Overlap of RIM and SNOWMED CT Semantics

2.2.1 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 HL7 and guidelines to manage areas of overlap or apparent conflict.

2.2.2 General Options for Dealing with Potential Overlaps

2.2.2.1 Classification of options

Table 1 considers the interplay between three rules (required, optional and prohibited) that might in theory be applied to use of HL7 and SNOMED CT 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 these cases there is no difficulty because there is no actual overlap. The remaining cases create either a requirement to manage duplication or some 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.

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| Table 1: General approach to options for dealing with overlaps | | | | |
|  | **SR - Require SCT representation** | **SO – Optional allow SCT representation (if present)** | **SO – Optional allow SCT representation (if absent)** | **SN - Prohibit SCT representation** |
| **HR - Require HL7 representation** | Generate, validate and combine dual representations | Generate HL7 representation (if not present) Validate and combine dual representations | No overlap | Manage unconditional prohibition of SCT concept/expression |
| **HO - Optional HL7 representation (if present)** | Generate SCT representation (if not present) Validate and combine dual representations | Validate and combine dual representations | No overlap | Manage conditional prohibition of SCT concept/expression |
| **HO - Optional HL7 representation (if absent)** | No overlap | No overlap | No information | No information |
| **HN - Prohibit HL7 representation** | Manage unconditional prohibition of HL7 attribute/structure | Manage conditional prohibition of HL7 attribute/structure | No information | No information |

2.2.2.2 Prohibiting overlapping HL7 representations

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

Some unconditional prohibitions may be sufficiently generalized to be modeled by excluding a particular attribute or association from the relevant model. If a prohibition is conditional, other constraints (e.g. a restricted vocabulary domain) or implementation guidelines (e.g. textual supporting material) may be more necessary.

Any prohibition needs to be expressed in a way that does not undermine support for any required communications of non-SNOMED CT encoded data. In most cases, the universal HL7v3 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.

2.2.2.3 Prohibiting overlapping SNOMED CT representations

Any prohibition of a SNOMED representation that overlaps with a 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 SNOMED CT representation is fraught with difficulties. If a particular SNOMED CT concept is recorded in a sending system, prohibiting the inclusion of that expression in an HL7 message prevents faithful communication of original structured clinical information. A syntactic transformation of a SNOMED CT expression (e.g. use of the Concept Descriptor data type) presents no significant issues. It has been argued that disaggregating a SNOMED expression across multiple HL7 attributes (e.g. assigning SNOMED "procedure site" to the HL7 Procedure.bodySiteCode) is a similar kind of transformation. However, this presumes a one-to-one match between the semantics of the SNOMED CT concept and the specific HL7 attribute. SNOMED CT distinguishes more finely grained attributes than those present in the RIM (e.g. "procedure site – direct" and "procedure sit – indirect"). As the SNOMED CT Concept Model continues to evolves more of these distinct attributes are likely to be added increasing the information loss from transforms of this type.

A general prohibition of use of valid SNOMED CT concepts or expressions 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 SNOMED CT representations. These guidelines will be most effective if implemented in the design of data entry and storage rather than restricted by communication specifications.

2.2.2.4 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 are needed, unless the communicating applications also use the required representation for storage.

2.2.2.5 Validating and combining dual representations

If SNOMED CT and HL7 representations of a similar characteristic may co-exist, there is a requirement for rules that determine how duplicate, refined and different meanings are validated or combined. Table 2 outlines the general types of rules that might be applied. The rules in this table form a framework for discussion of specific recommendations in the next section.

