiding principles for populating observation.code and observation.value:

- Acceptable patterns shall be fully transformable amongst each other (by a machine, with no loss of semantics).
- Acceptable patterns shall not conflict with SNOMED CT's definitions, where only certain hierarchies (e.g. [363787002 | Observable entity |](#), [386053000 | Evaluation procedure |](#)) are defined as being able to take on values (i.e. have an associated observation.value).
- Acceptable patterns shall not conflict with the RIM, which defines the Act class as "a record of something that is being done, has been done, can be done, or is intended or requested to be done", and defines the Act.code attribute as "a code specifying the particular kind of Act that the Act-instance represents within its class".

3.4 Source of information

Another recurring issue for many clinical statements is the representation of how the information in that statement was obtained (e.g. patient-reported symptom, gleaned from chart review, physical exam finding). Whether or not the source of information needs to be included in a particular communication is outside the scope of this guide, but in some cases, such as the recording of patient medications, knowing the source of the information can have significant clinical implications, and since there are overlaps in HL7 and SNOMED CT representations, the topic is addressed in this guide.

Common sources include: [1] Previously recorded information (e.g. a patient-authored questionnaire, a problem list entry, a lab report); [2] Informant (e.g. the patient, a witness); [3] Direct examination (e.g. a physical examination finding, a radiographic finding, an automated specimen analysis).

Various ways by which the source of information can be represented include:

- SNOMED CT defining attributes (whether pre- or post-coordinated)
 - [418775008 | Finding method |](#): Used to indicate the method by which a finding was ascertained.
 - [419066007 | Finding informer |](#): Used to indicate the informant of a finding.
 - [260686004 | Method |](#): Used to indicate the method by which a procedure is performed.
 - [370129005 | Measurement method |](#): Used to indicate the method by which an observable entity or evaluation procedure is performed.
- RIM attributes
 - Procedure.methodCode: Identifies the means or technique used to perform the procedure.
 - Observation.methodCode: A code that provides additional detail about the means or technique used to ascertain the observation.
- RIM participants
 - Informant (INF): A source of reported information.
- RIM act relationships
 - Excerpt (XCRPT): The source is an excerpt from the target.
 - Verbatim excerpt (VRXCRPT): The source is a direct quote from the target.

3.4.1.1 Acceptable patterns for source of information

Patterns for the common sources listed above include:

PATTERN ONE: Source is previously recorded information.

Example 12: Current observation is directly referenced from something previously recorded

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <id root="3568dbel-8f49-11da-a72b-0800200c9a66"/>
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache, per problem list</text>
  <value xsi:type="CD" code="25064002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Headache"/>
  <actRelationship typeCode="XCRPT"
    contextConductionInd="false">
    <actReference classCode="OBS" moodCode="EVN">
      <id root="201877f1-8f49-11da-a72b-0800200c9a66"/>
    </actReference>
  </actRelationship>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <id root="3568dbel-8f49-11da-a72b-0800200c9a66"/>
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache, per problem list</text>
  <value xsi:type="CD" code=" 25064002 | Headache | "
    codeSystem="2.16.840.1.113883.6.96">
    <displayName value="Headache"/>
  </value>
  <actRelationship typeCode="XCRPT"
    contextConductionInd="false">
    <actReference classCode="OBS" moodCode="EVN">
      <id root="201877f1-8f49-11da-a72b-0800200c9a66"/>
    </actReference>
  </actRelationship>
</observation>
```

This pattern uses an ActRelationshipType of "XCRPT (Excerpts)" to indicate that there is a new observation which represents an excerpt of previously recorded information. The ActReference class is used here as the target, but other clinical statement act choices could also be used. Context conduction to the ActReference class is blocked by setting contextConductionInd to "false".

PATTERN TWO: Source is informant.

The distinction between the excerpt (XCRPT) relationship in [Example 12](#) and an informant participant discussed here can be blurry, such as when a clinician is drawing upon the patient's recollection and a prior record of medication use to determine the current medication usage. An informant (or source of information) is a person who provides relevant information, whereas an excerpt is a sub-portion of some other act.

Example 13: Informant is the father

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>
    Father says that the patient has a headache
  </text>
  <value xsi:type="CD" code="25064002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Headache"/>
  <informant typeCode="INF">
    <relatedEntity classCode="PRS">
      <code code="66839005"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Father"/>
    </relatedEntity>
  </informant>
</observation>
```

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>
    Father says that the patient has a headache
  </text>
  <value xsi:type="CD" code="25064002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Headache">
    <qualifier>
      <name code="419066007"
        displayName="Finding informer"/>
      <value code="66839005" displayName="Father"/>
    </qualifier>
  </value>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Father says that the patient has a headache.</text>
  <value xsi:type="CD" code="25064002 | Headache | "
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Headache"/>
</value>
  <informant typeCode="INF">
    <relatedEntity classCode="PRS">
      <code code="66839005 | Father | "
codeSystem="2.16.840.1.113883.6.96">
      <displayName value="Father"/>
    </code>
  </relatedEntity>
  </informant>
</observation>
```



```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Father says that the patient has a headache.</text>
  <value xsi:type="CD" code="25064002 | Headache |:419066007 | Finding
informer | =66839005 | Father |" codeSystem="2.16.840.1.113883.6.96"/>
</observation>

```

Example 12 uses an Informant participant to indicate that the observation is gleaned through the record subject's father, and *Example 13* expresses the same thing using the finding informer attribute in a post-coordinated expression.

Example 12 is particularly useful where there is a need to identify or provide additional specifics about the informant participant. Where both informant participant and finding informer are present, the former should be the same as or a specialization of the latter.

Example 14: Source is patient-reported symptom

CD data type R1 (used in CDA R2)

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
  codeSystem="2.16.840.1.113883.5.4"/>
  <text>Patient states he has a headache</text>
  <value xsi:type="CD" code="25064002"
  codeSystem="2.16.840.1.113883.6.96"
  displayName="Headache">
    <qualifier>
      <name code="419066007"
      displayName="Finding informer"/>
      <value code="116154003" displayName="Patient"/>
    </qualifier>
  </value>
</observation>

```

CD data type R2

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Patient states he has a headache</text>
  <value xsi:type="CD" code="25064002 | Headache |:419066007 | Finding
informer | =116154003 | Patient |"
codeSystem="2.16.840.1.113883.6.96"/>
</observation>

```

This example shows the use of the finding informer attribute to indicate that the patient is the source of the information. It will commonly be the case that a V3 instance will assert an informant participant, which will propagate to nested observations. Therefore it won't often be necessary to directly assert a finding informer of patient.

PATTERN THREE: Source is direct examination.

Example 15: Source is direct examination of patient

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="77989009"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Measurement of skin fold thickness">
    <qualifier>
      <name code="370129005"
        displayName="Measurement method"/>
      <value code="5880005" displayName="Physical exam"/>
    </qualifier>
  </code>
  <text>Skin fold thickness is 7cm</text>
  <value xsi:type="PQ" value="7" unit="cm"/>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="77989009 | Measurement of skin fold thickness
|:370129005 | Measurement method | =5880005 | Physical examination
procedure |" codeSystem="2.16.840.1.113883.6.96"/>
  <text>Skin fold thickness is 7cm</text>
  <value xsi:type="PQ" value="7" unit="cm"/>
</observation>
```

This pattern uses the SNOMED CT measurement method attribute to qualify a measurement procedure concept, indicating that the observation was determined via physical exam.

Example 16: Source is direct examination of radiograph

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Hilar mass on chest CT</text>
  <value xsi:type="CD" code="309530007"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Hilar mass">
    <qualifier>
      <name code="418775008"
        displayName="Finding method"/>
      <value code="169069000" displayName="CT chest"/>
    </qualifier>
  </value>
  <actRelationship typeCode="SUBJ"
    contextConductionInd="false">
    <observation classCode="DGIMG" moodCode="EVN">
      <id root="9cc8b460-8f47-11da-a72b-0800200c9a66"/>
      <code code="169069000"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="CT chest"/>
    </observation>
```

```

    </actRelationship>
</observation>

```

CD data type R2

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Hilar mass on chest CT</text>
  <value xsi:type="CD" code="309530007 | Hilar mass | :418775008 |
Finding method | =169069000 | CT of chest | "
codeSystem="2.16.840.1.113883.6.96"/>
  <actRelationship typeCode="SUBJ" contextConductionInd="false">
    <observation classCode="DGIMG" moodCode="EVN">
      <id root="9cc8b460-8f47-11da-a72b-0800200c9a66"/>
      <code code="169069000 | CT of chest | "
codeSystem="2.16.840.1.113883.6.96">
        <displayName value="CT chest"/>
      </code>
    </observation>
  </actRelationship>
</observation>

```

This pattern uses the SNOMED CT finding method attribute to qualify a finding concept, indicating that the finding was determined via CT chest. To relate the finding to the actual CT scan being observed, the example uses an act relationship of type "SUBJ", with blocked context conduction (using the original “conduction-indicator-based” context conduction style in both the R1 and R2 examples).

3.5 Allergies, Intolerances and Adverse Reactions

Both SNOMED CT and HL7 differentiate an isolated reaction event from the condition of being allergic or intolerant. For instance, the following hierarchy is present in SNOMED CT:

- [404684003 | Clinical finding |](#)
 - [420134006 | Propensity to adverse reactions |](#)
 - [609328004 | Allergic disposition |](#)
 - [416098002 | Drug allergy |](#)
 - [281647001 | Adverse reaction |](#)
 - [416093006 | Allergic reaction to drug |](#)

Different SNOMED CT value sets may apply, depending on the application context. Potential value sets include:

- **Substance/Product value set:**¹³ Values drawn from [105590001 | Substance |](#) and/or [373873005 | Pharmaceutical / biologic product |](#) hierarchies, might

¹³ SNOMED distributes an allergen subset, drawn from Substance and Product hierarchies.

be used where the context is the recording of substances to which the patient is allergic (e.g. a data entry box labeled "ALLERGIES").¹⁴

- **Findings value set:** Values drawn from <413350009 | Finding with explicit context | and/or <404684003 | Clinical finding | hierarchies, might be used where the context is an encounter diagnosis or a problem list.

Note: The HL7 Patient Care Work Group is continuing to develop a formal model for allergy tracking, which supports the representation of the sequential determination of primary and secondary observations relating to discovery and analysis of adverse reactions. The examples provided here are greatly simplified so as to illustrate certain aspects of SNOMED CT implementation.

Example 17: Allergies coded with Substance/Product value set

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Allergy to PCN manifesting as hives</text>
  <value xsi:type="CD" code="609328004"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Allergic disposition ">
    <qualifier>
      <name code="246075003"
        displayName="Causative agent"/>
      <value code="373270004"
        displayName="Penicillin -class of antibiotic- (substance)"/>
    </qualifier>
  </value>
  <actRelationship typeCode="MFST"
    inversionInd="true" contextConductionInd="true">
    <observation classCode="OBS" moodCode="EVN">
      <code code="ASSERTION"
        codeSystem="2.16.840.1.113883.5.4"/>
      <value xsi:type="CD" code="247472004"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Hives"/>
    </observation>
  </actRelationship>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Allergy to PCN manifesting as hives</text>
  <value xsi:type="CD" code="609328004 | Allergic disposition
|:246075003 | Causative agent |=373270004 | Penicillin - class of
antibiotic (substance) |" codeSystem="2.16.840.1.113883.6.96"/>
  <actRelationship typeCode="MFST" inversionInd="true"
contextConductionInd="true">
```

¹⁴ Note that it may not be possible in this context to differentiate an allergic reaction from the condition of being allergic, since the data entry field only accepts substance and product values.

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD" code="247472004 | Hives | "
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Hives"/>
  </value>
</observation>
</actRelationship>
</observation>

```

Where the clinician fills in both the substance/product and the reaction, context can propagate across the “is manifestation of” (MFST) relationship. The manifestation should not be post-coordinated with the allergic disorder (i.e. this guide recommends against a single post-coordinated expression such as "penicillin allergy manifesting as hives").

Example 18: Allergies coded with Findings value set

CD data type R1 (used in CDA R2)

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
  codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD" code="91936005"
  codeSystem="2.16.840.1.113883.6.96"
  displayName="Allergy to penicillin"/>
  <text>Allergy to PCN</text>
</observation>

```

CD data type R2

```

<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD" code="91936005 | Allergy to penicillin | "
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Allergy to penicillin"/>
  </value>
  <text>Allergy to PCN</text>
</observation>

```

In this case, the selected finding indicates the condition of being allergic.

3.6 Assessment Scale Results

An assessment scale is a collection of observations that together yield a summary evaluation of a particular condition. Examples include the Braden Scale (used for assessing pressure ulcer risk), APACHE Score (used for estimating mortality in critically ill patients), Mini-Mental Status Exam (used to assess cognitive function), APGAR Score (used to assess the health of a newborn), and Glasgow Coma Scale (used for assessment of coma and impaired consciousness.)

Assessment scales share certain features, which are described here as part of a recommended pattern:

1. Assessment scales have one or more component observations that can be taken in aggregate to provide an overall score (e.g. [248241002 | Glasgow coma score |](#)).
2. Assessment scale component observations can be represented as a question and answer (e.g. [248240001 | Response to pain | = "3"](#)) or as a finding (e.g. [85157005 | Decorticate posture |](#)). Either or both of these representations may need to be communicated, depending on the use case.

The following [Table 8](#) shows a sample Glasgow Coma Scale and result. A score is given for each of three types of neurological responses. A Coma Score of 13 or higher indicates a mild brain injury, 9 to 12 is a moderate injury and 8 or less a severe brain injury.

Table 8: Glasgow Coma Scale

Glasgow Coma Scale	Value	Score
Eye Opening		
spontaneous	4	
to speech	3	
to pain	2	2
no response	1	
Motor Response		
obeys verbal command	6	
localizes pain	5	
flexion-withdrawal	4	
flexion-abnormal	3	3
extension	2	
no response	1	
Verbal Response		
oriented and converses	5	
disoriented and converses	4	
inappropriate words	3	
incomprehensible sounds	2	2
no response	1	
Glasgow Coma Score		7

Example 19: Glasgow Coma Score assessment scale result pattern

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="248241002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Glasgow coma score"/>
  <derivationExpr/>
  <value xsi:type="INT" value="7"/>
  <actRelationship typeCode="DRIV">
    <observation classCode="OBS" moodCode="EVN">
```

```

        <code code="288598006"
            codeSystem="2.16.840.1.113883.6.96"
            displayName="verbal response"/>
        <value xsi:type="INT" value="2"/>
    </observation>
</actRelationship>
<actRelationship typeCode="DRIV">
    <observation classCode="OBS" moodCode="EVN">
        <code code="248240001"
            codeSystem="2.16.840.1.113883.6.96"
            displayName="Motor Response"/>
        <value xsi:type="INT" value="3"/>
        <actRelationship typeCode="XFRM">
            <observation classCode="OBS" moodCode="EVN">
                <code code="ASSERTION"
                    codeSystem="2.16.840.1.113883.5.4"/>
                <value xsi:type="CD" code="85157005"
                    codeSystem="2.16.840.1.113883.6.96"
                    displayName="Decorticate posture"/>
            </observation>
        </actRelationship>
    </observation>
</actRelationship>
</observation>

```

CD data type R2

```

<observation classCode="OBS" moodCode="EVN">
    <code code="248241002 | Glasgow coma score | "
codeSystem="2.16.840.1.113883.6.96">
        <displayName value="Glasgow coma score"/>
    </code>
    <derivationExpr/>
    <value xsi:type="INT" value="7"/>
    <actRelationship typeCode="DRIV">
        <observation classCode="OBS" moodCode="EVN">
            <code code="288598006 | Ability to use verbal communication | "
codeSystem="2.16.840.1.113883.6.96">
                <displayName value="verbal response"/>
            </code>
            <value xsi:type="INT" value="2"/>
        </observation>
    </actRelationship>
    <actRelationship typeCode="DRIV">
        <observation classCode="OBS" moodCode="EVN">
            <code code="248240001 | Response to pain | "
codeSystem="2.16.840.1.113883.6.96">
                <displayName value="Motor Response"/>
            </code>
            <value xsi:type="INT" value="3"/>
            <actRelationship typeCode="XFRM">
                <observation classCode="OBS" moodCode="EVN">
                    <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
                    <value xsi:type="CD" code="85157005 | Decorticate posture | "
codeSystem="2.16.840.1.113883.6.96">
                        <displayName value="Decorticate posture"/>
                    </value>
                </observation>
            </actRelationship>
        </observation>
    </actRelationship>

```



```
        </value>
      </observation>
    </actRelationship>
  </observation>
</actRelationship>
</observation>
```

The aggregate score is modeled as the value of the assessment procedure (outer) observation. The <derivationExpr> can contain a formal language expression specifying how the value is computed. Component observations are nested under the aggregate observation, linked with a "DRIV" (is derived from) relationship. Where a component observation needs to be communicated in different formats, each format is a discrete observation, linked by a "XFRM" (is a transformation of) relationship.

