



SNOMED CT Style Guide: Situations with Explicit Context

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Purpose of this document

This document describes editorial policies regarding the intended meanings of the hierarchy under situation with explicit context in SNOMED CT. It is intended to describe the editorial policies and previous decisions about meanings that are reflected in the current logic-based models. To the extent that there are inconsistencies between the stated policy in this document and the implemented logic-based definitions, these inconsistencies should be resolved through a consensus-based process. For short-term decision-making, the policies in this document should be adhered to. However, this is a working document, subject to change and revision. The intention is to support communication among those who are actively creating definitions, as well as those who are advising, consulting or providing feedback in a variety of capacities.

Status

The document is a working draft. Its contents have in part been derived from several historical sources, including the SNOMED RT Users Guide, Clinical Terms Version 3 documentation, minutes of the SNOMED CT Content Working Group, Concept Model Working Group, Kaiser CMT modelers meetings, and SNOMED Editorial Board / SNOMED International Standards Board meetings.



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1 The meaning of "situation with explicit context"

SNOMED CT contains some *Concepts* that include "context" information and some that are regarded as "context-free". The precise meaning of "context" in this discussion is rather elusive and it is almost certainly colored by perspective¹. The following definition seeks to encapsulate the essential aspect of "context" in relation to SNOMED CT.

A concept includes "context" information if the name of the concept explicitly represents information that might otherwise be represented by another less "context-rich" concept in a particular structural placement within a record. Context elements typically alter the meaning in such a way that the resulting concept is no longer a subtype of the original concept.²

Context can be expressed in at least three ways:

- 1) Pre-coordinated codes can represent context embedded within the meaning of an existing concept name.
- 2) Post-coordinated constructs can embed context by combining codes to make a composed expression.
- 3) Context can be represented by a code or expression placed in an electronic record field which has predefined meaning.

Examples:

- "FH: Myocardial infarction" (SCTID: 266897007) might be put directly in a blank field in a record. A family history of myocardial infarction is not a subtype of myocardial infarction, so "FH" represents context.
- "Hip replacement planned" might be represented as "Hip replacement" (SCTID: 397956004) within a section of record on "Planned actions". A planned hip replacement is not a kind of hip replacement, so "planned" represents context.
- "Intracranial injury, without skull fracture" (SCTID: 54355006) might be placed directly in the record, or might instead be represented as "Intracranial injury" (SCTID: 127296001) in a record that also contains a negative finding "**Absent**+"Fracture of skull". The record might make the relationship between these two entries explicit or it might depend on their temporal relationship. A disorder "without skull fracture" is not a subtype of skull fracture, so "without" represents context.
- "Normal blood pressure" might be placed in a field labelled as "Goal". A goal of a normal blood pressure is not a kind of normal blood pressure, so "goal" represents context.

These circumstances determine that SNOMED CT requires a terminological model to consistently cope with both pre- and post-coordinated contextual constructs. Designers and implementers of systems need guidance to identify which fields within their record structure will critically affect the meaning of the placed code. They require open strategies of dealing with such instances to preserve

¹ From one perspective there is arguably no such thing as a "context-free" concept since the freedom from context is itself a frame of context around a concept!

² The potential for a *Concept* to undergo axis modification as a result of surrounding contextual information in patient records has been explored in various initiatives. These include the standards work of CEN, HL7 and a variety of initiatives in UK, Europe, Australia and the US. Different labels have been given to similar aspects of this issue "major modifiers" (ENV13606) or "primary status terms" (NHS Clinical Terms Project), "modifiers" (GEHR, GP2GP).



meaning if retrieved or transferred and allow detection of equivalence to constructs derived from alternative approaches.

1.1 Variable meanings according to context of use

The implicit contextual assumptions noted above are by no means universal. The same *Concepts* can be used in many different ways with quite different intended meanings. The following list identifies some of the different contexts of use.