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| Table 2: Outline of possible management of dual representations | | | | |
| **Possible types of rule** | **Examples** | **Duplicate\*** | **Refinement\*** | **Different\*** |
| Apply meaning ignoring repetition | HL7="negative" & SCT="negative" ->Combined = "negative" | X |  |  |
| Apply more specific meaning (ignoring more general meaning) | HL7=" intention" & SCT="request" -> Combined = "request" |  | X |  |
| Apply the HL7 representation as a combinatorial revision of the meaning of the SNOMED CT representation | HL7="negative" & SCT="negative" -> Combined = "double negative" (i.e. affirmation). | HL7="intention" & SCT="request"-> Combined = "intention to request" | X |  |
| Same as above | HL7="intention" & SCT="request" > Combined = "intention to request" |  | X |  |
| Same as above | HL7="intention" & SCT="goal" -> Combined = "intention to set a goal" |  |  | X |
| HL7="hand" & SCT="foot" -> Combined = "applies to both hand and foot" |  |  |  |  |
| Apply both meanings independently | HL7="hand" & SCT="foot" -> Combined = "applies to both hand and foot" |  |  | X |
| Apply HL7 and ignore SCT | HL7="hand" & SCT="foot" -> Combined = "applies to hand" |  |  | X |
| Apply SCT and ignore HL7 | HL7="hand"& SCT="foot" -> Combined = "applies to foot" |  |  | X |
| Treat as error | HL7="hand" & SCT="foot" -> Combined = ERROR |  |  |  |
| Note \*: Duplicate – the meanings of both the HL7 and SNOMED CT representations are identical Refinement – the meaning of one of the two representations is a subtype of the meaning of the other representation Different – the meaning of the two representations differs and neither meaning is a subtype of the other. | | | | |

2.2.3 Attributes

2.2.3.1 Act.classCode

Definition: A code specifying the major type of Act that this Act-instance represents.

The HL7 classCode is as structural code with values drawn from an internal HL7 vocabulary. The differences between different classes and the way in which they overlap with the terminology model are discussed in Section 0.

2.2.3.2 Act.moodCode

**Background**

The HL7 Act.moodCode 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".

The HL7 moodCode is as structural code with values drawn from an internal HL7 vocabulary. The values in this vocabulary partial overlap SNOMED CT representations of "finding context" and "procedure context".

SNOMED CT "finding context" can be applied to any "finding" concept. It indicates whether a finding present, absent, unknown, possible, probable, a goal, a risk, an expectation, etc. SNOMED CT specifies that "finding context" can also be applied to an "observable" concept or a "measurement procedure concept" if these concepts are associated with a value. Thus SNOMED CT finding context is applicable to a concept in an HL7 Observation class if that class is in "event" or "goal" mood but not to an Observation in "intention" mood.

SNOMED CT procedure context can be applied to any SNOMED CT "procedure" concept. It indicates whether a procedure has been done, is in progress, is planned to be done, has not been done, should not be done, etc. In SNOMED CT a "procedure" is something that is or can be done and the scope of this definition is substantially broader that that defined for the HL7 procedure class. Thus SNOMED CT "procedure context" can apply to a concept in almost any HL7 Act class specialization. This includes Observations in any "intention" mood because in this mood the "observable" or "measurement procedure" has no associated value.

**Constraints and recommendations**

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

SNOMED CT finding context and 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.

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 rules exist for applying defaults bases on the moodCode and other relevant attributes in the HL7 Act class.

Tables 3 to 5 show recommended default mappings and validation constraints relating to use of SNOMED finding and procedure context with specific moodCodes.

In these tables:

* Default Context
  + Indicates the default values for any context attributes that are omitted in a SNOMED CT concept (or expression) when used in the code attribute of an act in a given mood.
* Context Constraints
  + Specifies constraints on the permitted explicit SNOMED CT contexts that may be expressed in the code attribute of an HL7 act in given mood. The symbol "<=" means any subtype of the value shown.

:Applies to Observations in Event, Goal, Risk or Expectation mood. SNOMED CT concept must be one of the following <=404684003|clinical finding| <= 416698001|link assertion| <=413350009|context-dependent finding| <=122869004|measurement (procedure)| [with Observation.value present] <=363787002|observable entity| [with Observation.value present] Note that if uncertaintyCode or negationInd attributes are used these may alter the mappings shown here. See notes on these attributes.