3.7 Observation, Condition, Diagnosis, Concern

Note: The HL7 Patient Care Work Group is continuing to develop a formal model for condition tracking. The examples provided here are greatly simplified so as to illustrate certain aspects of SNOMED CT implementation.

Observations, Conditions, Diagnoses, and Concerns are often confused, but in fact have distinct definitions and patterns.

- "Observation" and "Condition": An HL7 observation is something noted and recorded as an isolated event, whereas an HL7 condition is an ongoing event. Symptoms and findings (also know as signs) are observations. The distinction between "seizure" and "epilepsy" or between "allergic reaction" and "allergy" is that the former is an observation, and the latter is a condition.

SNOMED CT distinguishes between "Clinical Findings" and "Diseases", where a SNOMED CT disease is a kind of SNOMED CT clinical finding that is necessarily abnormal:

- [404684003 | Clinical finding |](#)
 - [64572001 | Disease |](#)

The SNOMED CT finding/disease distinction is orthogonal to the HL7 observation/condition distinction, thus a SNOMED CT finding or disease can be an HL7 observation or condition.

- "Diagnosis": The term "diagnosis" has many clinical and administrative meanings in healthcare
 - A diagnosis is the result of a cognitive process whereby signs, symptoms, test results, and other relevant data are evaluated to determine the condition afflicting a patient.
 - A diagnosis often directs administrative and clinical workflow, where for instance the assertion of an admission diagnosis establishes care paths, order sets, etc.

- A diagnosis is often something that is billed for in a clinical encounter. In such a scenario, an application typically has a defined context where the billable object gets entered.
- "Concern": A concern is something that a clinician is particularly interested in and wants to track. It has important patient management use cases (e.g. health records often present the problem list or list of concerns as a way of summarizing a patient's medical history).

Differentiation of Observation, Condition, Diagnosis, and Concern in common patterns:

- "Observation" and "Condition": The distinction between an HL7 Observation and HL7 Condition is made by setting the Act.classCode to "OBS" or "COND", respectively. The distinction between a SNOMED finding and SNOMED disease is based on the location of the concept in the SNOMED CT hierarchy. There is no flag in a clinical statement instance for distinguishing between a SNOMED CT finding vs. disease.
- "Diagnosis":
 - Result of a cognitive process: Could potentially be Indicated by post-coordinating a SNOMED CT finding method attribute with a procedure such as "cognitive process".
 - Directs administrative and clinical workflow: These use cases typically rely more on the context in which the diagnoses are entered (e.g. where an order set has a field designated for the admission diagnosis). In such a case, the distinction of a (particular kind of) diagnosis is that it occurs within a particular organizer (e.g. a condition within an Admission Diagnosis section is an admission diagnosis from an administrative perspective).
 - Something that is billed for: The fact that something was billed for would be expressed in another HL7 message. There is nothing in the pattern for a diagnosis that says whether or not it was or can be billed for.
- "Concern": The HL7 Patient Care Work Group is developing a formal model for condition tracking. In that model, a problem (which may be an Observation, a Procedure, or some other type of Act) is wrapped in an Act with a new Act.classCode "CONCERN". The focus in this guide is on the use of SNOMED CT, whereas the Patient Care condition tracking model is the definitive source for the overall structure of a problem list.

It should be noted that the administrative representation of a diagnosis and the representation of a concern break the rules from section 3.1.1 Observations vs. Organizers, in that these designations are based on context, whereas the designation of something as an Observation vs. Condition is inherent in the clinical statement itself.

Example 20: Assertion of a clinical finding

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache</text>
  <value xsi:type="CD" code="25064002"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Headache"/>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Headache</text>
  <value xsi:type="CD" code="25064002 | Headache | "
codeSystem="2.16.840.1.113883.6.96">
  <displayName value="Headache"/>
</value>
</observation>
```

The observation is asserting a clinical finding of "headache".

Example 21: Context-dependent (administrative) assertion of a diagnosis

CD data type R1 (used in CDA R2)

```
<act classCode="DOCSECT" moodCode="EVN">
  <code code="8646-2"
    codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>Hospital Admission Diagnosis</title>
  <text>Hospital admission diagnosis of headache</text>
  <actRelationship typeCode="COMP">
    <observation classCode="OBS" moodCode="EVN">
      <code code="ASSERTION"
        codeSystem="2.16.840.1.113883.5.4"/>
      <value xsi:type="CD" code="25064002"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Headache"/>
    </observation>
  </actRelationship>
</act>
```

CD data type R2

```
<section classCode="DOCSECT" moodCode="EVN">
  <code code="8646-2" codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC"/>
  <title>Hospital Admission Diagnosis</title>
  <text>Hospital admission diagnosis of headache</text>
  <entry typeCode="COMP">
    <observation classCode="OBS" moodCode="EVN">
      <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
    </observation>
  </entry>
</section>
```

```

    <value xsi:type="CD" code="25064002"
codeSystem="2.16.840.1.113883.6.96">
    <displayName="Headache"/>
  </value>
</observation>
</ entry>
</section>

```

That a given diagnosis is, for instance, an Admission Diagnosis, can be asserted by wrapping the Observation within a particular Organizer (or other applicable Act or Act subtype).

Example 22: Example of a problem list containing concerns

CD data type R1 (used in CDA R2)

```

<act classCode="DOCSECT" moodCode="EVN">
  <code code="11450-4"
    codeSystem="2.16.840.1.113883.6.1"
    codeSystemName="LOINC"/>
  <title>Problem List</title>
  <text>
    <list>
      <item>Headache</item>
      <item>Osteoarthritis of knee</item>
    </list>
  </text>
  <actRelationship typeCode="COMP">
    <act classCode="CONCERN" moodCode="EVN">
      <actRelationship typeCode="SUBJ">
        <observation classCode="OBS" moodCode="EVN">
          <code code="ASSERTION"
            codeSystem="2.16.840.1.113883.5.4"/>
          <value xsi:type="CD" code="25064002"
            codeSystem="2.16.840.1.113883.6.96"
            displayName="Headache"/>
        </observation>
      </actRelationship>
    </act>
  </actRelationship>
  <actRelationship typeCode="COMP">
    <act classCode="CONCERN" moodCode="EVN">
      <actRelationship typeCode="SUBJ">
        <observation classCode="OBS" moodCode="EVN">
          <code code="ASSERTION"
            codeSystem="2.16.840.1.113883.5.4"/>
          <value xsi:type="CD" code="239873007"
            codeSystem="2.16.840.1.113883.6.96"
            displayName="Osteoarthritis of knee"/>
        </observation>
      </actRelationship>
    </act>
  </actRelationship>
</act>

```

CD data type R2

```
<act classCode="DOCSECT" moodCode="EVN">
  <code code="11450-4" codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC"/>
  <title>Problem List</title>
  <text>
    <list>
      <item>Headache</item>
      <item>Osteoarthritis of knee</item>
    </list>
  </text>
  <actRelationship typeCode="COMP">
    <act classCode="CONCERN" moodCode="EVN">
      <actRelationship typeCode="SUBJ">
        <observation classCode="OBS" moodCode="EVN">
          <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
          <value xsi:type="CD" code="25064002 | Headache | "
codeSystem="2.16.840.1.113883.6.96">
            <displayName value="Headache"/>
          </value>
        </observation>
      </actRelationship>
    </act>
  </actRelationship>
  <actRelationship typeCode="COMP">
    <act classCode="CONCERN" moodCode="EVN">
      <actRelationship typeCode="SUBJ">
        <observation classCode="OBS" moodCode="EVN">
          <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
          <value xsi:type="CD" code="239873007 | Osteoarthritis of
knee | " codeSystem="2.16.840.1.113883.6.96">
            <displayName value="Osteoarthritis of knee"/>
          </value>
        </observation>
      </actRelationship>
    </act>
  </actRelationship>
</act>
```

That a given clinical statement is a part of a condition tracking structure can be asserted by containing the clinical statement within the concern act, using the mechanism defined by the HL7 Patient Care Work Group, as shown here.

3.8 Family History

As noted above (see section 2.2.5 Participations), the HL7 "subject" participant overlaps in meaning with the SNOMED CT Subject Relationship Context.

Where a family member has a condition, regardless of whether the observation code contains an explicit Subject Relationship Context, the subject of the observation is the family member, and not the patient. Where the observation code does include an explicit Subject Relationship Context, the subject participant can also be used where needed to provide further information about the subject.

Example 23: Family history, with explicit Subject Relationship Context

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Family history of cancer in father</text>
  <value xsi:type="CD" code="275937001"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Family history of cancer">
    <qualifier>
      <name code="408732007" displayName="Subject relationship
context"/>
      <value code="9947008" displayName="Biological father"/>
    </qualifier>
  </value>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Family history of cancer in father</text>
  <value xsi:type="CD" code="275937001 | Family history of cancer
|:408732007 | Subject relationship context | =9947008 | Biological
father |" codeSystem="2.16.840.1.113883.6.96"/>
</observation>
```

This observation uses an explicit SNOMED CT Subject relationship context attribute to represent the fact that the subject of the observation is the father.

Example 24: Family history, without explicit Subject Relationship Context

CD data type R1 (used in CDA R2)

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION"
    codeSystem="2.16.840.1.113883.5.4"/>
  <text>Family history of cancer in father</text>
  <value xsi:type="CD" code="363346000"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Cancer"/>
  <subject typeCode="SBJ">
    <relatedEntity classCode="PRS">
      <code code="9947008"
        codeSystem="2.16.840.1.113883.6.96"
        displayName="Biological father"/>
    </relatedEntity>
  </subject>
</observation>
```

CD data type R2

```
<observation classCode="OBS" moodCode="EVN">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <text>Family history of cancer in father</text>
```

```

    <value xsi:type="CD" code="363346000 | Cancer | "
codeSystem="2.16.840.1.113883.6.96">
    <displayName value="Cancer"/>
</value>
<subject typeCode="SBJ">
    <relatedEntity classCode="PRS">
    <code code="9947008 | Biological father | "
codeSystem="2.16.840.1.113883.6.96">
    <displayName="Biological father"/>
    </code>
    </relatedEntity>
</subject>
</observation>

```

This example is equivalent to the preceding example, using the subject participant rather than the SNOMED CT Subject relationship context attribute to represent the fact that the subject of the observation is the father.

3.9 Medications and Immunizations

Areas of overlap between HL7 and SNOMED CT include the source of information, as described above ([§ 3.4](#)). This is particularly important for medications, where one needs to differentiate what a patient is actually having administered vs. what is being dispensed. The former is typically gleaned from the patient, family member, or the medication administration record for an inpatient. The latter is often gleaned from a pharmacy application.

Another area of overlap between HL7 and SNOMED CT includes the method and route by which a substance is administered. Various ways by which this information can be represented include:

- SNOMED CT defining attributes (whether pre- or post-coordinated)
 - [260686004 | Method |](#): Used to indicate the method by which a procedure is performed.
 - [410675002 | Route of administration |](#): Used to indicate the route by which a substance is administered.
- RIM attributes
 - SubstanceAdministration.code: A code further describing the type of administration.
 - SubstanceAdministration.routeCode: The method of introducing the therapeutic material into or onto the subject.

The following patterns post-coordinate within SubstanceAdministration.code to represent the route of administration. Within a particular realm, or as required by a particular implementation, there may also be a need to populate SubstanceAdministration.routeCode, possibly with values drawn from a required and non-SNOMED CT value set.

The level of detail by which an administered substance is known can vary greatly, particularly when dealing with patient recollection. SNOMED CT has both a [<105590001 | Substance |](#) hierarchy and a [<373873005 | Pharmaceutical / biologic product |](#)

hierarchy, and may have realm-specific drug extensions that include manufacturer-specific product codes. Concepts from the Substance hierarchy **SHOULD NOT** be used to code an administered substance.

In the following examples, the pharmacy is dispensing atenolol 50mg tablets with instructions to take one tablet per day, whereas the patient's daughter says that only a half-tablet per day is being ingested.

Example 25: Pharmacy: Atenolol 50mg tablet, take 1 per day.

CD data type R1 (used in CDA R2)

```
<substanceAdministration classCode="SBADM" moodCode="INT">
  <code code="18629005"
    codeSystem="2.16.840.1.113883.6.96"
    displayName="Administration of medication">
    <qualifier>
      <name code="410675002"
        displayName="Route of administration"/>
      <value code="26643006" displayName="Oral route"/>
    </qualifier>
  </code>
  <text>Atenolol 50mg tablet, take 1 per day</text>
  <effectiveTime xsi:type="PIVL_TS">
    <period value="24" unit="h"/>
  </effectiveTime>
  <doseQuantity value="1"/>
  <consumable typeCode="CSM">
    <manufacturedProduct classCode="MANU">
      <manufacturedLabeledDrug classCode="MMAT"
        determinerCode="KIND">
        <code code="318420003"
          codeSystem="2.16.840.1.113883.6.96"
          displayName="Atenolol 50mg tablet"/>
      </manufacturedLabeledDrug>
    </manufacturedProduct>
  </consumable>
  <actRelationship typeCode="XCRPT"
    contextConductionInd="false">
    <actReference classCode="SBADM" moodCode="EVN">
      <id root="b3440e50-8f48-11da-a72b-0800200c9a66"/>
    </actReference>
  </actRelationship>
</substanceAdministration>
```

CD data type R2