- A **disorder** *Concept* might also be recorded to represent:
 - A possible diagnosis or part of a differential diagnosis
 - A diagnosis applied to a family member or some other contact person
 - A diagnosis explicitly excluded
 - A diagnosis now known to be incorrect but which was the basis for a particular course of treatment.
 - An absent feature of a related disorder.
 - A diagnosis that the patient believes or fears they have.
- A **procedure** *Concept* might also be recorded to represent:
 - A requested, recommended or planned procedure
 - A procedure for which consent has been given or withheld
 - A procedure that is contra-indicated
 - A procedure that has been cancelled or postponed
 - A procedure for which follow up is now being arranged.
 - A procedure which is the cause of a complication.
- A **symptom** *Concept* might also record
 - Confirmed absence of that symptom
 - A symptom deduced and reported by a third party as a witness of a clinical event.
 - Inability or failure to obtain information about a symptom
 - A symptom which the patient is advised to respond to in a particular manner.
- A **finding** *Concept* might also record
 - Absence of that finding
 - Inability or failure to check for that finding
 - A finding which if present is to trigger a particular change in clinical management.
 - A finding stated which is the goal or target of a treatment.
- A **therapeutic product** *Concept* might also record
 - An allergy or other contraindication to that product.
 - An assertion that that product caused a particular side effect.
 - Various types of therapeutic activity involving the product
 - Advice to a patient to take a treatment (i.e. over the counter products)
 - Clinical authorization of one or more prescriptions
 - The issuing of prescription for a course of treatment
 - Supply (dispensing) of a specified quantity of that product
 - Administration of a single dose of a product
 - Changes treatment dosage
 - Discontinuation of a course of treatment with that product



- A recommendation from a specialist to treat a patient with a particular product if certain circumstances apply.

1.2 Critical Record Instances

When a user places a concept from SNOMED CT within an electronic record the action of chronicling transforms the concept from being a theoretical representation of a clinical notion to an actual instance within the owner (patient) of the record. For example if the concept Meningococcal meningitis is entered into a patient's electronic record it usually indicates that the patient has had an instance of this disease. Similarly the entry of Cholecystectomy would imply that the patient has undergone this procedure.

Each record system is structured differently and might use different field definitions that could subtly affect the exact meaning of the entered concept. The placement of a concept into a record field can be identified to affect the meaning in one of two ways:

- **Affect the quality of the meaning but not the instance**

The placement of Angina in fields labelled "Current problems", "Past medical history" or "History of" all indicate that an instance of angina has occurred in the patient but assign different timescales and possible significance to the event (and the concept assumes a status compatible with its default value status).

- **Critically affect the meaning and the instance**

In this case the placement in the record field critically affects meaning. For example the placement of Parkinsons disease within a field designed for recording "Family history" or Coronary angioplasty within a field allocated for "Planned procedure" does not indicate an instance of the concept in the owner (patient) of the record. The adopted status is not compatible with the default value status. In these circumstances the designer of the system will need to identify the appropriate context values from an authoritative list to be linked to concepts placed within the fields to substitute their default values.

The context model uses attributes which reference values which critically affect the meaning of a concept when applied (and change the axis of class to which they relate).

1.3 Systematic (weak) defaults

Procedures and clinical findings have systematic un-stated defaults. These are "weak" defaults in that they are the default value if the concept appears in a record with no explicit context. For example, if knee pain appears in a record with no context, we assume it is "present" in the patient, and current. If gastrectomy appears with no context, we assume it is "done" to the patient, at the current time. Observable entities behave like clinical findings when given a numerical value or qualitative interpretation but they behave like procedures otherwise.