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| Table 3: HL7 Act.moodCode mapping to/from SNOMED CT finding context | | | |
| **moodCode** | **Name** | **Default Context** | **Context Constraints** |
| EVN | Event | Subject relationship context = 410604004|subject of record| Temporal context = 410512000|current or specified| Finding context  =410515003|known present| | Subject relationship context <=125676002|person| Temporal context <= 410511007|current or past| Finding context  <= 36692007|known| or <= 261665006|unknown| |
| GOL | Goal | Subject relationship context = 410604004|subject of record| Temporal context = 410512000|current or specified| Finding context  = 410518001|goal| | Subject relationship context <=125676002|person| Temporal context <= 410511007|current or past| FindingContext  <= 410518001|goal| |
| RSK | Risk (new not yet in ballot pack) | Subject relationship context = 410604004|subject of record| Temporal context = 410512000|current or specified| Finding context  = 410519009|at risk| | Subject relationship context <=125676002|person| Temporal context <= 410511007|current or past| FindingContext  <= 410519009|at risk| |
| EXPEC | Expectation  (new not yet in ballot pack) | Subject relationship context = 410604004|subject of record| Temporal context = 410512000|current or specified| Finding context = 410517006|expectation| | Subject relationship context <=125676002|person| Temporal context <= 410511007|current or past| FindingContext  <= 410517006|expectation| |

Applies to Acts other than Observations in Event or Goal mood. SNOMED CT concept must be one of the following: <= 71388002|procedure| [Except measurement (procedure) with values] <= 129125009|context-dependent procedure| <= 363787002|observable entity| [without Observation.value present] Note that if uncertaintyCode or negationInd attributes are used these may alter the mappings shown here. It is also possible that in some cases statusCode may affect the default mapping. See notes on these attributes.

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| Table 4: HL7 Act.moodCode mapping to/from SNOMED CT procedure context | | | |
| **moodCode** | **Name** | **Default Context** | **Context Constraints** |
| EVN | Event | Subject relationship context = 410604004|subject of record| Temporal context = 410512000|current or specified| Procedure context  = 385658003|done| | Subject relationship context <=125676002|person| Temporal context <= 410511007|current or past| Procedure context  <=410523001|post-starting action status| |
| INT | Intent | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  = 410522006|pre-starting action status| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <= 410522006|pre-starting action status| |
| RQO | Request | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  = 385644000|requested| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <= 385644000|requested| |
| PRP | Proposal | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  = 385643006|to be done| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <= 385649005|being organized| or <= 385643006|to be done| |
| PRMS | Promise | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  =385645004|accepted| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <=385649005|being organized| |
| ARQ | Appointment request | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  = 385644000|requested| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <= 385644000|requested| |
| APT | Appointment | Subject relationship context = 410604004|subject of record| Temporal context = 15240007|current| Procedure context  = 60304008|scheduled| | Subject relationship context <=125676002|person| Temporal context <= 410512000|current or specified| Procedure context  <= 60304008|scheduled| or <= 385649005|being organized| |

|  |  |
| --- | --- |
| Table 5: MoodCodes that have no direct relationship to finding or procedure context | |
| **moodCode** | **Name** |
| DEF | Definition |
| SLOT | Resource slot |
| EVN.CRT | Event criterion |
| OPT | Option |

2.2.3.3 Act.negationInd

**Issue**

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”. The semantics of this attribute overlaps with or interacts with SNOMED “finding context” values indicating absence and with SNOMED CT “procedure context” values indicating “not done”. Potential interpretations of this overlap include:

a) Double negative

* If negation indicatorInd is true and the SNOMED CT "finding context" is “absent” the double negative would be “not absent” (i.e. “present”).
* If negation indicatorInd is true and the SNOMED CT "procedure context" is “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.

b) 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 SNOMED CT “absent” or “not done” context value must be present.
* May imply that when a SNOMED CT “absent” or “not done” context is present the negationInd should be true. However, in this case the specific values that imply HL7 negation as opposed to incompleteness are debatable.

c) 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 intepretation. This mapping table would need to specify combinations of moodCode and negationInd. The SNOMED CT context for negationInd=true plus moodCode=“RQO” would be “not requested” whereas with moodCode=“EVN” the context would be “not done”.