```
<substanceAdministration classCode="SBADM" moodCode="INT">
  <code code="432102000 | Administration of substance | :410675002 |
Route of administration | =26643006 | Oral route | "
codeSystem="2.16.840.1.113883.6.96"/>
  <text>Atenolol 50mg tablet, take 1 per day</text>
  <effectiveTime xsi:type="PIVL_TS">
    <period value="24" unit="h"/>
  </effectiveTime>
  <doseQuantity value="1"/>
  <consumable typeCode="CSM">
```



```

    <manufacturedProduct classCode="MANU">
      <manufacturedLabeledDrug classCode="MMAT" determinerCode="KIND">
        <code code="318420003 | Atenolol 50mg tablet |"
codeSystem="2.16.840.1.113883.6.96">
          <displayName value="Atenolol 50mg tablet"/>
        </code>
      </manufacturedLabeledDrug>
    </manufacturedProduct>
  </consumable>
  <actRelationship typeCode="XCRPT" contextConductionInd="false">
    <actReference classCode="SBADM" moodCode="EVN">
      <id root="b3440e50-8f48-11da-a72b-0800200c9a66"/>
    </actReference>
  </actRelationship>
</substanceAdministration>

```

This act represents an excerpt from a pharmacy application.

Example 26: Informant: Atenolol 50mg tablet, taking 1/2 per day.

CD data type R1 (used in CDA R2)

```

<substanceAdministration classCode="SBADM" moodCode="EVN">
  <code code="18629005"
codeSystem="2.16.840.1.113883.6.96"
displayName="Administration of medication">
    <qualifier>
      <name code="410675002"
displayName="Route of administration"/>
      <value code="26643006" displayName="Oral route"/>
    </qualifier>
  </code>
  <text>Atenolol 50mg tablet, taking 1/2 per day</text>
  <effectiveTime xsi:type="PIVL_TS">
    <period value="24" unit="h"/>
  </effectiveTime>
  <doseQuantity value="0.5"/>
  <consumable typeCode="CSM">
    <manufacturedProduct classCode="MANU">
      <manufacturedLabeledDrug classCode="MMAT"
determinerCode="KIND">
        <code code="318420003"
codeSystem="2.16.840.1.113883.6.96"
displayName="Atenolol 50mg tablet"/>
      </manufacturedLabeledDrug>
    </manufacturedProduct>
  </consumable>
  <informant typeCode="INF">
    <relatedEntity classCode="PRS">
      <code code="66089001"
codeSystem="2.16.840.1.113883.6.96"
displayName="Daughter"/>
    </relatedEntity>
  </informant>
</substanceAdministration>

```

CD data type R2