1.4 Axis modifiers

An “axis modifier” is an attribute-value pair that does not result in a subtype of the modified concept when it is understood as carrying the systematic default meaning. For example, “family history” applied to diabetes makes SubjectRelationshipContext = “family member”, and this is not a subtype of SubjectRelationshipContext = subject of record (the default) for a disease (e.g. diabetes), so “family history” is an axis modifier (see 6.3) and critically affects the meaning within the patient record. In contrast, specifying the precise family member with a given family history does not axis modify a representation of the combined concept “family history diabetes” e.g. ischemic heart disease SubjectRelationshipContext = father

2 Context Terminological Model

2.1 Context Attributes and Applicable Values

Table 2.1: Approved Context attributes summary table

Defining Attribute	Permissible Values (Concepts listed and their descendents)
SUBJECT RELATIONSHIP CONTEXT	<i>Person</i> 125676002
TEMPORAL CONTEXT	<i>Temporal context value</i> 410510008
FINDING CONTEXT	<i>Finding context value</i> 410514004
PROCEDURE CONTEXT	<i>Context values for actions</i> 288532009
ASSOCIATED FINDING	<i>Clinical finding</i> 404684003
ASSOCIATED PROCEDURE	<i>Procedure</i> 71388002

2.1.1 SubjectRelationshipContext

This attribute is used to specify the relationship between the subject of the record and the subject of the *Clinical finding* or *Procedure* being recorded. In the example below, the subject of the record is the patient and the subject who smokes is the patient’s father.

Permissible values include the following concept and its descendants:

Person (person) 125676002

Example:

Father smokes (situation)

ASSOCIATED FINDING *Smoker (finding)*

SUBJECT RELATIONSHIP CONTEXT *Father (person)*

Default value: subject of record



If the concepts are being used in a patient record, then subject of record is the patient. If they are being used in a record about some other subject, then it is whatever subject the record is about (e.g. a population, a herd, an epidemic, etc).

Value hierarchy for the SubjectRelationshipContext attribute:

subject of record	
family member	
	mother
	brother
	father
	etc.
fetus of	
donor to	
contact of	
group including	
	population including
	herd including
	family including

Distinction from “performer of method”: The application of SubjectRelationshipContext to a procedure-related “situation” concept is used to denote the type of *recipient* of the procedure. In contrast, the model for procedures has a “performer of method” attribute that is used to indicate the class of *performer*. There are some concepts where the type of *performer* needs to be modeled e.g. the “performer” of self-catheterization is also the subject of record; in the case of chest physiotherapy performed at home by the mother of a child with cystic fibrosis the performer is the mother and the recipient (SubjectRelationshipContext) is the subject of record.

2.1.2 TemporalContext

This attribute captures the time of occurrence of the situation, indicating whether the procedure or finding that it represents is actual and therefore occurred in the present, in the past, or at a specified time; or that it is planned or expected, that is, temporally located in the future. The most general value is simply “current-or-past (actual)”, meaning that the concept was actual (not planned or expected), but not specifying anything further about its time. “Specified” means that there is a date-time stamp associated with the code in the record, that gives a date and/or time, as a point and/or interval, that applies to the concept..

Permissible values include the following concept and its descendants:

Temporal context value (qualifier value) 410510008

Example:

History of - hematuria (situation)

ASSOCIATED FINDING *Blood in urine (finding)*

TEMPORAL CONTEXT *In the past (qualifier value)*



Default value: current-or-specified

Value hierarchy for the TemporalContext attribute:

current-or-past (actual)
 current-or-specified
 current
 current-specified
 current-unspecified
 specified time-actual
 current-specified
 past-specified
 all-times-past
past (past medical history concepts will use this value)
 past-unspecified (should not be combined with “FindingContext=known-absent”)
 past-specified
 all-times-past (may be combined with “FindingContext=known-absent”)

Examples:

Diabetes [TemporalContext] current-or-specified

Pneumonia [TemporalContext] past

IHD [TemporalContext] current-unspecified

Hepatitis B infection [TemporalContext] past

Sodium level = 132 mmol/l [interpretation] normal - [TemporalContext] current

2.1.3 FindingContext

The FINDINGCONTEXT attribute is used to represent a situation in which a *Clinical finding* is known or unknown, and if known, whether it is present, absent, or uncertain (possible); and also to express the meaning that the finding is not actual but instead an anticipated or possible future finding.