**General guidance on use of negationInd**

1. In a constrained information model or message design
   * The negationInd attribute should be omitted from any class in which SNOMED CT is the only permitted code system for the Act.code attribute.
   * The negationInd attribute must be optional, if it is included in any class in which SNOMED CT is one of the permitted code systems for the Act.code attribute.
2. In message instances:
3. The negationInd attribute should be omitted from any class in which SNOMED CT is the code system applied to the Act.code attribute.
4. If (despite this guidance) the negationInd attribute is present in a class in which the Act.code attribute is represented using SNOMED CT it shall be interpreted as an error.

2.2.3.4 Act.priorityCode

The priorityCode attribute should be used where it has specific functional role in relation to the purpose of a communication. For example, to prioritize a requested action. The SNOMED CT priority indicates the nature of the procedure rather than the priority of a request. For example "emergency caesarean section" does not imply an urgent request for an "elective caesarean section".

2.2.3.5 Act.statusCode

The Act.statusCode attribute tracks the state of the Act with values that include "new", "active", "held", "completed", "cancelled", "suspended", "nullified" and "obsolete". Some of these values appear to relate to procedure context values. However, the nature of this relationship depends on the moodCode and on the way the HL7 dynamic model is applied to a particular communication. The HL7 statusCode is connected with the process life cycle of an Act in its particular mood and thus a simple relationship to procedure context only seems to apply in "EVN" mood.

For example, statusCode="completed" when combined with the moodCode="ENV" implies the procedure context "done". However, statusCode="completed" when combined with moodCode="RQO" implies that the act of request has been "completed".

In other moods, and in cases where finding context applies (see Table 3) the role of the status seems mostly concerned with validity of the statement (e.g. statusCode="nullified" or "obsolete").

2.2.3.6 Act.uncertaintyCode

**Issue**

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). The semantics of this attribute overlaps with or interacts with SNOMED “finding context” values indicating "possibly present", "probably present", "probably absent" and "possibly absent". Potential interpretations of this overlap include:

General guidance on use of uncertaintyCode

1. In a constrained information model or message design:
   * The uncertaintyCode attribute should be omitted from any class in which SNOMED CT is the only permitted code system for the Act.code attribute.
   * The uncertaintyCode attribute must be optional, if it is included in any class in which SNOMED CT is one of the permitted code systems for the Act.code attribute.
2. In message instances:
   * The uncertaintyCode attribute should be omitted from any class in which SNOMED CT is the code system applied to the Act.code attribute.
   * If (despite this guidance) the uncertaintyCode attribute is present in a class in which the Act.code attribute is represented using SNOMED CT it shall be interpreted as an error.

**Notes**

There is a possible gap in the set of SNOMED CT procedure context values. While there is a value "action status unknown" there is no value "possible done" or "probably done" to cover situations in the author wishes to indicate 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". This issue has been raised with the SNOMED Concept Model Working Group.

The HL7 UVP data type was considered as this as 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.

2.2.3.7 Procedure.targetSiteCode and Observation.targetSiteCode

**Issue**

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."

SNOMED CT finding concepts have a defining attribute that specifies the "finding site" and similarly SNOMED CT procedure concepts have a defining attribute that specifies the "procedure site". The post-coordination rules that apply to SNOMED CT (as supported by the HL7 Concept Description (CD) data type) permit refinement of these defining attributes.

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

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.

Based on these notes, there is no requirement to include either targetSiteCode where the Act.code is sufficiently well specified. When using SNOMED CT post-coordination to refine the site, the Act.code is at least as well specified as can be achieved using an additional field.