```
<substanceAdministration classCode="SBADM" moodCode="EVN">
  <code code="432102000 | Administration of substance | :410675002 |
Route of administration | =26643006 | Oral route | "
codeSystem="2.16.840.1.113883.6.96"/>
  <text>Atenolol 50mg tablet, taking 1/2 per day</text>
  <effectiveTime xsi:type="PIVL_TS">
    <period value="24" unit="h"/>
  </effectiveTime>
  <doseQuantity value="0.5"/>
  <consumable typeCode="CSM">
    <manufacturedProduct classCode="MANU">
      <manufacturedLabeledDrug classCode="MMAT" determinerCode="KIND">
        <code code="318420003 | Atenolol 50mg tablet | "
codeSystem="2.16.840.1.113883.6.96">
          <displayName value="Atenolol 50mg tablet"/>
        </code>
      </manufacturedLabeledDrug>
    </manufacturedProduct>
  </consumable>
  <informant typeCode="INF">
    <relatedEntity classCode="PRS">
      <code code="66089001 | Daughter | "
codeSystem="2.16.840.1.113883.6.96">
        <displayName value="Daughter"/>
      </code>
    </relatedEntity>
  </informant>
</substanceAdministration>
```

This act represents information gleaned from the patient's daughter.

4 NORMAL FORMS

Every application has its own data entry screens, workflow, internal database design, and other nuances, and yet despite this, we talk of semantic interoperability. In order to achieve interoperability, and enable a receiver to aggregate data coming from any number of applications, it must be possible to compare data generated on any of these applications. In order to compare data, it helps to imagine a canonical or normal form. [A canonical form is defined as a serialized representation of a SNOMED CT expression which follows the normal form and in which the refinements, attributes and attribute groups are arranged in a standard order.] If all data, regardless of how it was captured, can be converted into a common representation, it becomes possible to compare.

To that end, we differentiate the "model of use" from the "model of meaning", where the former represents the way in which the data was captured, and the latter represents a common representation. All representations recommended in this guide can be converted into a common model of meaning. This common model of meaning can be expressed in a SNOMED CT normal form and/or a RIM Normal Form, thereby enabling data comparisons.

There is no attempt in this section to comprehensively address "HL7/RIM Normal Forms", but rather to suggest why they may be desirable and useful. An "agreed upon comprehensive reference normal form" is declared as out of scope for this document. A normal form for Clinical Statements would likely be very useful and desirable and it certainly could be considered for inclusion in a future version of this document.

4.1 SNOMED CT Normal Forms

The text below outlines the purpose of transformations and the general method of transformation. Further detailed information on SNOMED CT normal forms and transformations and their use in subsumption and equivalence testing can be found in [sections 7.8.2.4.3 – 7.8.2.4.5 of the Technical Implementation Guide \(TIG\)](#). From the perspective of integration of SNOMED CT expressions in HL7 communications the assumption is that in most cases the data will be stored and communicated in a form that is as close as possible to the form in which it was recorded ([TIG section 8.2.1.7](#)). The normal form transformation provides a method that enables consistent comparison of these expressions with one another and with retrieval queries.

The purpose of generating normal forms is to facilitate complete and accurate retrieval of pre- and post-coordinated SNOMED CT expressions from clinical records or other resources.

The approach described is based on the description logic definitions of SNOMED CT concepts which are used when recording clinical statements in an electronic records system. Using this approach, expressions that are authored, stored and/or communicated in a relatively informal close-to-user form are logically transformed into a common normalized form. In this normalized form it is possible to apply simple rules to test subsumption between expressions.

The simplest case of a valid close-to-user expression is a single conceptId, and the approach described can be applied to these simple pre-coordinated expressions, as well

as to more complex expressions that include multiple conceptIds and refinements (qualifiers).

Likewise, transformations and normalizations can be both simple and complex, however the general principle is that the normalization process will restate a SNOMED CT expression in terms of the 'primitive' concepts with which it is associated in the reference data. By example, the SNOMED CT concept [80146002 | Appendectomy |](#) would, in essence, transform under normalization to [71388002 | Procedure |: { 260686004 | Method | = 129304002 | Excision - action |, 405813007 | Procedure site - Direct | = 66754008 | Appendix structure |}](#) ("a procedure that consists of excising an appendix").

The approach to normalization may be applied to the specific SNOMED CT expressions but may also be extended to take account of contextual information derived from the information model in which the expression is situated. Therefore, the normal form may include SNOMED CT context information, even if this is not present in the initial SNOMED CT expression. As such the result of transformation of [80146002 | Appendectomy |](#) is a simplification (the additional contextual/situation information is missing), but it is hoped that the example sufficiently illustrates the principle of normalization.

The algorithm extends earlier work on normal forms as follows:

- Normalizes fully-defined values within definitions or expressions producing nested expressions that are fully normalized.
- Merges refinements stated in an expression with definitional relationships present in the definitions of the concepts referenced by the expression.
- The merge process takes account of refinements that may not be grouped or nested in a manner that precisely reflects the structure of a current (or future) concept definition.
- This avoids the need to add, store and communicate potentially spurious detail from current definitions to the expression recorded by a user or software application.
- Takes account of context rules including soft default context and a preliminary approach to moodCode mapping and handling of procedures with values (present in algorithm but not yet easily visible in test environment).

4.2 Transformations to Normal Forms

The requirements for full normalization of alternative representations using different combinations of SNOMED CT and HL7 RIM artifacts requires an agreed upon comprehensive reference normal form. This is beyond the scope of this document. However, the rules and guidance in *Guidance on Overlaps between RIM and SNOMED CT Semantics §2* provide the foundations for specifying some of the more common transformation requirements.

In particular the following types of transformation may be required

- Transforming deprecated patterns using the *Observation.code* and *Observation.value* to the preferred pattern. See *Act.code § 2.2.2* and

Observation.value ([§ 2.2.3](#)) and Observation code and value (in event mood) ([§ 3.3](#))

- Transforming based on moodCode and statusCode to apply specified contexts to SNOMED CT expressions, where these expressions do not state an explicit context. See Act.moodCode ([§2.2.4](#)) and Act.statusCode ([§2.2.5](#)).
- Transforming any deprecated uses of the negationInd attribute to an appropriate SNOMED CT expression that explicitly state appropriate "finding context" or "procedure context". See Act.negationInd ([§2.2.10](#)).
- Transforming any information in specific HL7 methodCode, targetSiteCode and approachSiteCode attributes into the appropriate refinements of the associated SNOMED CT expression. See Procedure.methodCode ([§2.2.8](#)) and Observation.methodCode ([§2.2.8](#)), Procedure.targetSiteCode ([§2.2.6](#)) and Observation.targetSiteCode ([§2.2.6](#)) and Procedure.approachSiteCode ([§2.2.7](#)) and SubstanceAdministration.approachSiteCode ([§2.2.7](#)).
- Transforming the representation of "subject" participation and SNOMED CT "subject relationship context" into a single coherent form. See Subject Participation and Subject Relationship Context ([§2.6.1](#)).

Additional documentation on this topic will be added based on experience with use of this specification.

5 SNOMED CT CONCEPT DOMAIN CONSTRAINTS

5.1 Introduction

This section presents general guidance regarding which SNOMED CT concepts are suitable for use as values for specific attributes of the main classes of the Clinical Statement pattern. These value set constraints are presented at a fairly high level, by partitioning of SNOMED CT into a number of major concept classes that relate to the concept domains that apply to the relevant HL7 attributes.

In most cases, these value sets are supersets of the values used in the constrained models in Common Patterns [§3](#) (any exceptions to this are indicated).

Reference the HL7 Value Set Definition standard¹⁵ and [SNOMED CT documents](#) like the reference set, compositional grammar and expression constraint language (and other "family of language") specifications for obtaining additional guidance in this area.

5.2 Approach to Value Set Constraint Specifications

5.2.1 How the Value Sets Are Presented

The value set specifications are presented as tables in the following general structure:

Class Name: The Clinical Statement pattern class is identified here	Class Code: If relevant, distinct classCodes are identified here
Attribute Name: The relevant attribute(s) is/are identified here	
Narrative description of concept domain: The relevant narrative description of the concept domain is identified here.	
Value set representation: Value sets are identified here, using the SNOMED CT Expression Constraint Language, as described in SNOMED CT Compositional Grammar and Expression Constraint Language §B.3	
Notes: Any notes relevant to this className + classCode + attributeName value set specification are made here.	

5.2.2 Why These Value Set Constraints Are Useful

The value set specifications provided in this section serve two important purposes, as described in the following sub-sections.

5.2.2.1 General Partitioning of SNOMED CT

A large clinical terminology such as SNOMED CT represents a number of lexically similar concepts which are grammatically, linguistically or semantically distinct. This

¹⁵ The Value Set Definition standard is undergoing ballot resolution and is not yet published as of December 2015. See the VSD Project Wiki at: http://wiki.hl7.org/index.php?title=Value_Set_Definition_Standard_Project

phenomenon is particularly pronounced if the terminology is considered without any kind of partitioning. The coarse-grained partitioning specified by these constraints simplifies and clarifies decisions about which of a set of superficially similar SNOMED CT concepts are appropriate to particular HL7 concept domains.

For example, consider a concept domain defined as representing "an adverse event in reaction to a drug".

The most suitable SNOMED CT concepts to represent such an event would be those subsumed by [<62014003 | Adverse reaction to drug |](#).

However from a lexical perspective other less appropriate concepts may appear to be suitable. For example:

The reference to "adverse drugs reaction" may suggest the use of [<396079007 | Assessment of adverse drug reactions |](#) procedure concepts.

The reference to "drug" may suggest the use [<373873005 | Pharmaceutical / biologic product | OR <410942007 | Drug or medicament |](#) concepts.

The simple value set constraints in these specifications exclude these inappropriate alternatives and thus provide a helpful guide for value set developers.

5.2.2.2 Starting Point for SNOMED CT Model-based Value Set Specifications

The high-level value set constraints presented in this document provide guidance and a starting point for more specific model-based value set specifications. Specific model-based value set specifications may differ from these simple value set constraints in the following ways:

1. By adding appropriate context to the values, thereby using associated values in the 'Situation with explicit context' hierarchy of SNOMED CT.

The schematic illustrations of SNOMED CT expressions shown in the Technical Implementation Guide (TIG) section on ["Expression parts" \(7.8.2.4.2\)](#) identify the "clinical kernel" or primary clinical "focus concept" that may exist alone or as part of a contextualized expression. In most cases, the simple value set constraints in these specifications apply to this clinical focus concept. However, in some cases, appropriate explicit context may be applied.

2. By specializing the general value set constraints defined in this document. This can be done in a number of ways, including:

- Replacing the focus concepts with one or more subtypes
- Adding additional refinement conditions to the focus concepts
- Excluding additional subhierarchies (using the 'MINUS' operator)

Further extended discussion of expressions, normal forms and subsumption and equivalence testing may be found in the other TIG subsections under ["Expression retrieval and normal forms" \(7.8.2.4\)](#). And additional related information is documented in the TIG subsections under ["Communicating Expressions" \(8.4\)](#).

For example, consider a value-set constraint which indicates that the "focus concept" must be a [<404684003 | Clinical finding |](#).

- The concept model indicates that a <404684003 | Clinical finding | concept
 - can be refined by name/value pairs with attribute names such as 363698007 | Finding site |, 246112005 | Severity |, 116676008 | Associated morphology | etc.,
 - can be the value to the attribute name 246090004 | Associated finding |
 - as part of the definition or refinement of a 413350009 | Finding with explicit context |
 - as part of post-coordinated expression that includes the 404684003 | Clinical finding | within a context wrapper.
- A comprehensive specification of a value set that allows <404684003 | Clinical finding | may therefore also need to indicate whether any restrictions apply either to the refinement or situation in which the concepts are used.
 - The context wrapper may, for instance, be used to communicate negation and uncertainty and may thus be required to support some types of information. However, it may also be necessary to constrain the use of context in a manner that is relevant to the Act.moodCode or other attributes and associations in the HL7 representation.

5.3 Constraint Specifications

The "simple" value set constraints are provided as a set of tables, covering the major classes of the Act and Entity choice boxes. Each identified constraint is intended to represent a **SHOULD** conformance (CONF) statement.

5.3.1 Specifications

5.3.1.1 Observation

Class Name: Observation	Class Code: OBS
Attribute Name: Observation.value	
Narrative description of concept domain: An act that is intended to result in new information about a subject. The main difference between observations and other acts is that it has a value attribute that is used to state the result of the assessment action described in Act.code.	
Simple representation: <404684003 Clinical finding OR <413350009 Finding with explicit context OR <272379006 Event (CONF:115)	
Notes: Where Observation.code = ASSERTION. As indicated in section 2.2.3.2 subheading 3 under "Deprecated or non-recommended"	

forms", the situation may arise in which Observation.value is a SNOMED CT expression from the set specified in the 'simple representation' field of this table and Act.code is represented by a code other than "ASSERTION". Such an approach can only be safely used if interpretation of the Act.code together with the Observation.value does not yield a meaning that is substantially different from the meaning implied if the Act.code was "ASSERTION". Without exhaustive scrutiny of SNOMED CT's content it is not possible to identify that set of codes that can safely be used in this way in Act.code.

A further alternative representation is needed to communicate record entries where SNOMED CT content has been used to represent both Observation.code and a coded Observation.value. Observation.value may be numeric, or it may be a coded nominal or ordinal result and so itself may also be drawn from SNOMED CT:

Class Name: Observation	Class Code: OBS
Attribute Name: Observation.code Attribute Name: Observation.value	
Narrative description of concept domain: An act that is intended to result in new information about a subject. The main difference between observations and other acts is that it has a value attribute that is used to state the result of the assessment action described in Act.code.	
<p>Simple representation for Observation.code: <386053000 Evaluation procedure OR <363787002 Observable entity (CONF:116)</p> <p>Simple representation for Observation.value: When Observation.value is data type CD, the Observation.value needs to correspond with the Observation.code, as a valid result of the Observation and needs to be in alignment with the IHTSDO work on Observation Result, which is ongoing. (CONF:117)</p> <p style="text-align: center;">Example 27: Example of organism as value</p> <pre><observation classCode="OBS" moodCode="EVN"> <code code="61594008" codeSystem="2.16.840.1.113883.6.96" displayName="Microbial culture"/> <value xsi:type="CD" code="112283007" codeSystem="2.16.840.1.113883.6.96" displayName="Escherichia coli"/> </observation></pre>	
Note: Observation.code need not be a SNOMED CT code (e.g., it could be a LOINC code).	

5.3.1.2 Procedure

Class Name: Procedure	Class Code: PROC
Attribute Name: Procedure.code	
Narrative description of concept domain: An Act whose immediate and primary outcome (post-condition) is the alteration of the physical condition of the subject.	
Simple representation: (<71388002 Procedure OR <129125009 Procedure with explicit context) MINUS (<<432102000 Administration of substance OR <<243704004 Provision of appliances OR <<183253002 Provision of medical equipment OR <<404919001 Wheat-free diet OR <<223456000 Provision of a special diet OR <<440298008 Dispensing of pharmaceutical/biologic product) (CONF:118)	
Notes: in order to prevent overlap, this specification includes the negated clauses to exclude the value sets of "Substance administration" and "Supply".	

5.3.1.3 Substance Administration

Class Name: SubstanceAdministration	Class Code: SBADM
Attribute Name: SubstanceAdministration.code	
Narrative description of concept domain: Introducing or otherwise applying a substance to the subject	
Simple representation: <416118004 Administration ; optionally: <432102000 Administration of therapeutic substance (CONF:119)	
Notes: In Release 1 of this guide, and in order to support a tighter standardization of this class and ensure that the "substance" administered was only represented in the related Material Entity, SNOMED CT content that explicitly referred to substances (for example <39543009 Administration of insulin (procedure) was excluded (by a specification that limits the codes offered and disallows any of the subtypes.)	

In response to examples that have been identified where specific subtypes of [432102000 | Administration of substance \(procedure\) |](#) are required for use in SubstanceAdministration.code, the looser optional constraint is offered to provide access. Nevertheless, the intent of the guide (to ensure that the "substance" administered was only represented in a related Material Entity) still holds to enable consistent analysis.

5.3.1.4 Supply

Class Name: Supply	Class Code: SPLY
Attribute Name: Supply.code	
Narrative description of concept domain: The provision of a material by one entity to another	
Simple representation: <243704004 Provision of appliances OR <183253002 Provision of medical equipment OR <404919001 Wheat-free diet OR <223456000 Provision of a special diet OR <440298008 Dispensing of pharmaceutical/biologic product (CONF:120)	
Notes: Possibly incomplete. Currently SNOMED CT has no abstract notion of the "supply/provision of material", so while diet and appliances, equipment and pharmaceutical/biologics are supported, it is still possible that some cases are not supported.	

5.3.1.5 Organizer

Class Name: Organizer	Class Code: ORGANIZER
Attribute Name: Organizer.code	
Narrative description of concept domain: Organizer of entries. Navigational. No semantic content. Knowledge of the section code is not required to interpret contained observations. Represents a heading in a heading structure, or "organizer tree".	
Simple representation: <419891008 Record artifact OR <386053000 Evaluation procedure	

(CONF:121)
Notes: <386053000 Evaluation procedure is included to allow the naming of batteries with Laboratory procedure terms.

5.3.1.6 Entity

The following very general SNOMED CT value set for using the Entity.code attribute is outlined below. In any specific model this set should be appropriately constrained.

Class Name: Entity	Class Code: ENT
Attribute Name: Entity.code	
Narrative description of concept domain: A physical thing, group of physical things or an organization capable of participating in Acts, while in a role.	
Simple representation: <410607006 Organism OR <373873005 Pharmaceutical / biologic product OR <260787004 Physical object OR <105590001 Substance OR <123038009 Specimen OR <308916002 Environment or geographical location (CONF:122)	
Notes: (1) A more sophisticated division of SNOMED CT Entities is needed to reconcile with the coarse-grained specializations of Entity within the HL7 V3 Specification (e.g. LivingSubject, Place, Manufactured Material...) (2) the SNOMED CT class 123038009 Specimen could be viewed as merging both the Entity and the specimen "role"; however, it is included in this specification on the understanding that the "specimen" role would be restated within the Clinical Statement pattern-conformant specification.	

5.3.2 Notes

5.3.2.1 moodCode influences

A comprehensive notation for all SNOMED CT "findings and procedures" value sets is logically "wrapped" in the SNOMED CT context/situation wrapper, and indeed the context/situation wrapper would be used to communicate negation and uncertainty in message designs where SNOMED CT is the only permitted code system. In more "complete" value set constraint specifications, therefore, it can be expected that the moodCode values found in message instances should influence the corresponding valid "finding and procedure context" values. Details of the recommended mappings are provided in Act.moodCode (§2.2.4).

5.3.2.2 Translations

A value set constraint can be applied to any coded content where the codeSystem is SNOMED CT. This includes cases where original encoding is SNOMED CT or where the SNOMED CT encoding is based on a translation from another codeSystem. Thus the value set constraints may be tested against the original encoding or translation sub-element in an instance of the HL7 Concept Descriptor (CD) data type.

5.3.2.3 Inactive SNOMED CT concepts

New record entries should be made using SNOMED CT concepts with an active status. However it is possible that communications may contain SNOMED CT content that, while active at the time of entry, has subsequently been rendered inactive in the reference data (e.g. as a result of recognition of errors such as duplication or ambiguity). In these cases value set testing SHOULD include analysis of information contained in the SNOMED CT history data. Such data will assist in establishing the relationship(s) between inactive concepts and active concepts. If it can be demonstrated that an inactive concept has an appropriate historical relationship to a value set valid active concept, and if the specification does not explicitly exclude inactive concepts, then the inactive concept should be regarded as valid for communication.

For example, consider the concept [274638001 | Asthenia |](#), which is now marked as an inactive duplicate in SNOMED CT. This concept may have been active in the past, and may thus have been used in the creation a record entry. This historical record entry may subsequently be communicated (perhaps as part of a record extract), by which time the concept has been marked as inactive. If this is encountered it is possible (by analysis of the SNOMED CT history data) to identify the [168666000 | SAME AS |](#) association to the active concept [13791008 | Asthenia |](#). Assuming the message specification does not explicitly exclude inactive concepts it is then possible to test the (active) concept for suitability in the message instance and accept it as valid.

APPENDIX A GENERAL OPTIONS FOR DEALING WITH POTENTIAL OVERLAPS

A.1 Introduction

This section outlines the general options for dealing with overlaps in semantics between an information model and a terminology model. It considers the advantages and disadvantages of requiring, prohibiting or allowing either or both of two overlapping forms of representation.

The discussion in this section is applicable to the potential overlaps between any information model and any terminology. It was used as the basis for the consideration of specific overlaps between HL7 and SNOMED CT semantics in Guidance on Overlaps between RIM and SNOMED CT Semantics ([§Appendix A2](#)).

A.2 Classification of Options

[Table 9](#) considers the interplay between rules that might in theory be applied to the use of an HL7 and a terminology representation in each case where there is an overlap. For each optional rule two potential instances are considered – presence and absence of the optional element. The intersection of the rules and instances result in a total of sixteen potential cases. In half of these cases there is no difficulty because there is no actual overlap. The remaining cases create either a requirement to manage duplication or a requirement to enforce a prohibition imposed by the relevant rule. The general issues related to different types of prohibition or duplicate management are considered below. These general considerations are then applied to specific areas of overlap.