Permissible values include the following concept and its descendants:

Finding context value (qualifier value) 410514004

Example:

No cough (situation)

ASSOCIATED FINDING *Cough (finding)*

FINDING CONTEXT *Known absent (qualifier value)*

Expressions like “rule out”, and “should be excluded” express a recommended action that should be taken as a result of uncertainty; the meaning relating to recommended action should be expressed using another attribute. (to be determined). FindingContext should be used only to represent the level of uncertainty.



Default value: KnownPresent

Value hierarchy for the FindingContext attribute:

known

- known but not recorded
- known but not reported
- known-present (Asserted) {known or believed to be present}
 - definitely-present [100] synonym: definite
 - probably-present [50-100) synonym: probable
- known-possible (0-100) synonyms: possibly present, possibly absent, uncertain
 - probably-present [50-100) synonym: probable
 - probably NOT present = Probably absent (0-50]
- known-absent (Negated)
 - definitely NOT present = Definitely absent [0]
 - probably NOT present = Probably absent (0-50]

unknown

- unknown – no attempt to ascertain
- unknown – unsuccessful attempt to ascertain
 - asked but unknown

expectation

likely outcome

prognosis

goal

at-risk

The bracketed numbers in the value list (above) should be interpreted as belief certainty ranges (open and closed intervals), not probabilities. The attribute FindingContext combines the notions of certainty and presence. Pilot testing of the alternative approach of splitting these aspects allowed the identification of a potential inconsistency in post-coordination. For example, Presence: Present and Certainty: Possible was equally likely to be captured as Presence: Absent and Certainty: Possible. As a result of this pilot testing, it was decided that the use of a single combined scale offers a more robust solution.

2.1.4 ProcedureContext

This attribute indicates the degree of completion, or status, of a *Procedure*, as well as its various possible future states prior to its being initiated or completed.

Permissible values include the following concept and its descendants:

Context values for actions (qualifier value) 288532009



Example:

Operative procedure planned (situation)

ASSOCIATED PROCEDURE *Surgical procedure (procedure)*

PROCEDURE CONTEXT *Planned (qualifier value)*

Default value: done

The value hierarchy for the ProcedureContext attribute is located under “context values for actions”:

action status unknown
contraindicated
indicated
not done
 did not attend
not indicated
post-starting action status
 ended
 discontinued
 done
 attended
 performed
 stopped before completion
 abandoned
 suspended
 in progress
 not to be stopped
 started
 suspended
 to be stopped
pre-starting action status
 being organized
 accepted
 planned
 requested
 scheduled
 approved and scheduled
 not to be done
 cancelled
 not needed
 not offered
 not wanted
 rejected by performer
 rejected by recipient



organized
schedule rejected
to be done
under consideration
 needed
 not wanted yet
 not yet offered
 offered
 wanted
was not started
 cancelled
 considered and not done

Examples:

Appendectomy [ProcedureContext] done
HbA1c [ProcedureContext] needed
Coronary angiogram [ProcedureContext] to be done
Lumbar puncture [ProcedureContext] abandoned

We believe in clinical records, an event-mood SNOMED-type-procedure does not normally ever have a “new” status.

Negation is not applied to procedures. For example the notion of the absence of completion of an appendectomy is captured using the values was not completed etc.

Additional synonyms may be needed for Not done yet; Not done currently [proposal].

2.1.5 Associated finding

This attribute links concepts in the *Situation with explicit context* hierarchy to their related *Clinical finding*. It specifies the *Clinical finding* concept whose context is being modified.

Permissible values include the following concept and its descendants:

Clinical finding (finding) 404684003

Example:

Family history of stroke (situation)

ASSOCIATED FINDING *Cerebrovascular accident (disorder)*

NB The attribute AssociatedFinding must not reference concepts that already have pre-coordinated context themselves.

For example, the following definition uses "family history of thyroid disease" incorrectly:



History of thyroid disease in father:
SubjectRelationshipContext = father
AssociatedFinding = family history of thyroid disease.