SNOMED CT offers some more specific site related attributes (e.g. "procedure site – direct", "procedure site – indirect", "direct morphology" and indirect morphology"). These are of value in procedures involving multiple structures such as removal of a cyst from the cyst from an organ).

To avoid redundancy and potential confusion, it is preferable to avoid using the targetSiteCode attribute in association with a SNOMED CT procedure or finding concept.

**General guidance on use of targetSiteCode**

1. In a constrained information model or message design:
   * The targetSiteCode attribute should be omitted from any class in which SNOMED CT is the only permitted code system for the Act.code attribute.
   * The targetSiteCode attribute must be optional, if it is included in any class in which SNOMED CT is one of the permitted code systems for the Act.code attribute.
2. In message instances:
   * The targetSiteCode attribute should be omitted from any class in which SNOMED CT is the code system applied to the Act.code attribute.
   * If (despite this guidance) the targetSiteCode attribute is present in a class in which the Act.code attribute is represented using SNOMED CT:
     + the targetSiteCode must also be represented using SNOMED CT;
     + the targetSiteCode must be the same as or a subtype of a "finding site" or "procedure site" specified for the concept represented by Act.code;
     + the targetSiteCode should be regarded as equivalent to a SNOMED CT refinement applied to the appropriate "finding site" or "procedure site".

2.2.3.8 Procedure.approachSiteCode

**Issue**

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

SNOMED CT procedure concepts have a defining attribute that specifies the "approach" and has a comparable meaning. The post-coordination rules that apply to SNOMED CT (as supported by the HL7 Concept Description (CD) data type) permit refinement of these defining attributes.

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

The notes following the Procedure.approachSiteCode definition suggest that code systems might be fixed by the nature of the procedures.

Some 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.

As with targetSiteCode there should not be a requirement to include either approachSiteCode where the Act.code is sufficiently well specified to describe the approach. Using its post-coordination rules SNOMED CT meets this objective.

The vocabulary domain specified for approachSiteCode is ActSite which is the same as the vocabulary domain for targetSiteCode. In contrast SNOMED CT uses a specific value hierarchy for approaches which is differs from that one used for "finding site" or "procedure site". The distinction is that an approach is a routes 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 name or routes, several routes may pass through a single site and a route may pass through several sites. Therefore attempt to combine SNOMED and HL7 representations of approach may result in confusion rather than clarity.

To avoid redundancy and potential confusion, it is preferable to avoid using the approachSiteCode attribute in association with a SNOMED CT procedure concept.

**General guidance on use of approachSiteCode**

1. In a constrained information model or message design:
   * The approachSiteCode attribute should be omitted from any class in which SNOMED CT is the only permitted code system for the Act.code attribute.
   * The approachSiteCode attribute must be optional, if it is included in any class in which SNOMED CT is one of the permitted code systems for the Act.code attribute.
2. In message instances:
   * The approachSiteCode attribute must be omitted from any class in which SNOMED CT is the code system applied to the Act.code attribute.
     + If the approachSiteCode attribute is present in a class in which the Act.code attribute is represented using SNOMED CT, the approachSiteCode should be treated as adding more specific information about the site at which the approach entered the body.. Value set should be SNOMED body structure.

2.2.3.9 Procedure.methodCode and Observation.methodCode

**Issue**

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.”

SNOMED CT procedure concepts have a defining attribute that specifies the "method" and this includes measurement procedures that may be applied to the code attribute of some observations. Similarly SNOMED CT finding concepts have a defining "finding method" attribute. In practice, many HL7 observations that have a specifiable method are represented in SNOMED CT as measurement procedure to which values can be applied and in these cases appropriate "method" values can be added as refinements or qualifiers.

The post-coordination rules that apply to SNOMED CT (as supported by the HL7 Concept Description (CD) data type) permit refinement of defining attributes and addition of appropriate qualifiers. The result of this is that there are two overlapping approaches to the representation of methods associated with observations and procedures.