Table 9: General approach to options for dealing with overlaps

	Terminology representation Required	Terminology representation Optional and is Included	Terminology representation Optional but is Omitted	Terminology representation Prohibited
HL7 representation Required	Generate, validate and combine dual representations	Generate HL7 representation (if not present). Validate and combine dual representations	No overlap	Manage unconditional prohibition of Terminology representation
HL7 representation Optional and is Included	Generate Terminology representation (if not present). Validate and combine dual representations	Validate and combine dual representations	No overlap	Manage conditional prohibition of Terminology representation
HL7 representation Optional but is Omitted	No overlap	No overlap	No information	No information
HL7 representation Prohibited	Manage unconditional prohibition of HL7 attribute/structure	Manage conditional prohibition of HL7 attribute/structure	No information	No information

A.3 Prohibiting Overlapping HL7 Representations

Any prohibition of an HL7 representation that overlaps with a terminology representation is unconditional if the corresponding terminology representation is required. However, if the terminology representation is optional, then the prohibition of the HL7 representation becomes conditional and is only applied in cases where the corresponding terminology representation is actually present.

Some unconditional prohibitions may be sufficiently generalized to be modeled by excluding a particular attribute or association from the relevant model. A conditional prohibition may require additional constraints (e.g. a restricted concept domain) or implementation guidelines (e.g. textual supporting material).

Any prohibition needs to be expressed in a way that does not undermine support for any required communications of data encoded using other code systems. In most cases, the universal HL7 standards for a domain should support conditional prohibition. This allows some realms or communities to enforce prohibition, while allowing others to use alternative code systems.

A.4 Prohibiting Overlapping Terminology Representations

A prohibition of a terminology representation that overlaps with an HL7 representation is unconditional if the corresponding HL7 representation is required. However, if the HL7 representation is optional, the prohibition is conditional and does not apply unless the HL7 representation is present.

Prohibition of a terminology representation is fraught with difficulties. If a particular terminology representation is recorded in a sending system, prohibiting the inclusion of that expression in an HL7 message prevents faithful communication of original structured clinical information. Transformation of a terminology representation into an HL7 syntactic form such as the Concept Descriptor (CD) data type should be possible for most if not all terminologies. It has been argued that disaggregating a post-coordinated Terminology representation across multiple HL7 attributes (e.g. assigning SNOMED CT "procedure site" to the HL7 Procedure.targetSiteCode) is a similar kind of transformation. However, this presumes a one-to-one match between the semantics of the Terminology representation and the specific HL7 attribute. In cases where the terminology has more finely grained attributes than those present in the RIM (e.g. SNOMED CT includes "procedure site – direct" and "procedure site – indirect"), a mapping to RIM attributes will be less precise and will result in some degree of information loss. As a terminology continues to evolve, more finely grained attributes are expected to be added, thus increasing the likelihood of information loss from transforms of this type.

A general prohibition of use of valid terminology representations is likely to form an obstacle to communication rather than encouraging semantic interoperability. However, guidelines on specific topics within a domain may recommend use of HL7 representations rather than or in addition to terminology representations. These guidelines will be most effective if implemented in the design of data entry and storage rather than restricted by communication specifications.

A.5 Generating Required Representations

If either form of representation is required, any sending system that does not store that required representation must generate it to populate a valid message. In any case where a particular representation is required, clear mapping rules from the other representation(s) are needed, unless the communicating applications also use the required representation for storage.

A.6 Validating and Combining Dual Representations

If HL7 and terminology representations of a similar characteristic are permitted to co-exist, there is a requirement for rules that determine how duplicate, refined and different meanings are validated or combined. [Table 10](#): Outline of possible rules for interpretation of dual representations outlines the general types of rules that might be applied. The rules in this table form a framework for discussion of specific recommendations related to the overlaps between HL7 and particular terminology representation.

Note that different rules that appear superficially rational can result in profoundly different interpretations of the same data. While it is possible for different rules to apply

to different overlaps it is essential that the rules for each given overlap are clear and unambiguous. Applying different rules based on convenience of a particular representational form in a particular environment, domain or use case can lead to serious misinterpretation of information flows between environments. Furthermore, every variation in the rules will require additional processing overhead and implementer understanding.

Table 10: Outline of possible rules for interpretation of dual representations

Overlap condition	Examples	Possible rules for interpretation	Interpretation
General form used for examples	HL7R = “HL7 representation” TMR = “Terminology model representation”	-	-
The meanings of both the HL7 and Terminology representations are equivalent	HL7R: negationInd="true" TMR: presence="not present"	Apply meaning ignoring repetition	NOT PRESENT
		Apply HL7R as combinatorial revision of TMR	PRESENT (i.e. double negative "not not present")
The meaning of one of the two representations is a subtype of the meaning of the other representation	HL7R: moodCode="intention" TMR: stage="requested"	Apply more specific meaning (ignoring more general meaning)	REQUESTED
		Apply HL7R as combinatorial revision of TMR	INTENTION TO REQUEST
The meaning of the two representations differs and neither meaning is a subtype of the other	HL7R: moodCode="intention" TMR: stage="goal"	Apply HL7R as combinatorial revision of TMR	INTENTION TO SET A GOAL
		Apply HL7R as addition to TMR	INTENTION AND A GOAL
		Apply HL7R and ignore terminology representation	INTENTION
		Ignore HL7R and apply TMR	GOAL
		Treat as an error	-
	HL7R: targetSiteCode="ovary" TMR: site="cyst"	Apply HL7R as combinatorial revision of TMR	CYST OF OVARY
		Apply HL7R as an addition to TMR	CYST AND OVARY
		Apply HL7R and ignore TMR	OVARY
		Ignore HL7R and apply TMR	CYST
		Treat as an error	-

Appendix B References

B.1 HL7 V3 References

[Clinical Statement Pattern](#)

[Version 3 Data types](#)

[Reference Information Model](#)

[CDA Release 2](#)

B.2 SNOMED CT Reference Materials

The following SNOMED CT reference materials (or their successors) are available at <http://snomed.org/doc/>. Most of the previously referenced materials (or equivalent) are now included in the SNOMED CT Technical Implementation Guide ([TIG](#)):

- **SNOMED CT Reference Set Guide** (TIG Section 5.6) - includes information about:
 - Representation and use of sets of SNOMED CT components using the Reference Set mechanism (and its predecessor the Subset mechanism).
- **SNOMED CT Concept Model Guide** (TIG Section 6) - includes information about:
 - Defining relationships in the SNOMED CT concept model.
- **SNOMED CT Logical Abstract Models** (TIG Section 4.2) - includes information about:
 - SNOMED CT concept definitions;
 - Representation of context in the SNOMED CT concept model;
- **SNOMED CT Compositional Grammar Specification and Guide** (<http://snomed.org/compgrammar>) - includes information about:
 - Logical model of SNOMED CT expressions;
 - Syntax for representation of SNOMED CT expressions, including use in HL7 Concept Descriptor (CD) data type.
- **SNOMED CT Expression Constraint Language Specification and Guide** (<http://snomed.org/expressionconstraints>) - includes information about:
 - Logical model of SNOMED CT expression constraints;
 - Syntax for representation of SNOMED CT expression constraints.
- **SNOMED CT Expression Retrieval and Normal Forms** (TIG Section 7.8.2.4) - includes information about:
 - Transformation between close-to-user representation of SNOMED CT expressions and normal forms that can be used for comparison and computation;

- Comparison of normal forms to determine equivalence and subsumption;
- Optimization of the process of normal form comparison.

All efforts have been made to ensure that the SNOMED CT identifiers used in this version of the guide are currently active in the SNOMED CT International Release.

B.3 SNOMED CT Compositional Grammar and Expression Constraint Language

This document uses the SNOMED CT Compositional Grammar to refer to SNOMED CT concepts and expressions. *Table 11* provides an overview of this grammar which is intended to meet the needs of readers of this document. However, those with a more detailed interest in this topic should read the “SNOMED CT Compositional Grammar Specification and Guide” (<http://www.snomed.org/compgrammar>), which explains the underlying logical model and includes a full Augmented Backus-Naur Form (ABNF) definition of the grammar.

The abstract model of expressions and definitions is at the heart of SNOMED CT. In contrast, the grammar is just one way of representing instances of concepts, definitions and expressions. As noted in the “Formal rules for post-coordinated expressions” (*1.8.6.2*), there are other ways to represent expressions, including the HL7 Concept Descriptor data type. The reason for using the compositional grammar in this document is that it offers a terse representation which is both human-readable and computer-processable.

To enable a simple representation of constrained value-sets of concepts and expressions based on post-coordinated refinement, a subset of the SNOMED CT Expression Constraint Language (<http://snomed.org/expressionconstraint>) is used. This language provides a syntax that is consistent with SNOMED CT Compositional Grammar, to represent constraints on concepts and expressions.

The notation used in SNOMED CT Compositional Grammar is summarized in *Table 11*. The SNOMED CT Expression Constraint Language extends Compositional Grammar with the additional operators and functions specified in *Table 12*. The elements that may be constrained in an Expression Constraint are listed in *Table 13*.

Table 11: Summary of SNOMED CT Compositional Grammar

Symbol	Notes	Examples
digits	ConceptId	<p>A sequence of digits in an expression represents a SNOMED CT concept identifier. The only exception to this is where digits occur between a pair of pipe symbols, in which case the digits are part of the display name (see next row of this table).</p> <p>The simplest expression is a concept identifier on its own. For example: 87628006</p>
text	Display name delimiter	<p>A pair of pipe (" ") symbols are used to delimit an optional display name for the immediately preceding concept identifier. For example:</p> <p>87628006 Bacterial infectious disease </p> <p>The display name may be the term string of any of the descriptions associated with the concept in a current version of SNOMED CT. For example any the following are a sample of valid representations of the same concept:</p> <p>87628006 Bacterial infectious disease (disorder) 87628006 Disease caused by bacteria 87628006 Enfermedad infecciosa bacteriana 87628006 Infección bacteriana </p> <p>Note: In this document all expressions include display names to aid understanding. Although the Fully Specified Name is more precise, use of the Preferred Term makes the document easier to read and full details can be found by looking up the concept identifier. Except where otherwise specified, the display name used in this document is the Preferred Term in US English in the SNOMED CT International Edition.</p>
space tab linefeed return	Whitespace characters	<p>Whitespace characters are ignored and can thus be used to format the appearance of an expression where this aids clarity. The only exception to this rule is that spaces are not ignored within a display name.</p> <p>Note: Spaces before or after the last non whitespace character of a display name are ignored. The text between the pair of pipe characters is trimmed of any surrounding whitespace but spaces within the enclosed text are treated as part of the display name.</p>
:	Refinement prefix	<p>A colon (":") precedes a refinement of meaning of the concept to the left of the colon. A refinement consists of one or more attributes and/or attributes groups and these are illustrated by examples in subsequent rows of this table.</p>
=	Attribute value prefix	<p>Each of the attributes that make up a refinement consists of an attribute name and an attribute value. The attribute name precedes the value and is separated from it by an equals sign ("=").</p> <p>The attribute name is represented by a concept identifier and the attribute value. The attribute value may be represented by a concept identifier as in the following example or by a nested expression (see example later in this</p>

		<p>table).</p> <p>The following example specifies a bacterial infectious disease caused by streptococcus pneumoniae.</p> <pre>87628006 Bacterial infectious disease : 246075003 Causative agent = 9861002 Streptococcus pneumoniae </pre>
,	Attribute separator	<p>A refinement may includes more than one attribute. In this case, a comma (",") is used to separate attributes from one another.</p> <p>The following example specifies a bacterial infectious disease affecting the lung and caused by streptococcus pneumoniae.</p> <pre>87628006 Bacterial infectious disease : 246075003 Causative agent = 9861002 Streptococcus pneumoniae , 363698007 Finding site = 39607008 Lung structure </pre>
(exp)	Nested expression	<p>The value of an attribute may be represented by a nested expression rather than a single concept identifier. In this case, the nested expression is enclosed in parentheses.</p> <p>The following example specifies a bacterial infectious disease affecting the left upper lobe of the lung and caused by streptococcus pneumoniae. The nested expression localizes (upper lobe of the lung) and lateralizes (left) the site of the disease.</p> <pre>87628006 Bacterial infectious disease : 246075003 Causative agent = 9861002 Streptococcus pneumoniae , 363698007 Finding site = (45653009 Structure of upper lobe of lung : 272741003 Laterality = 7771000 Left)</pre>
{ group }	Attribute group	<p>In some cases different sets of attributes apply to different facets of the same concept. For example, some common fractures involve two adjacent bones and the nature of the fracture of each bone may differ. Similarly, some procedures involve removal of one structure and repair of another and different refinements of these actions may be required.</p> <p>In SNOMED CT concepts that have multiple facets are defined with each facet represented by a separate relationship group. When these concepts are refined it may be necessary to specify which group is being refined. In these cases, curly braces are used to group together sets of attributes that act together.</p> <p>The following example represents a fracture of the shaft of the tibia and fibula. The tibia has a spiral fracture while the nature of the fracture of the fibula is incomplete.</p> <pre>271577005 Fracture of shaft of tibia and fibula : { 116676008 Associated morphology =</pre>

		<p>73737008 Fracture, spiral , 363698007 Finding site = 52687003 Bone structure of shaft of tibia } {116676008 Associated morphology = 30543000 Fracture, incomplete , 363698007 Finding site = 113224005 Bone structure of shaft of fibula }</p>
+	Combination	<p>A disorder that is both a bacterial disease and disorder of the respiratory systems. For example "bacterial pneumonia". 87628006 Bacterial infectious disease + 50043002 Disorder of respiratory system </p> <p>It does not mean two separate disorders that for some reasons are being linked. For example, this use of the plus sign is not the appropriate way to represent that someone has both a separate respiratory disorder (e.g. allergic asthma) and a separate bacterial disease (e.g. impetigo).</p>

Table 12: Summary of SNOMED CT Expression Constraint Language

Symbol	Notes	Examples
	This specific concept (No symbol prefix)	<p>71388002 Procedure </p> <p>The concept "procedure" SHALL be used. Note: By default, unless the surrounding context states otherwise, this implies this precise concept (i.e. not one of its subtypes) shall be used. However, the context within a sentence or parsable expression may imply a less specific requirement. For example, if the concept is followed by any options for addition of refinements these implicitly permit refinement of the concept.</p>
<<	This concept or any subtype	<p><< 71388002 Procedure </p> <p>Either the concept "procedure" or one of its subtypes SHALL be used. Note: this differs from the "<=" symbol used to indicate the same constraint in other HL7 specifications. The reason for the difference is to limit the use of "=" as the operator that joins an attribute name and an attribute value in the SNOMED CT compositional grammar. Supersedes "<=".</p>
<=	Deprecated symbol Has same meaning as << (see above)	<p>In HL7 Version 3 information models the symbol "<=" is used to indicate a concept domain consisting of the specified concept or one of its subtypes. This symbol may be confused with the use of the "=" symbol between the attribute name and value in a post-coordinated expression. Therefore, it SHOULD be replaced by "<<" in the Expression Constraint Language.</p>
<	Any subtype of this concept (but	<p>< 71388002 Procedure </p>

	not the concept itself)	A subtype of the concept "procedure" SHALL be used. The concept "procedure" itself SHALL NOT be used.
[x..y]	Cardinality	<pre>< 373873005 pharmaceutical / biologic product : [1..3] 127489000 has active ingredient = < 105590001 substance </pre> <p>The pharmaceutical / biologic product SHALL have between 1 and 3 active ingredients, whose value is a descendant of substance.</p>
!=	Not equal to any value in the given set	<pre>< Procedure : << 363704007 Procedure site = (<< 29836001 Hip region structure : [0..0] 272741003 Laterality != <182353008 Side)</pre> <p>The procedures SHALL have the attribute "procedure site" or one of its subtypes (e.g. procedure site – direct") and its value SHALL be "hip region structure" or one of its subtypes. This 'hip region structure' SHALL have zero "laterality" attributes whose value is NOT a descendant of "side". In other words, the attribute "laterality" MAY BE applied and if present its value SHALL be a subtype of "side" but SHALL not be "side" itself.</p>
MINUS	One set minus another set	<pre>< 71388002 Procedure MINUS << 432102000 Administration of substance </pre> <p>Subtypes of "procedure" which are NOT subtypes (or self) of "administration of substance".</p>
~	Deprecated symbol <i>Optional attribute</i>	<pre>71388002 Procedure : <<363704007 Procedure site = (<<29836001 Hip region structure : ~272741003 Laterality = <182353008 Side)</pre> <p>The attribute "procedure site" or one of its subtypes (e.g. "procedure site – direct") SHALL be applied and its value SHALL be "hip region structure" or one of its subtypes. The attribute "laterality" MAY BE applied and if present its value SHALL be a subtype of "side" but SHALL NOT be "side" itself.</p>
!	Deprecated symbol <i>This concept is prohibited and SHALL NOT be used.</i>	<pre>71388002 Procedure : 363704007 Procedure site = (29836001 Hip region structure : !272741003 Laterality)</pre> <p>The procedure site SHALL be the value "hip region structure" and SHALL NOT include the attribute "laterality". Note: This example conflicts with the SNOMED CT compositional grammar as no value is supplied for the laterality attribute. Since the laterality attribute is not permitted, it makes no sense to provide a value. Alternatively a dummy value could be provided but it has been omitted here and in the examples in this document as it would decrease rather than enhance clarity.</p>

!<	<p>Deprecated symbol This concept and all its subtypes are prohibited and SHALL NOT be used.</p>	<pre>71388002 Procedure : 363704007 Procedure site = (29836001 Hip region structure : ~272741003 Laterality = !<66459002 Unilateral)</pre> <p>The procedure site SHALL be the value "hip region structure" and MAY include the attribute "laterality" The value of "laterality" SHALL NOT be "unilateral" or a subtype of "unilateral".</p>
OR	<p>Disjunction / Union Either the first value or the second value</p>	<pre>< 71388002 Procedure : 363704007 Procedure site = (29836001 Hip region structure : 272741003 Laterality = (7771000 Left OR 24028007 Right))</pre> <p>The procedure site SHALL be the value "hip region structure" with the attribute "laterality" The value of "laterality" SHALL be either "left" or "right".</p>
AND	<p>Conjunction / Intersection Both the first value and the second value</p>	<pre>< 404684003 clinical finding : 363698007 finding site = <<39057004 pulmonary valve structure AND 116676008 associated morphology = <<415582006 stenosis </pre> <p>The clinical finding SHALL have a “finding site” that SHALL be a subtype of “pulmonary valve structure” or “pulmonary valve structure” itself. In addition it SHALL also have an associated morphology that SHALL be a subtype of “stenosis” or “stenosis” itself.</p>

Table 13: Expression Constraint Language - Constrainable elements

Element	Notes and examples
ConceptId	<p>The following constraint symbols MAY directly precede a ConceptId: “<”, “<<”. If this is the case, it requires, allows, or prohibits use of the referenced concept (and/or subtypes of that concept) in that logical position in the expression.</p>
Attribute Name	<p>The following constraint symbols MAY directly precede a concept id that specifies the name of an attribute: “<”, “<<”, “[x.y]”. In this case it requires, allows, prohibits or constrains use of that attribute (or a subtype of that attribute). Unless the use of the attribute is prohibited, the value of that attribute MAY be separately constrained.</p> <p>The following example asserts that the attribute "procedure site" or one of its subtypes (e.g. "procedure site – direct") SHALL be applied and its value SHALL be "hip region structure" or one of its subtypes.</p> <pre>< 71388002 Procedure : <<363704007 Procedure site = <<29836001 Hip region structure </pre>

Attribute Group	<p>The following constraint symbol MAY directly precede an attribute group: “[x.y]”. In this case, it constrains the inclusion of the specified group (and/or refinements of that group).</p> <p>The following example asserts that exactly one group with the given attributes must be present.</p> <pre>< 71388002 Procedure : [1..1] { 260686004 Method = 129304002 Excision - action , 405813007 Procedure site - Direct = 113345001 Abdominal structure }</pre>
Other	<p>The constraints cannot be used elsewhere in the expression constraint. In particular a constraint cannot be applied to a refinement as whole or to a display name. Therefore, the constraint symbols cannot immediately follow the concept identifier, nor can they precede the pipe (“ ”) or colon (“:”) symbols.</p>

Note: According to the HL7 TermInfo Requirements and Criteria (§ 1.9.2) and the SNOMED CT Technical Implementation Guide chapter 4.3, when alternative representations are semantically equivalent either representation may be used. Therefore, the constraints defined in this document specify the range of possible representations, rather than the precise way a meaning is represented. From an operational perspective it may sometimes be desirable to constrain the forms of representation permitted within a given community or realm. In these cases, additional constraints may be stated in an implementation profile.

B.4 Guidance on using SNOMED CT Compositional Grammar in CD R2 Data type

Note: The material in this section is provided for reference, as it is likely to be incorporated in a future version of CDA. However, it does not apply currently to CDA R2, which is based on the R1 data types.

B.4.1 Introduction

The HL7 V3 “Data Types – Abstract Specification, Release 2” defines what can be carried in the Concept Descriptor (CD) data type as “the plain code symbol defined by the code system, or an expression in a syntax defined by the code system which describes the concept.”

In response to the requirement for “syntax defined by the code system” The IHTSDO has published the “SNOMED CT Compositional Grammar Specification and Guide” (<http://snomed.org/compgrammar>).

This section describes the recommended way for communicating SNOMED CT expressions using the HL7 V3 Concept Descriptor (CD) data type.

B.4.2 Rules and guidance on usage

B.4.2.1 Minimal representation

Where communicating parties agree that only ConceptId’s are required for communication, whether single ID’s or compositional code phrases, these SHALL be communicated using CD.code, with expressions structured according to the SCG.

Example 28: Minimal CD representation of single code (pre-coordinated) Fracture of humerus