The following is the correct definition:

History of thyroid disease in father:
SubjectRelationshipContext = father
AssociatedFinding = thyroid disease.

2.1.6 Associated procedure

This attribute links concepts in the *Situation with explicit context* hierarchy to concepts in the *Procedure* hierarchy for which there is additional specified context.

Permissible values include the following concept and its descendants:

Procedure (procedure) 71388002

Example:

Operative procedure planned (situation)

ASSOCIATED PROCEDURE *Surgical procedure (procedure)*

ProcedureContext represents, and adds additional detail (E.g. restarted), in a less event-driven model, the information ordinarily represented in the HL7 ActMood and ActStatus. For example, ProcedureContext does not have equivalents to the HL7 ActStatus values of “nullified” and “obsolete”. When a procedure has a result value it behaves like a finding. For example, serum sodium measurement with value “above normal” behaves like the finding hypernatremia.

2.2 Contextualized Observable Entities

Observable entities, when they have not been given a value, behave like procedures with respect to the concept model for context. Observable entities, when they have been given a value, behave like Clinical Findings with respect to the concept model for context.

3 Rules for Concept Definition and Modeling

Once a concept has “context-shifted” and become context-dependent, it is nonsense to use that concept in an expression that once again shifts context. In other words, when one context attribute is given an axis modifying value, it forces the other context attributes to be fixed. For example, the model for Family history of diabetes is:



```
ISA situation-with-explicit-context
{
    [SubjectRelationshipContext] family member
    [AssociatedFinding] diabetes
    [TemporalContext] current-or-past
    [FindingContext] known-present
}
```

Even though the “family” part of the concept results in an explicit axis shift of the [SubjectRelationshipContext] only, we impose a rule that requires [TemporalContext] and [FindingContext] to be given their default values, rather than being left unspecified.

The concept that would be expressed as No family history of diabetes allows negation of Family history of diabetes by switching the value of [FindingContext]:

```
ISA Situation-with-explicit-context
{
    [SubjectRelationshipContext] Family member
    [AssociatedFinding] diabetes
    [TemporalContext] current-or-past
    [FindingContext] known-absent
}
```

What is NOT a legitimate expression is:

```
{
    [FindingContext] known-absent
    [AssociatedFinding] Family history of diabetes
}
```

3.1 Role grouping

In context-dependent expressions, [AssociatedFinding] or [AssociatedProcedure] are role grouped with the other context attributes that have a value. Also, [AssociatedFinding] and [AssociatedProcedure] must not themselves reference concepts that have embedded context.

The following examples illustrate the rule that, once a concept has context-shifted and become context-dependent, it is nonsense to use that concept in an expression that once again shifts context. The exception is negation of a concept with [FindingContext] KnownPresent, in which case the value of [FindingContext] becomes KnownAbsent. It may be that the context attributes that are not fixed/locked by the context shift could be distributed as relationships in the relationships table that have a distinct CharacteristicType, or perhaps a distinct Refinability.

For example:



Family history of asthma

is-a situation-with-explicit-context

- [AssociatedFinding] asthma
- [SubjectRelContext] family member
- [FindingContext] known-present
- [TemporalContext] current-specified

No family history of asthma

is-a situation-with-explicit-context

- [AssociatedFinding] asthma
- [SubjectRelContext] family member
- [FindingContext] known-absent
- [TemporalContext] current-specified

No asthma

is-a situation-with-explicit-context

- [AssociatedFinding] asthma
- [SubjectRelContext] subject-of-record
- [FindingContext] known-absent
- [TemporalContext] current-specified

3.2 Mandatory context statements

When asserting a concept within a record it should be mandatory to apply the three context attributes and an applicable value in order to guarantee accurate meaning if that concept (plus context) is subsequently transferred to another record environment.