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 post-coordinate method with the procedure.

… a code system might be designed such that it specifies a set of available methods for each defined Procedure concept. As with targetSiteCode there should not be a requirement to include either methodCode where the Act.code is sufficiently well specified to describe the method. Using its post-coordination rules SNOMED CT meets this objective.

The notes on methodCode use "open" and "laparoscopic" procedures as an example of differences in method. SNOMED CT makes this same differentiation using another defining attribute "access". This highlights the potential for confusion from using both SNOMED and HL7 representations of method.

To avoid redundancy and potential confusion, it is preferable to avoid using the methodCode attribute in association with a SNOMED CT procedure concept.

**General guidance on use of methodCode**

1. In a constrained information model or message design:
   * The methodCode attribute should be omitted from any class in which SNOMED CT is the only permitted code system for the Act.code attribute.
   * The methodCode attribute must be optional, if it is included in any class in which SNOMED CT is one of the permitted code systems for the Act.code attribute.
2. In message instances:
   * The methodCode attribute must be omitted from any class in which SNOMED CT is the code system applied to the Act.code attribute.
   * If the methodCode attribute is present in a class in which the Act.code attribute is represented using SNOMED CT, this should be regarded as an error.
     + The on methodCode is stronger than that given in respect of targetSiteCode. This is because of the apparent mismatch between the models of methodCode and the SNOMED CT method and access attributes.

2.2.3.10 Dates and times

The HL7 effectiveTime attribute influences the interpretation of Temporal Context. This is taken into account by the Temporal Context value "current or past-specified" which recognizes that the information model may specify a specific date and time.

There is no need for special handling of this overlap as rules applicable to HL7 message specifications determine the nature of the clinical relevant time applicable to an Act. This is the specified time that applies if the value of the "temporal context" attribute is "current or past-specified" (or "specified time" or one "current or past specified").

If the effectiveTime is stated then this is the specified time of the observation or procedure. If the Temporal Context is "current or past-specified", the effectiveTime is the specified time of the observation or procedure. If no effectiveTime is present then participation times for the performer or author can be regarded as the specified time. Similar dates and time inherited from a containing organizer or document may also apply in the absence of specific dates and times that apply to the individual act.

2.2.3.11 Codes and Values

**Values and SNOMED CT findings**

The HL7 "value" attribute can also be used to apply coded values to a more general concept in the "code" attribute. This dichotomy arose within HL7 from the laboratory background where it is relatively easy to specify that the "code" represents the question and the "value" the answer to the question. The split was further reinforced by the use of LOINC code for the "code". However, for more general clinical statements expressed using SNOMED CT, the split leads to a potential diversity of representations since the division of semantics between the "code" and "value" attributes is arbitrary. This split substantially complicates the reproducible computation of context dependent semantics:

**For example, the concept "Past History of Asthma" could be represented in various ways:**

* code="Clinical record" value="Past History of Asthma"
* code="Past History" value="Asthma"
* code="Past History of respiratory disease" value="Asthma"
* code="Past History of Asthma" value="True"

In the SNOMED CT Concept Model a "clinical finding" can be represented either using a "clinical finding" concept or using an "observable entity" or "measurement procedure" concept with an associated value.

**Guidance on use of the Observation.code and Observation.value**

If a SNOMED CT "observable entity" or "measurement procedure" concept is accompanied by a value, the concept (or post-coordinated expression) should be in the "code" attribute of an Observation and the "value" attribute should contain the associated value. The value may be represented by numeric data or by nominal scales (which may be in some cases be coded using SNOMED CT).