```
<value code="66308002" codeSystem="2.16.840.1.113883.6.96"/>
```

Example 29: Minimal CD representation of one pattern of compositional (post-coordinated) Fracture of humerus

```
<value code="127278005:363698007=85050009,116676008=72704001" codeSystem="2.16.840.1.113883.6.96"/>
```

It is, however, likely that good recording/communication practice between communicating parties will require the communication of associated human readable elements. Guidance is therefore provided for the following circumstances:

B.4.2.2 Single code SNOMED CT expression associated with a valid SNOMED CT description

Where a term of a valid description for the communicated SNOMED CT ConceptId has been selected to make the originating record entry, or where communicating parties wish to communicate a valid description for a code it may be communicated as:

CD.displayName - subject to the rules of the terminology, e.g. by use of a designated reference set that specifies the term to be selected for each code:

Example 30: Valid description “Fracture of humerus” communicated as displayName

```
<value code="66308002" codeSystem="2.16.840.1.113883.6.96">
  <displayName value="fracture of humerus"/>
</value>
```

CD.code, using the SCG rules:

Example 31: Minimal CD representation of single code (pre-coordinated) Fracture of humerus

```
<value code="66308002 | Fracture of humerus | " codeSystem="2.16.840.1.113883.6.96"/>
```

Both CD.code and CD.displayName:

Example 32: Valid description “Fracture of humerus” communicated as displayName

```
<value code="66308002 | Fracture of humerus | " codeSystem="2.16.840.1.113883.6.96">
  <displayName value="fracture of humerus"/>
</value>
```

Where both CD.code and CD.displayName are used, the terms must be the same.

CD.originalText may, of course, also be communicated - subject to the rules of the data type specification:

Example 33: Valid description “Fracture of humerus” communicated as originalText and displayName

```
<value code="66308002" codeSystem="2.16.840.1.113883.6.96">
  <displayName value="fracture of humerus"/>
  <originalText mediaType="text/plain" value="fracture of the humerus"/>
</value>
```

</value>

B.4.2.3 Single code or compositional SNOMED CT expression with an associated human-readable string

Where either a pre-crafted human-readable string or a relevant fragment from analysed narrative text is associated with a single code or compositional SNOMED CT expression, this string SHALL be communicated as CD.originalText:

Example 34: Text string “Open repair of outlet of muscular interventricular septum” communicated with associated code-only compositional code phrase

```
<code
code="387713003:363704007=264116001,260507000=129236007,260686004=257903006"
codeSystem="2.16.840.1.113883.6.96">
  <originalText mediaType="text/plain" value="Open repair of outlet of
muscular interventricular septum"/>
</code>
```

Where the recording process also presents a valid SNOMED CT description (or descriptions) to assist in the selection/creation of the communicated SNOMED CT expression, or where communicating parties wish to communicate a valid description for a code (or each code in a compositional expression) the associated term (or set of terms) MAY be communicated as follows:

Example 35: Concept representing “Open repair of outlet of muscular interventricular septum” communicated with SCG structured code and term phrase in CD.code

```
<code code="387713003 | Surgical procedure | :363704007 | Procedure
site | =264116001 | Outlet muscular septum | ,260507000 | Access |
=129236007 | Open approach - access | "
  codeSystem="2.16.840.1.113883.6.96">
  <originalText mediaType="text/plain" value="Open repair of outlet of
muscular interventricular septum"/>
</code>
```

If communicating parties agree that CD.code will only convey ConceptIds, then there is no current support, according to the rules of the data type specification and the SCG rules, for unambiguously communicating descriptions using available CD attributes.

In the future, if alternative standard term-phrase composition rules become part of the SNOMED CT standard (and are regarded as such by relevant communicating parties) then the value of displayName could be generated according to these to be specified rules.

B.4.2.4 Compositional SNOMED CT expression without an associated human-readable string

If neither a pre-crafted human-readable string, nor a relevant fragment from analysed narrative text is associated with a single code or compositional SNOMED CT expression, then:

1. The minimal representation pattern MAY be used (if this is regarded as satisfactory for recording/communication purposes between communicating parties) – see ‘Minimal representation’ above.
2. If recording process also presents a valid SNOMED CT description (or descriptions) to assist in the selection/creation of the communicated SNOMED CT expression, the associated term (or set of terms) must be communicated in

CD.code, structured according to the SCG rules, as has been the convention used in examples elsewhere in this implementation guide.

Example 36: Compositional code phrase corresponding to one representation of “Open repair of outlet of muscular interventricular septum” communicated with SCG structured code and term phrase in CD.code