4 Known issues and problems

4.1 Other possible attributes – currently considered non-context (subtype qualifiers)

The following attributes are under consideration by the context working group as possible additional mechanisms of expressivity. These attributes are not likely to be axis modifiers and therefore have not been included in the current list of attributes for the situation hierarchy.

Source of information



Change
Expectation
Ease of action
Successfulness
Link attributes (including temporal, causal and reason functionality)
ReasonForFindingContext

4.2 ReasonForFindingContext

Description: This attribute is used to indicate the reason a FindingContext takes the value that it does. It was initially organized to represent reasons for a Finding to be unknown, but the reasons apply to other FindingContext values as well. This is not a closed list, since it would be possible to use “X not done”, for example, where X could be any procedure, as the reason a finding is unknown.

Valid class: This attribute can be applied to all ClinicalFindings, and to procedures and observable entities that have a value.

Default value: Information was provided by source-of-information

Information was provided by source-of-information (default for FindingContext = Known)

Default value accepted (charting by exception, for example)

Actively asserted by source-of-information

patient confidentiality

subject is adopted

subject is comatose

procedure not done

no stereo-opsis

etc.

4.3 Change

Description: Describes the change of a state

Valid class: This attribute would be applied to any clinical finding, including post-coordinated observable entity findings

Default value: -

Authoritative value list:

Changes

Is worsening

Has worsened

Is improving

Has improved

Maintained

Stable

No change



4.4 Expectation

Description: Describes how states are expected to change

Valid class: This attribute would be applied to any clinical finding, including post-coordinated observable entity findings

Default value: -

Authoritative value list:

Expectation

Expected to resolve

Expected to improve

Expected to remain unchanged

Expected to worsen

4.5 Ease of action

Description: Describes how easily an action was performed

Valid class: This attribute would be applied to any procedure

Default value: -

Authoritative value list:

Ease of actions

Easily

Straightforward

With difficulty

4.6 Successfulness

Description: Describes the success of an action that was performed

Valid class: This attribute would be applied to any procedure-situation

Default value: -

Authoritative value list:

Successfulnesses

Successful

Partially Successful

Unsuccessful

4.7 Link attributes

In general, a number of different linkages can be made between different statements in a clinical record. The consensus has been that most, if not all, of these “link attribute” relationships should be represented by separate assertions in the clinical record using the information model of the application, rather than attempting to represent them using the terminology. Nevertheless, the list of proposed link attributes is given here for completeness and to spur additional discussion.

Description: Describes non-hierarchical links associations between two clinical findings or a clinical finding and a procedure



Valid class: Described for each attribute link

Link attributes:

- Co-incident procedure
- Reason for known status
- Outcome of action
- Related finding
 - Temporally related
 - Temporally follows
 - During
 - Precedes
- Causally related
 - Is caused by

Link attribute	Link	Example
Co-incident procedure	Procedure -> Procedure	Hysterectomy with incidental appendectomy: Hysterectomy [Co-incident procedure] Appendectomy
Reason for Known Status	Clinical finding -> any concept	Microaneurysm count unknown, no stereo-opsis: Microanerysm count unknown [Reason for known status] Stereo-opsis not available
Outcome of action	Clinical finding -> Procedure	Ileostomy created: Ileostomy present [Outcome of action] Creation of ileostomy
Related finding	Clinical finding -> Clinical finding	Diabetes with diabetic retinopathy: Diabetes [Related finding] Diabetic retinopathy
Temporally follows	Clinical finding -> Clinical finding	Sciatica following scoliosis: Sciatica [Temporarily follows] Scoliosis
Is caused by	Clinical finding -> Clinical finding	Left hemiparesis due to right CVA: Left hemiparesis [Is caused by] Right CVA



Annex A Background

A.1 SNOMED CT Glossary of Context

A.1.1 Introduction

One problem with any discussion of context is that we use words and phrases without necessarily sharing an understanding of what they mean. To address this problem, the Context Group agreed to use the working definitions in the following sub-section.