If a SNOMED CT "clinical finding" concept is used to represent an Observation then one of the following options should be applied:

1. The SNOMED expression should be in the "code" attribute of an Observation and the "value" should not be used.
   * This is the simplest option as it is consistent with the use of SNOMED CT within HL7 Acts. However, some people argue it is not aligned with the intended use of the code in HL7 Observations.
2. ...or The SNOMED expression should be in the "value" attribute of an Observation and the "code" should contain a pre-specified fixed value meaning "determination of clinical finding" which is used in all cases.
   * This adds a code that is in effect meaningless. However, it is completely transformable to/from option 1 with no loss of information. This approach may therefore be adopted if concerns about intended use of the HL7 Observation code are considered significant.
3. ...or (theoretically) Both the code and value should contain SNOMED expressions with a specified relationship between the value-sets applicable to each in order to reproducibly represent different meanings.
   * This approach is not currently supported because as yet no generalized reproducible rules for such combinations have been specified. However, if a clear use-case is made will clear mapping rules to avoid semantic loss in conversion to and from option 1 and 2 then this could be considered as a third option.

The use of combinations of SNOMED CT findings in the value of an observation where the code attribute contains a code from another code system is not recommended. This is because any such representation introduces an additional degree of freedom (the other code system) allowing additional ways to represent similar or identical clinical meanings without the ability to computationally resolve equivalences and subsumption.

2.2.3.12 Representation of units

**Units applied to PQ data type values**

The HL7 observation class supports the inclusion of a "value" attribute that provides a vale for the concept represented by the "code" attribute.

The "value" attribute has a clear use in association with a SNOMED CT concept that represents an observable or finding that can be given a more specific numeric value. In this case there is an issue about the coded representation of units. HL7 specifies the use of the UCUM codes to express units and SNOMED CT also has concepts that represent most of the widely used units.

**Recommendation**

Coding of units using the UCUM representation is recommended as it simplifies interoperability using HL7 messages and in particular the PQ (Physical Quantity) data type. Mapping between SNOMED CT codes and UCUM unit representations is believed to be feasible and will reduce the need for inconsistent representations.

2.2.4 ActRelationships

In the HL7 clinical statement model the ActRelationship class is used to be 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".

This functionality overlaps with and extends the potential use of SNOMED CT attributes. In general SNOMED CT attributes are most appropriate for expressing a logically indivisible concept that contains multiple facets. 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 seems to have equal merit.

Over 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.

**Recommendation**

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 guiding principles should be applied:

* It is reasonable to use terminological expressions to represent:
  + A combination of findings is a part of a single recognisable condition
    - E.g. "Headache preceded by visual disturbance",
  + A disorder is specialised by a specific cause
    - E.g. "Asthma due to allergy to grass pollen".
  + The nature of a disorder is determined by another condition
    - E.g. "Diabetic retinopathy"
  + A temporal or causative relationship between a two concepts is recognised as a specific symptom or diagnostic criterion.
    - E.g. "Post-viral fatigue", "Shortness of breath after moderate exercise".
  + A single recognised procedure involves two or more distinct but related actions:
    - E.g. "Reduction and fixation of a fracture", "Hysterectomy with bilateral oophorectormy"
* It is preferable to use information model constructs to represent:
  + 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.

**Issue**

Even when these guidelines are followed, there will be grey areas and the key to success in this area is to devise rules that can be used to compute equivalence. While this is theoretically possible, one practical obstacle is that 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.

2.2.5 Participations

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. It can also be used to associate a related person in much the same way as Subject Relationship Context.

Current approach in the UK

The HL7 subject participation should be used if

* A named or identified individual is the subject of a clinical statement; or
* The implementation guidance for a message requires the subject to be specified explicitly.

In other cases, the Subject Relationship Context should be used.

**Issues**

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 SNOMED CT "subject relationship context value" hierarchy.

Ambiguity may be introduced if the information is coded using a concept with explicit Subject Relationship Context and also has an association to a specific subject. For example, if the concept "family history of diabetes" 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).

2.2.6 Context Conduction

2.2.6.1 Structures which propagate context in HL7 models

HL7 Version 3 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.

It is not clear how this applies to contextual information that is represented in concepts within an Act.