```
<code code="387713003 | Surgical procedure |:363704007 | Procedure
site | =264116001 | Outlet muscular septum |,260507000 | Access |
=129236007 | Open approach - access |"
codeSystem="2.16.840.1.113883.6.96"/>
```

B.4.3 Supporting discussion and rationale

The approach described is based on the following principles:

- CD.code should only be used to communicate expressions in a syntax defined by the code system.
- Equality – “The equality of two CD values is determined solely based upon code and codeSystem”. From the perspective of HL7 data types, "66308002" is not equivalent to "66308002 | Fracture of humerus |” – however according to SNOMED CT and the rules of the SCG it is.
 - Users wishing to test for true equality of concepts should therefore refer to SCG guidance from the IHTSDO.
- For the simple case of a single SNOMED CT code and corresponding description, use of CD.code and CD.displayName is allowed.

Appendix C Revision changes

Significant changes based on the January 2014 ballot and subsequent updates include:

- All sections
 - Applied the ballot comment resolutions from the January 2014 ballot cycle
 - Updated numbering and streamlined format, capturing Tables, Figures and Examples and adding cross references
 - Moved Glossary to Appendix
 - Added clarifications and examples specifically to the normative sections 2 and 5
- Section 1
 - Added detail to audience section and how to read the document section
 - Added identification of conformance statement section
- Section 2
 - Added conformance statement numbering
- Removed Open SNOMED CT Issues section
- Section 5
 - Revised discussion of value set specifications to reflect the new SNOMED CT Compositional Grammar (published July 2015) and SNOMED CT Expression Constraint Language (published August 2015) specifications
 - Added reference to the draft HL7 Value Set Definition standard (currently undergoing ballot resolution)
- Removed Appendix on “Detailed aspects of issues with a vocabulary specification formalism”
 - The recent releases of the Compositional Grammar and Expression Constraint Language specifications have rendered much of this discussion and guidance outdated or obsolete
 - Much of the remaining material is duplicatively and more effectively covered in the SNOMED CT Technical Implementation Guide
- Glossary
 - Updated entries and source information

Significant changes in the January 2014 ballot include:

- All sections
 - Applied the ballot comment resolutions from the May 2009 ballot cycle
 - Further specified the focus (for the current ballot cycle) to applications in CDA R2 models

- Restored R1 CD data type pattern examples for use with CDA R2
- Updated to reflect changes to SNOMED CT (Concept Model, Compositional Grammar, etc.)
- Re-organized some material for better accessibility and flow
- Updated references to reflect newer tools and definitions
- Converted from HTML to Word document format
- Section 1
 - Added new "Audience" and "Data Types" sections
- Section 2
 - Created separate sections for Act.code (general Acts) and Observation code and value attributes
- Glossary
 - Updated and added entries

Changes in the May 2009 balloted version include:

- All sections
 - Alignment of examples with R2 CD data type pattern
- Section 2
 - Addition of discussion/guidance on use of Observation.interpretationCode
 - Clarification of use of targetSiteCode, methodCode and approachSiteCode, uncertaintyCode, priorityCode
- Section5
 - Updates to domain and range constraints for Procedure, SBADM and Supply
- Annex B
 - Addition of guidance on the use of the SNOMED compositional grammar in R2 CD data type

Major changes in the January 2007 balloted version include:

- All Sections
 - Use of a common grammar for referencing SNOMED CT concepts, expressions and constraints within the text of the document. This approach is based on the SNOMED CT Compositional Grammar and Expression Constraint Language. The intention is to ensure that human readable references to SNOMED CT concepts can also be computer parsed and validated. See also changes to Annex B.
- Section 1. Introduction and Scope
 - Section 1.5, SNOMED CT: Restructured and expanded with examples.

- Section 1.6, Asserting Conformance to this Implementation Guide: New subsection.
- Section 2. Guidance on Overlaps between RIM and SNOMED CT Semantics
 - Section 2.2.2, Removed redundant references to temporal content and subject relationship context in the moodCode default mapping and constraint tables.
 - Section 2.2.5, More consistent representation of relevant site attributes by reference rather than repetition.
 - Section 2.2.12, Significant corrections to inconsistent handling of time temporal context.
- Section 3. Common Patterns
 - Section 3.1, Introduction: Describes the approach used to build examples that are both consistent with the SNOMED recommendations presented here, and are consistent with the source technical committee domain models.
 - Section 3.1.1, Observations vs. Organizers: Reference to ActContainer changed to now reference ActClassRecordOrganizer, based on RIM harmonization.
 - Section 3.4, Observation, Condition, Diagnosis, Problem: Updated to be consistent with Patient Care TC model
- Annex B. References
 - New section B.3 describing the SNOMED CT Expression Constraint Language used in the text of the document.
- Annex D. SNOMED CT Open Issues
 - New SNOMED CT open issue in relation to 'Events and Conditions'
 - New SNOMED CT open issue in relation to identifying those SNOMED CT codes suitable for Act.code where Observation.value is a SNOMED CT finding.
- Annex E. Detailed aspects of issues with a vocabulary specification formalism
 - Clarification of the definition of 'subsumption'.

Appendix D Glossary

D.1 Introduction to the Glossary

The HL7 Glossary provides "core" definitions of words and terms used throughout HL7 standards and documents. These definitions are maintained by the Modeling and Methodology (MnM) and Publishing Technical Committees (TC) and are identified in the glossary as "Core Glossary".

It should be noted that while the Modeling and Methodology and Publishing Technical Committees maintain the glossary definitions, the definitions themselves originate from within the various technical committees and special interest groups and are not constrained or vetted in any way by the MnM or Publishing TCs. It is expected that each committee and its balloters know their business best and that, should an imprecise or incorrect definition be put forward, it will be corrected through the domain balloting process.

It should further be noted that this glossary does not include all the definitions from the Reference Information Model (RIM) as the RIM definitions are already available in the RIM publication and are in context there.

Readers may also note that "core" definitions may be constrained or narrowed within the context of specific domains. For instance, the PM domain includes a definition for Person that is constrained from the RIM definition of Person. In these cases, the PM:Person is perfectly consistent with the RIM:Person, albeit as a specialized subset of the larger group. So while all instances of a PM:Person will also be members of RIM:Persons, not all instances of RIM:Person will fall within the group of PM:Persons.

The MnM and Publishing TCs encourage all members to review the definitions put forward by committees as part of the balloting process with an eye towards correcting and refining them as necessary and appropriate.

This glossary attempts to include terms used in this guide - it draws the definitions from various resources, which are listed in the source column of this table. References are drawn primarily from HL7 V3 (core glossary or Core principles), where available. When the term could not be found there, TermInfo is listed as the source.

D.2 Alphabetic Index

Term	Source	Definition
A		
ANSI	HL7 V3 Core Glossary	American National Standards Institute
application	HL7 V3 Core Glossary	Software program or set of related programs that provide some useful healthcare capability or functionality.
artifact	HL7 V3 Core Glossary	Any deliverable resulting from the discovery, analysis, and design activities leading to the creation of message specifications.
assessment scale	TermInfo	Collection of observations that together yield a summary evaluation of a particular condition. Note: Examples include the Braden Scale (used for assessing pressure ulcer risk), APGAR Score (used to assess the health of a newborn).
association	HL7 V3 Core Glossary	Reference from one class to another class or to itself, or a connection between two objects (instances of classes). For more information refer to the Relationships section of the Version 3 Guide.
attribute (in the context of HL7)	HL7 V3 Core Glossary	Abstraction of a particular aspect of a class. Attributes become the data values that are passed in HL7 messages.
attribute (in the context of SCT)	TermInfo	Abstraction of a particular aspect of a class. Note: Attributes express characteristics of SNOMED CT concepts. Example: Concept Arthritis IS-A Arthropathy IS-A Inflammatory disorder FINDING-SITE Joint structure ASSOCIATED-MORPHOLOGY Inflammation In this example, Arthritis has two attributes: FINDING-SITE and ASSOCIATED-MORPHOLOGY. The value of the attribute FINDING-SITE is Joint structure. SNOMED CT concepts form relationships to each other through attributes.
attribute (in the context of XML)	TermInfo	Characteristic of an object or entity Attributes are used to associate name-value pairs with elements.
B		
Bag	HL7 V3 Core Glossary	Form of collection whose members are unordered, and need not be unique.
binding realm	Core Principles and Properties of V3 Models	Named interoperability conformance space Note: All information models within a particular Binding Realm share the same conformance bindings. In non-technical terms, it can be considered a dialect where speakers use the semantics of the language but agree to use certain terms that are specific to their community; it is a context of use for terminology in HL7 models. Binding Realms may be defined by jurisdictional

Term	Source	Definition
		boundaries and are often HL7 Affiliates, or sub-national jurisdictional entities within the Affiliate purview. Binding Realms may also be based on other factors such as type of patient (e.g. human vs. veterinary, pediatric vs. geriatric), type of medicine (e.g. dentistry vs. psychiatry), etc..
C		
canonical form	TermInfo	Standard or basic structure of a post coordinated expression, a set of linked concepts
cardinality	HL7 V3 Core Glossary	Property of a data element (the number of times a data element MAY repeat within an individual occurrence of an object view) or column in the Hierarchical Message Description (the minimum and maximum number of occurrences of the message element).
choice (in the context of HL7)	HL7 V3 Core Glossary	Message construct that includes alternative portions of the message. Note: For a choice due to specialization, the sender picks one of the alternatives and sends it along with a flag.
class	HL7 V3 Core Glossary	Abstraction of a thing or concept in a particular application domain. For more information refer to the Classes section of the Version 3 Guide.
Clinical Statement Pattern	TermInfo	<p>A refinement of the RIM to represent discrete instances of clinical information and the context within which they are recorded.</p> <p>Note: The RIM is an abstract model and leaves many degrees of freedom with regard to representing a specific item of clinical information. The HL7 Clinical Statement project has developed and is now maintaining a more refined model for representing discrete instances of clinical information and the context within which they are recorded.</p> <p>The HL7 Clinical Statement Pattern is a refinement of the RIM, which provides a consistent structural approach to representation of clinical information across a range of different domains and may additionally include the attribute “context”. However, neither the RIM nor the Clinical Statement Pattern place any limits on the level of clinical detail that may be expressed in a structured form. At the least structured extreme, an HL7 Clinical Document Architecture (CDA) document may express an entire encounter as text with presentational markup, without any coded clinical information. An intermediate level of structure might be applied when communicating a clinical summary with each diagnosis and operative procedure represented as a separate coded statement. Requirements for more comprehensive communication of electronic health records can be met by using the Clinical Statement Pattern to fully structure and encode each individual finding and/or each step in a procedure.</p>

Term	Source	Definition
		<p>The Clinical Statement Pattern is the common foundation for the CDA Entries in HL7 Clinical Document Architecture release 2 and for the clinical information content of HL7 Care Provision messages. Details of the Clinical Statement Pattern can be found in the Universal Domains section of the HL7 Version 3 Normative Edition. The clinical statement models used in CDA R2 are based on an early pre-publication version of the Clinical Statement Pattern (the closest available version is published in the May 2005 ballot package under Common Domains – available to members).</p> <p>Even within the constraints of the Clinical Statement Pattern, similar clinical information can be represented in different ways. One key variable is the nature of the code system chosen to represent the primary semantics of each statement. The other key variable is the way in which overlaps and gaps between the expressiveness of the information model (clinical statement) and the chosen terminology are reconciled.</p>
clinical finding	TermInfo	<p>Concepts that represent the result of a clinical observation, assessment or judgment.</p> <p>These concepts are used for documenting clinical disorders and symptoms and examination findings. Within the “clinical finding” hierarchy is the sub-hierarchy of “disease”. Concepts that are descendants of “disease” are always and necessarily abnormal. Note: As expected, this definition includes concepts that would be used to represent HL7 Observations. However, it is worth noting that the definition of a finding in SNOMED CT is that it combines the question (see Observable entity) with the answering value.</p>
clone	HL7 V3 Core Glossary	<p>Class from the Reference Information Model (RIM) that has been used in a specialized context and whose name differs from the RIM class from which it was replicated. This makes it possible to represent specialized uses of more general classes to support the needs of messaging.</p>
code	Oxford Dictionary	<p>A series of letters, numbers, or symbols assigned to something for the purposes of classification or identification</p>
code system	HL7 V3 Core Glossary	<p>Collection of coded concepts, each having associated designations and meanings</p> <p>Note: This term is used to describe any and all such systems, whether authoratively managed or not.</p>
coded attribute	HL7 V3 Core Glossary	<p>Attribute in the Reference Information Model (RIM) with a base data type of CD, CE, CS, or CV.</p>
collection	HL7 V3 Core Glossary	<p>Aggregation of similar objects. The forms of collection used by HL7 are Set, Bag, and Sequence (LIST). Objects which MAY be found in collections include data types and message element types.</p>

Term	Source	Definition
Common Message Element Type (CMET)	HL7 V3 Core Glossary	Message type in a Hierarchical Message Description (HMD) that MAY be included by reference in other HMD's. For more information refer to the Common Message Element Types section of the Version 3 Guide.
concept identifier	HL7 V3 Core Glossary	Unique identification assigned to a concept.
concept	Core Principles and Properties of V3 Models	A Concept is a unitary mental representation of a real or abstract thing – an atomic unit of thought. It should be unique in a given Code System. A concept may have synonyms in terms of representation and it may be a singleton, or may be constructed of other concepts (i.e. post-coordinated concepts).
concept (in the context of SNOMED CT)	IHTSDO	Clinical concept to which a unique ConceptId has been assigned. Note: The term concept may also be used informally with the following meanings: <ul style="list-style-type: none"> • The concept identifier, which is the key of the SNOMED CT Concept file (in this case it is less ambiguous to use the term "conceptId" or "concept code", or "id" in SNOMED CT Release Format 2); • The real-world referent(s) of the concept identifier, that is, the class of entities in reality that the concept identifier represents (in this case it is less ambiguous to use the term "meaning" or "code meaning").
concept domain	Core Principles and Properties of V3 Models	A named category of like concepts (a semantic type) that is specified in the Vocabulary Declaration of an attribute in an information model or property in a data type, whose data types are coded or potentially coded, and may be used in a Context Binding. Note: Concept domains exist to constrain the intent of the coded element while deferring the binding of the element to a specific set of codes until later in the specification development process. Thus, concept domains are independent of any specific vocabulary or code system. Concept domains are hierarchical in nature, and each hierarchy represents a constraint path from a broader to a narrower semantic category. In HL7's base models – the RIM and the Abstract Data Types specification – all coded elements are tied to these abstract definitions of the allowed types of concepts.
conformance verb	HL7 V3 Core Glossary	Verb used to indicate the level or type of conformance required. Note: In HL7 Version 3 Specifications, the correct verb form for indicating a requirement is "SHALL." The correct verb form for indicating a recommendation is "SHOULD." The correct verb form for an option is "MAY." Universally accepted standardization terminology does not recognize

Term	Source	Definition
		<p>"must". Use "SHALL" to indicate a mandatory aspect or an aspect on which there is no option. The negatives are SHALL NOT, SHOULD NOT, MAY NOT. The Publishing Facilitator's Guide requires the Conformance Verbs to be capitalized when they are used to indicate conformance criteria, to differentiate from common usage of the words. The source for this usage is ANSI.</p>
constraint	HL7 V3 Core Glossary	<p>Narrowing down of the possible values for an attribute.</p> <p>Note: A suggestion of legal values for an attribute (by indicating the data type that applies, by restriction of the data type, or by definition of the domain of an attribute as a subset of the domain of its data type). MAY also include providing restrictions on data types. A constraint imposed on an association MAY limit the cardinality of the association or alter the navigability of the association (direction in which the association can be navigated). A Refined Message Information Model (R-MIM) class MAY be constrained by choosing a subset of its Reference Information Model (RIM) properties (i.e., classes and attributes) or by cloning, in which the class' name is changed. For more information refer to the Constraints section of the Version 3 Guide.</p>
Context Model (SNOMED CT)	TermInfo	<p>Part of the SNOMED CT Concept Model containing rules for use of the hierarchy of "Situation with explicit context".</p> <p>Note: The SNOMED CT context model has been developed to allow users and/or implementers to specify context using the terminology, without depending on a particular record structure. The Situation with explicit context hierarchy and various attributes assigned to concepts in this hierarchy accomplish this.</p> <p>Concepts can be placed in explicit contexts related to subject (e.g. subject of record, family member, disease contact, etc.), time, finding (e.g. unknown, present, absent, goal, expectation, risk, etc.) or procedure (e.g. not done, not to be done, planned, requested, etc)</p>
context wrapper	IHTSDO	<p>Part of a SNOMED CT expression that specifies the context that applies to the focus concept that it contains.</p> <p>Note: An example: "Family history of asthma" can be represented by an expression in which the concept "asthma" is nested within an context wrapper that indicates that this is "family history" - rather than a current condition affecting the patient.</p>
D		

Term	Source	Definition
data type	HL7 V3 Core Glossary	<p>Structural format of the data carried in an attribute.</p> <p>Note: It MAY constrain the set of values an attribute may assume. For more information refer to the Data Types section of the Version 3 Guide.</p> <p>HL7 has defined two sets of “abstract” data types for use in HL7 models, including CDA. The two versions are known as Release 1 (R1) and Release 2 (R2) – details can be found in the HL7 Version 3 Normative Edition. Of particular interest for this implementation guide is the Concept Descriptor (CD) data type (present in both versions), which is used for the representation of coded data (in SNOMED CT or other terminologies), and is the most general coded data type. The CD data types provides for the representation of post-coordinated expressions, although by different mechanism in the two versions.</p> <p>The Data Types R1 specification, which is used by CDA R2 (and other earlier versions of V3), represents post-coordination using “qualifier” elements (one or more) which encode attribute-value pairs that “qualify” (or modify) a primary concept (code) and are represented as an XML structure. Datypes R2 instead uses an arbitrary length string representation for the “code” attribute, which allows post-coordination to be represented by the grammar (if any) that is defined for that purpose by the terminology (code system) itself. In the case of SNOMED CT, this is the Compositional Grammar. In this guide examples will be shown of the use of both Data Types R1 and R2, with the R1 examples being directly applicable to use in CDA R2.</p>
diagnosis	TermInfo	<p>Result of a cognitive process whereby signs, symptoms, test results, and other relevant data are evaluated to determine the condition afflicting a patient.</p> <p>Note: Diagnosis directs administrative and clinical workflow, where for instance the assertion of an admission diagnosis establishes care paths, order sets, etc., something that is billed for in a clinical encounter. In such a scenario, an application typically has a defined context where the billable object gets entered.</p>
domain	HL7 V3 Core Glossary	<p>Particular area of interest.</p> <p>Note: For example, the domain for HL7 is healthcare.</p>
domain (in the context of HL7)	TermInfo	<p>Set of possible values of a data type, attribute, or data type component.</p> <p>Note: See also concept domain.</p> <p>A special interest group within HL7, such as Pharmacy, Laboratory, or Patient Administration</p>
E		

Term	Source	Definition
event	HL7 V3 Core Glossary	Stimulus that causes a noteworthy change in the state of an object, or a signal that invokes the behavior of an object. Note: See also trigger event.
event (in the context of HL7)	HL7 V3 Core Glossary	Concept in the ActMood code system (universally bound for use with the Act.moodCode attribute) representing “An act that actually happens (may be an ongoing act or a documentation of a past act).”
expression (in the context of SNOMED CT)	TermInfo	Structured collection of one or more concept identifiers used to express a clinical idea. Note: An expression containing a single concept identifier is referred to as a pre-coordinated expression. An expression that contains two or more concept identifiers is a post-coordinated expression. The concept identifiers within a post-coordinated expression are related to one another in accordance rules expressed in the SNOMED CT Concept Model. These rules allow concepts to be: <ul style="list-style-type: none"> • combined to represent clinical ideas which are subtypes of all the referenced concepts • E.g. “tuberculosis” + “lung infection” • applied as refinements to specified attributes of a more general concept. • E.g. “asthma” : “severity” = “severe” Notes: The SNOMED CT compositional grammar provides one way to represent an expression. The HL7 messaging standard supports communication of SNOMED CT expressions using the “concept descriptor” (CD) data type.
Extensible Markup Language (XML)	HL7 V3 Core Glossary	A meta-language that defines a syntax used to define other domain -specific, semantic, structured markup languages. Based on SGML (Standard Generalized Markup Language), it consists of a set of rules for defining semantic tags used to mark up the content of documents. Abbreviated as XML.
H		
Hierarchical Message Description (HMD)	HL7 V3 Core Glossary	Specification of the exact fields of a message and their grouping, sequence, optionality, and cardinality. This specification contains message types for one or more interactions, or that represent one or more common message element types. This is the primary normative structure for HL7 messages.
HL7	HL7 V3 Core Glossary	Health Level 7
HTML	HL7 V3 Core Glossary	Hypertext Markup Language, a specification of the W3C that provides markup of documents for display in a web browser