A.1.2 Context

When we talk about “context” we are describing the effects of embedding a concept in a clinical situation

- A concept is embedded in a clinical situation when it is used in a clinical record.
 - For example:

In the abstract the concept "myocardial infarction (disorder)" (ConceptId=22298006) could be used to refer to the idea of this disorder in a general way as a pure notion. This concept has the potential to be used in many ways (e.g. as a literature reference, as one of a set of possible complications of smoking, as a link to a protocol for care of a patient admitted with chest pain, as a contraindication for a particular medication, as a disorder suffered by a particular patient, as a possible diagnosis justifying a particular investigation, as a diagnosis excluded by an investigation, as a condition suffered by a close relative of a particular patient, etc).

When the concept "myocardial infarction (disorder)" is used in a clinical record it takes on a specific contextualized meaning. This specific meaning might be an assertion by a particular author that on a given date patient was diagnosed as having had a "myocardial infarction".
- Embedding a concept in a clinical situation may elaborate the semantic interpretation of a concept in one of several ways. Four distinct types of elaboration are recognized for the purpose of this discussion.
 - Subtype qualification
 - Axis modification
 - Affirmation or Negation
 - Combination

A.1.3 Elaboration

We use "elaboration" to refer to any addition to or change of the meaning of a concept that may be brought about when it is embedded in a clinical situation.



A.1.4 Subtype qualification³

We use "subtype qualification" to refer to an elaboration of a concept that results in a concept that is a subtype of the original unelaborated focus concept.

- Subtype qualification refines or increases the precision of meaning of a concept.

For example:

- The concept "Fracture of femur" can be elaborated by an indication of whether the fracture is open, whether it is the left or right femur that is fractured. A patient who has an open fracture of the neck of the left femur" has a type of "fracture of the femur". Therefore, refining the morphology, site and adding laterality all act as subtype qualifications.
- The concept "Asthma attack" can be elaborated by an indication of severity. A patient who has had a "severe asthma attack" has had a type of "asthma attack". Therefore, severity acts as a subtype qualification.
- The concept "Hysterectomy" may be elaborated by specifying a priority and a particular approach. A patient who has had a "routine vaginal hysterectomy" still has had a type of "hysterectomy". Therefore both priority and approach is a subtype qualification.

A.1.5 Axis modification⁴

We use "axis modification" to refer to an elaboration of a concept that results in a concept that is **not** a subtype of the original unelaborated concept.

- Axis modification places the elaborated concept in a different axis of the logical semantic hierarchy.

For example:

- The concept "Myocardial infarction" can be elaborated by including it in part of a clinical record specifying "family history". A record of a "family history of myocardial infarction" does not imply that the individual patient has had any type of "myocardial infarction". Therefore, "family history" acts as an axis modification.
- The concept "Total hip replacement" can be elaborated by stating that this procedure is planned to be carried out at some future date. A record of "planned total hip replacement" does not imply that the patient has actually had a "total hip replacement".

A.1.6 Affirmation or Negation

A concept may be stated "in the negative² in a clinical situation e.g. meningism not present. This creates potential for a concept to be used represent two meanings one of which is the inverse of the other.

³ *Subtype qualification* has also been referred to in other works as "qualifiers" (ENV136060, GEHR, CTV3) and "secondary status terms" (NHS Context of Care). The adjective "subtype" expresses more clearly the distinctive property of a qualifier. This is helpful because "modify" and "qualify" are treated by many dictionaries and some ISO authorities as synonymous.

⁴ *Axis modification* has also been referred to in other works as "major modifiers" (ENV136060), "modifiers" (GEHR), "primary status terms" (NHS Context of Care). The Context Group view was that none of these labels were sufficiently specific to convey the intended meaning unambiguously. The adjective "axis" expresses the sense of a fundamental shift in meaning in a way that should be familiar to those who used earlier "multi-axial" releases of SNOMED.



- According to perspective affirmation and negation may simplistically be viewed as inversion of the meaning of an unelaborated concept representing a clinical finding.
- However, the effects of negation on interpretation are profound and distinct from other elaborations and must be considered separately.