I		
ICD (9 or 10)	TermInfo	International Classification of Diseases (version 9 or 10) is a classification published by the World Health Organization (WHO). For use in the US, the

Term	Source	Definition
		National Center for Health Statistics, a branch of the Centers for Disease Control and Prevention, publishes ICD-9-CM and ICD-10-CM (CM = “clinical modification”).
IHTSDO	TermInfo	The International Health Terminology Standards Development Organisation Note: A not-for-profit organization that owns, administers and develops SNOMED CT.
information model	HL7 V3 Core Glossary	A structured specification, expressed graphically and/or narratively, of the information requirements of a domain. Explanation: An information model describes the classes of information required and the properties of those classes, including attributes, relationships, and states. Examples in HL7 are Domain Reference Information, Model (DMIM), Reference Information Model (RIM), and Refined Message Information Model (RMIM)
instance	HL7 V3 Core Glossary	Case or occurrence. Note: For example, an instance of a class is an object.
interaction	HL7 V3 Core Glossary	Single, one-way information flow that supports a communication requirement expressed in a scenario.
interoperability	IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries, IEEE, 1990	Ability of two or more systems or components to exchange information and to use the information that has been exchanged. Note: “Functional” interoperability is the capability to reliably exchange information without error “Semantic” interoperability is the ability to interpret, and, therefore, to make effective use of the information so exchanged. In our context, "effective use" means that the information can be used in any type of computable algorithm (appropriate) to that information
L		
life cycle	HL7 V3 Core Glossary	See state machine.
list	HL7 V3 Core Glossary	Form of collection whose members are ordered, and need not be unique.
logical concept definition	TermInfo	Relationships between concepts which define a concept Note: Each SNOMED CT concept is defined by relationships to one or more other concepts. The following example illustrates the type of logical definitions that are distributed as part of SNOMED CT. Example 1. SNOMED CT definition of 'fracture of femur'

Term	Source	Definition
		<p>71620000 Fracture of femur === 46866001 Fracture of lower limb + 7523003 Injury of thigh : { 116676008 Associated morphology = 72704001 Fracture , 363698007 Finding site = 71341001 Bone structure of femur }</p> <p>This example and many of the other illustrations in this document are expressed using the SNOMED CT Expression Constraint Language. Where relevant, this document also uses this language to represent constraints on use of SNOMED CT concepts and expressions. This Expression Constraint Language is explained in SNOMED CT Compositional Grammar and Expression Constraint Language (§B.3), together with references to the SNOMED CT source material.</p>
LOINC	The Regenstrief Institute	Logical Observations, Identifiers, Names, and Codes is terminology with a focus on clinical and laboratory observations maintained by The Regenstrief Institute (www.regenstrief.org)
M		
mandatory	HL7 V3 Core Glossary	Requirement for non-null content in a value Note: If an attribute is designated as mandatory, all message elements which make use of this attribute SHALL contain a non-null value or they SHALL have a default that is not null. This requirement is indicated in the "mandatory" column in the Hierarchical Message Description.
markup	HL7 V3 Core Glossary	Computer-processable annotations within a document. Note: Markup encodes a description of a document's storage layout and logical structure. In the context of HL7 Version 3, markup syntax is according to the XML Recommendation.
MAY	HL7 V3 Core Glossary	The conformance verb MAY is used to indicate a possibility. See the conformance verb definition for more information.
message (in the context of HL7)	HL7 V3 Core Glossary	Package of information communicated from one application to another. Note: See also message type and message instance.
message element (in the context of HL7)	HL7 V3 Core Glossary	Unit of structure within a message type.
message element type (in the context of HL7)	HL7 V3 Core Glossary	Portion of a message type that describes one of the elements of the message.
message instance	HL7 V3 Core Glossary	Message, populated with data values, and formatted for a specific transmission based on a particular message type.
message type	HL7 V3 Core Glossary	Set of rules for constructing a message given a specific set of instance data. Note: As such, it also serves as a guide for parsing a message to recover the instance data.

Term	Source	Definition
model	HL7 V3 Core Glossary	Representation of a domain that uses abstraction to express the relevant concepts. Note: In HL7, the model consists of a collection of schema and other documentation.
model of meaning	TermInfo	Universal semantic representation of an expression Note: This differs from the “model of use” which may have local interpretations or context, for example an application may place some clinical statements in a “Negative” column meaning “ruled out”. Those statements would have to be modified (transformed into a canonical form) to be correctly understood when transmitted to a third party. This would be the representation regardless of how it was collected / shared with the user.
model of use	TermInfo	Local interpretations or context of the model of meaning. Note: For example an application may place some clinical statements in a “Negative” column meaning “ruled out”. Those statements would have to be transformed into a canonical form to be correctly understood when transmitted to a third party. Distinguished from the “model of meaning” which stand on its own, which can be universally understood.
moodCode	TermInfo	A code distinguishing whether an Act is conceived of as a factual statement or in some other manner as a command, possibility, goal, etc. Note: This is one attribute of an HL7 Act.
N		
navigability	HL7 V3 Core Glossary	Direction in which an association can be navigated (either one way or both ways).
negationInd	TermInfo / V3 Reference Information Model (RIM)	An indicator specifying that the Act statement is a negation of the Act in event mood as described by the descriptive attributes. Note: negationInd is applicable to all Act subtypes, including Observation. In recent versions of the RIM there are two types of negation indicators – the Act.actionNegationInd (applicable to procedures, etc.), and the Observation.valueNegationInd (applicable to results, etc.). CDA R2 is using an older version of the RIM, where that distinction was not made, so when using Observation.negationInd in a CDA document it is important to specify whether it applies to the entire Observation class or to only the value element.
NHS	TermInfo	United Kingdom’s National Health Service
normal form (in the context of SNOMED CT)	IHTSDO	A representation of a SNOMED CT expression in which none of the referenced concepts are fully defined. Note: Normal forms can be used to determine equivalence and subsumption between expressions and thus assist with selective retrieval.

Term	Source	Definition
		<p>Any SNOMED CT expression can be transformed to its normal form by replacing each reference to a fully defined concept with a nested expression representing the definition of that concept.</p> <p>Transformation rules then resolve redundancies, which may arise from expanding fully defined concepts, by removing less specific attribute values. Normal forms can be used to determine equivalence and subsumption between expressions and thus assist with selective retrieval.</p>
null	HL7 V3 Core Glossary	Value for a data element which indicates the absence of data. A number of “flavors” of null are possible and are enumerated in the domain NullFlavor.
O		
object	HL7 V3 Core Glossary	<p>Instance of a class.</p> <p>Note: A part of an information system containing a collection of related data (in the form of attributes) and procedures (methods) for operating on that data. For more information refer to the Classes section of the Version 3 Guide.</p>
observable entity (in the context of SNOMED CT)	TermInfo	<p>Hierarchy in SNOMED CT which represents a question about something which may be observed or measured.</p> <p>Note: An observable entity combined with a result, constitutes a finding. For instance, the concept Left ventricular end-diastolic pressure (observable entity) in effect represent the question “What is the value of the left ventricular end diastolic pressure?” When Left ventricular end-diastolic pressure (observable entity) is given a value it represents a finding. For example: Increased left ventricular end-diastolic pressure is a finding with the value Increased. Left ventricular end-diastolic pressure combined with a separately expressed value such as 95 mmHg also behaves as a finding.</p> <p>This definition includes concepts that would be used to represent the code attribute of HL7 Observations.</p>
observation	HL7 V3 Core Glossary	<p>Measurement of a single variable or single value derived logically and/or algebraically from other measured or derived values</p> <p>Note: An Act of recognizing and noting information about the subject, and whose immediate and primary outcome (post-condition) is new data about a subject. Observations often involve measurement or other elaborate methods of investigation, but may also be simply assertive statements. Discussion: Structurally, many observations are name-value-pairs, where the Observation.code (inherited from Act) is the name and the Observation.value is the value of the property. Such a construct is also known as a “variable” (a named feature that can</p>

Term	Source	Definition
		<p>assume a value); hence, the Observation class is always used to hold generic name-value-pairs or variables, even though the variable valuation may not be the result of an elaborate observation method. It may be a simple answer to a question or it may be an assertion or setting of a parameter. As with all Act statements, Observation statements describe what was done, and in the case of Observations, this includes a description of what was actually observed (“results” or “answers”); and those “results” or “answers” are part of the observation and not split off into other objects.</p> <p>This definition refers to the action rather than the outcome of the observation but in the discussion continues to refer to the “results” or “answers” as being a part of the observation. The general idea of an HL7 Observation therefore includes three distinct types of concept from a SNOMED CT perspective “Observable entities” (things that can be measured), “Measurement procedures” (a type of procedure used to make a measurement or observation) and “Clinical finding” (expressing both the name of the observation and its value).</p>
Organizer	TermInfo	<p>Navigational structure or heading an object class in the HL7 Clinical Statement Pattern, which can be an ActContainer.</p> <p>Note: Organizers are used to group a set of acts sharing a common context, include such structures as folders, documents, document sections, and batteries. Values may be drawn from the SNOMED CT Care Record Elements hierarchy.</p>
P		
pattern	TermInfo	<p>An object model that is generally effective for a type of problem and can be easily adapted to a particular instance of the problem.</p>
post-coordinated expression	IHTSDO Glossary modified to meet SKMT metadata specifications	<p>Representation of a clinical meaning using a combination of two or more concept identifiers Synonym: postcoordinated expression</p> <p>Note: Post-coordinated expressions define a concept using semantics and linking of pre-coordinated concepts.</p> <p>Some clinical meanings may be represented in several different ways. SNOMED CT technical specifications include guidance for transforming logical expressions to a common canonical form.</p> <p>Each SNOMED CT concept is defined by relationships to one or more other concepts. The following example illustrates the type of logical definitions that are distributed as part of SNOMED CT.</p> <p>Example 1. SNOMED CT definition of 'fracture of</p>

Term	Source	Definition
		<p>femur'</p> <pre>71620000 Fracture of femur === 46866001 Fracture of lower limb + 7523003 Injury of thigh : { 116676008 Associated morphology = 72704001 Fracture , 363698007 Finding site = 71341001 Bone structure of femur }</pre> <p>This example and many of the other illustrations in this document are expressed using the SNOMED CT Expression Constraint Language. Where relevant this document also uses this language to represent constraints on the use of SNOMED CT concepts and expressions. This Expression Constraint Language is explained in SNOMED CT Compositional Grammar and Expression Constraint Language (§B.3), together with references to the SNOMED CT source material.</p>
pre-coordination	TermInfo	<p>Representation of an idea by a single attribute. Synonym: Precoordination</p> <p>Note: In HL7 documents the idea is the meaning of a class, though not clearly stated, but inferred from usage in relation to particular attributes like Procedure.methodCode and Procedure.targetSiteCode. Contrast this with the definition of pre-coordination in SNOMED CT documentation which implies a single concept identifier is used to represent a meaning. For examples of use in SNOMED CT see post-coordinated expression.</p>
problem		<p>Clinical statement that a clinician chooses to add to a problem list.</p>
Procedure (in the context of HL7)	TermInfo	<p>An Act whose immediate and primary outcome (post-condition) is the alteration of the physical condition of the subject.</p> <p>Note: Applied to clinical medicine, procedure is but one among several types of clinical activities such as observation, substance-administrations, and communicative interactions (e.g. teaching, advice, psychotherapy, represented simply as Acts without special attributes). Procedure does not subsume those other activities nor is procedure subsumed by them. Notably Procedure does not comprise all acts of whose intent is intervention or treatment. Whether the bodily alteration is appreciated or intended as beneficial to the subject is likewise irrelevant, what counts is that the act is essentially an alteration of the physical condition of the subject.</p> <p>This definition and the associated discussion exclude many activities which are subsumed by the more general sense of the word “procedure” which is</p>

Term	Source	Definition
		used in the SNOMED CT definition.
procedure (in the context of SNOMED CT)	TermInfo	<p>Concepts and hierarchy that represent the purposeful activities performed in the provision of health care.</p> <p>Note: This hierarchy includes a broad variety of activities, including but not limited to invasive procedures (Excision of intracranial artery), administration of medicines (Pertussis vaccination), imaging procedures (Radiography of chest), education procedures (Instruction in use of inhaler), and administrative procedures (Medical records transfer).</p> <p>As expected, this definition includes concepts that would be used to represent HL7 Procedure instances. However, it also includes measurement procedures and actions that involve administration of a substance. Therefore, the code attribute of many HL7 Observations and SubstanceAdministration Acts may also be expressed using concepts from the SNOMED procedures hierarchy.</p>
property	HL7 V3 Core Glossary	Any attribute, association, method, or state model defined for a class or object.
R		
Reference Information Model (RIM) (in the context of HL7)	HL7 V3 Core Glossary	<p>The model from which all other information models and messages are derived</p> <p>Note: The HL7 Version 3 Reference Information Model (RIM) provides an abstract model for representing health related information. The RIM comprises classes which include sets of attributes and which are associated with one another by relationships.</p> <p>Documentation of RIM classes, attributes and relationships and the concept domains specified for particular coded attributes provide standard ways to represent particular kinds of information. The RIM specifies internal vocabularies for some structurally essential coded attributes but also supports use of external terminologies to express more detailed information. SNOMED CT is one of the external terminologies that may be used in HL7 communications.</p>
Refined Message Information Model (RMIM)	HL7 V3 Core Glossary	<p>An information structure that represents the requirements for a set of messages.</p> <p>Note: A constrained subset of the Reference Information Model (RIM) which MAY contain additional classes that are cloned from RIM classes. Contains those classes, attributes, associations, and data types that are needed to support one or more Hierarchical Message Descriptions (HMD). A single message can be shown as a particular pathway through the classes within an R-MIM. For more</p>

Term	Source	Definition
		information refer to the Information Model section of the Version 3 Guide.
Role	HL7 V3 Core Glossary	<p>A Reference Information Model class that defines the competency of an Entity class.</p> <p>Note: Each Role is played by one Entity (the Entity that is in the Role) and is usually scoped by another. In UML, each end of an association is designated as a role to reflect the function that class plays in the association.</p>
S		
schema	HL7 V3 Core Glossary	<p>Diagrammatic presentation, a structured framework, or a plan.</p> <p>Note: A schema documents the set of requirements that need to be met in order for a document or set of data to be a valid expression within the context of a particular grammar.</p>
semantic interoperability	TermInfo	<p>Capability of two or more systems to communicate and exchange information, and for each system to be able to interpret the meaning of received information and to use it seamlessly with other data held by that system.</p> <p>Note: A receiving application should be able to retrieve and process communicated information, in the same way that it is able to retrieve and process information that originated within that application. One of the primary goals of HL7 Version 3 is to deliver standards that enable semantic interoperability. Semantic interoperability is a step beyond the exchange of information between different applications that was demonstrated by earlier versions of HL7. The additional requirement is that a receiving application should be able to retrieve and process communicated information, in the same way that it is able to retrieve and process information that originated within its own application. To meet this requirement the meaning of the information communicated must be represented in an agreed upon, consistent and adequately expressive form.</p> <p>Clinical information is information that is entered and used primarily for clinical purposes. The clinical purposes for which information may be used include care of the individual patient and support to population care. In both cases there are requirements for selective retrieval of information either from within a single patient record or from the set of records pertaining to the population being studied. Meeting these requirements depends on consistent interpretation of the meaning of stored and communicated information. This requires an understanding of the varied and potentially complex ways in which similar information may be represented. This complexity is apparent both in the range of clinical concepts that need to be expressed</p>

Term	Source	Definition
		and the relationships between instances of these concepts. Delivering semantic interoperability in this field presents a challenge for traditional methods of data processing and exchange. Addressing this challenge requires an established way to represent reusable clinical concepts and a way to express instances of those concepts within a standard clinical record, document or other communication.
set	HL7 V3 Core Glossary	Form of collection which contains an unordered list of unique elements of a single type.
SHALL	HL7 V3 Core Glossary	The conformance verb SHALL is used to indicate a requirement. Note: See the conformance verb definition for more information.
SHOULD	HL7 V3 Core Glossary	The conformance verb SHOULD is used to indicate a recommendation. Note: See the conformance verb definition for more information.
SNOMED CT	IHTSDO Glossary	Clinical terminology maintained and distributed by the IHTSDO. Note: It is considered to be the most comprehensive, multilingual healthcare terminology in the world. It was created as a result of the merger of SNOMED RT and NHS Clinical Terms Version 3. SNOMED CT is a clinical terminology which covers a broad scope of clinical concepts to a considerable level of detail. It is one of the external terminologies that can and will be used in HL7 Version 3 communications. SNOMED CT has various features that add flexibility to the range and detail of meanings that can be represented. These features summarized below are documented in detail in documents listed in SNOMED CT Reference materials (§B.2). The OID value that identifies SNOMED CT when used in HL7 V3 models (in CD and additional coded data types) is "2.16.840.1.113883.6.96". Preferred Synonym: SNOMED CT
specialization	HL7 V3 Core Glossary	Association between two classes (designated superclass and subclass), in which the subclass is derived from the superclass. Note: The subclass inherits all properties from the superclass, including attributes, relationships, and states, but also adds new ones to extend the capabilities of the superclass.
specification	HL7 V3 Core Glossary	Detailed description of the required characteristics of a product.
state	HL7 V3 Core Glossary	Named condition of a classinstance (object) that can be tested by examination of the instance's attributes and associations. Note: For more information refer to the Dynamic

Term	Source	Definition
		Behavior section of the Version 3 Guide.
state machine	HL7 V3 Core Glossary	Description of the life cycle for instances of a class, defined by a state transition model.
state transition model	HL7 V3 Core Glossary	Graphical representation of the life cycle of a class. Note: The model depicts all of the relevant states of a class, and the valid transitions from state to state.
T		
TermInfo	TermInfo	Project started by NASA and adopted by HL7 Vocabulary Committee to define how to use SNOMED CT in HL7 RIM record transfers.
terminology	TermInfo	The language, words and terms used in a specific domain.
terminology server	Adapted from Wikipedia	Software providing a range of terminology-related services through an applications programming interface to its client applications.
term	TermInfo	Linguistic representation of a concept Note: Terms are members of a terminology; a defined or limited vocabulary of terms or concepts, for example: ICD, SNOMED CT, LOINC.
trigger event	HL7 V3 Core Glossary	Event which, when recorded or recognized by an application, indicates the need for an information flow to one or more other applications, resulting in one or more interactions.
U		
uncertaintyCode	TermInfo	Attribute indicating whether the Act statement as a whole, with its subordinate components has been asserted to be uncertain in any way.
V		
value set	Core Principles and Properties of V3 Models	Uniquely identifiable set of values consisting of concept representations drawn from one or more code systems, which can be resolved at a given point in time to an exact set of codes. Note: A Value Set represents a uniquely identifiable set of valid concept identifiers, where any concept identifier in a coded element can be tested to determine whether it is a member of the Value Set at a specific point in time. A concept identifier in a Value Set may be a single concept code or a post-coordinated expression of a combination of codes.
vocabulary	TermInfo	Collection of terms governed by a set of rules, used in information systems.
vocabulary binding (in the context of HL7 version 3)	Core Principles	Mechanism of identifying specific codes to be used to express the semantics of coded model elements in HL7 information models or coded data type properties. Note: Vocabulary Binding may bind the coded element or data type property to a single fixed value code, or may bind it to a Value Set Assertion. The

Term	Source	Definition
		description of the collection that is bound, along with parameters controlling other aspects of the use and stability of the collection, are called a Value Set Assertion. Vocabulary binding is required to specify Vocabulary Conformance. (See Section 5.3 in HL7 Core Principles and Properties of V3 Models)
vocabulary declaration	Core Principles and Properties of V3 Models	The Vocabulary Declaration identifies the constraints on the coded expressions that can be used as well as the vocabulary conformance expectations for implementers of the data element. Note: A Vocabulary Declaration is the semantic constraint for a coded model element or data type property.
W		
W3C	HL7 V3 Core Glossary	The World Wide Web Consortium, an international industry consortium
X		
XML	HL7 V3 Core Glossary	See Extensible Markup Language.