Negation like axis modification results in a concept that is not a subtype of the unelaborated concept.

However, negation is a special case in that:

- It explicitly rules out the unelaborated concept.
 - The statement "family history of myocardial infarction" does **not** imply that "patient has had a myocardial infarction" is untrue. But "no headache" (if true) implies the statement "patient has headache" is untrue.
- Furthermore, the implications of a negative statement propagate in the opposite direction from those of a positive statement.
 - If "headache" is a subtype of "pain" then "patient has headache" implies the patient has some pain. However, "patient has no headache" does not imply the patient has no pain.
 - Conversely "patient has headache" does not imply the patient has an occipital headache but "patient has no headache" implies the patient does not have an occipital headache.

A.1.7 Uncertainty

A concept may be stated to be possible in a clinical situation. Statements that explicitly indicate uncertainty can be considered in two possible ways:

- As points on the arc between affirmation and negation.
- As a kind of axis modification.

A.1.8 Combination

Two or more concepts may be embedded in a clinical situation in a way that links them together.

- Linkages may include:
 - Simple combination of concepts;
 - Combination of a concept that is stated as present and another stated to be absent;
 - An explicit typed relationship between concepts.



Annex B Models for disease status, remission, severity, episodicity, phase, stage, and control

Many codes in SNOMED refer to the status of a disease. At present (Aug 2007) there is a “hold” on the pre-coordination of new content involving severity and remission status, and there is no way to model content involving staging or degree of control.

There has been some debate about whether these are subtypes of the disease, or whether they are subtypes of a situation in which the disease is present. This brief appendix summarizes the latter point of view and presents a possible solution that would allow resuming the pre-coordination of codes that mention disease status.

Kinds of disease status information:

- In remission, in relapse, in partial/complete remission -> disease phase (attribute)
- In control, not in control, in poor control, in good control -> NEW attribute needed.
- Disease phase (acute phase, convalescent phase, etc) -> disease phase (attribute)
- Severity (mild, moderate, severe) -> severity (attribute)
- Stage -> staging of disease (attribute)
- Episodicity -> episodicity (attribute)

Likewise “finding method” and “finding informer” relate to the knowing (epistemological concerns).

Consider the way to model “disease X, in remission” as a situation:

Options include

Situation, {associated finding = disease X, finding-context = in remission}

Situation, {associated finding = patient in remission (finding), finding-context = known present},
{associated finding = disease X, finding-context = known present}

Situation, {associated finding = disease X,
finding-context = known present,
disease-phase = in remission}

All options will make “disease X present, in remission” a subtype of “disease X present”.

Problems:

Option 1 problems:

“In remission” would not be a valid value for finding-context, and it would be a bad idea to combine the present/absent/uncertain dimension with the disease phase dimension.

Option 2 problems:



Currently “in remission” is a value for “severity”, while we have a separate finding called “patient in remission”. This is in addition to the unused qualifier values in the disease phase hierarchy. Perpetuating three different ways to specify that a patient is in remission seems like the wrong thing to do.

Option 3 appears to be the best, and suggests that at the same time we should consider movement of “severity”, “episodicity”, “finding informer”, and “finding method” from being finding attributes to being situation attributes, activate “staging of disease”, and add a new attribute “disease control” with a value set.

Using negation to test the model

Consider applying the context model with “finding-context=absent” to the associated finding “severe bronchitis”. This could be intended to mean two things. It may simply mean that all we know is that the subject does not have severe bronchitis. But why would anyone want to record that? More likely, what would be intended is that bronchitis is present but its severity is not severe. It is unlikely that one would use this phrase if no bronchitis were present at all.

This example re-emphasizes that severity is not a subtyping of the disease, it is a subtyping of the situation in which the disease is present.

Why do this?

1. Keep negation safe
2. Improve QA of disease hierarchy
3. Improve semantics by increasing consistency of attribute interactions