	<b>LRA Technical Model Developer's Manual Part 1: Model Design</b>			
	<b>Programme</b>	Informatics Data Standards	<b>Document Record ID Key</b>	
	<b>Sub-Prog / Project</b>	Logical Record Architecture for Health and Social Care	NPFIT-FNT-TO-DPM-1001.04	
	<b>Prog. Director</b>	D. Perry	Status	DRAFT
	<b>Owner</b>	S. Bentley	Version	0.5
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## **Logical Record Architecture for Health and Social Care: LRA Technical Model Developer's Manual Part 1: Model Design**

**Amendment History:**

Version	Date	Amendment History
0.1	2009-09-18	First draft for comment
0.2	2009-10-16	Second draft comprising complete restructuring, revision of common patterns and extensive revision of the associated SNOMED CT expressions
0.3	2009-11-04	Substantive changes to document organisation.
0.3.1	2009-11-04	<ul style="list-style-type: none"> <li>Document – removed outer parentheses from example instance expressions.</li> <li>Section 5.1 – emphasised point about consulting authoritative SNOMED CT guidance; replaced all occurrences of expression ( ( &lt; 91723000   anatomical structure   ) OR ( &lt; 280115004   acquired body structure   ) ) with = ( &lt; 442083009   anatomical or acquired body structure   ) ; and minor textual changes.</li> </ul>
0.4	2009-11-23	Minor revision to take account of comments received
0.4.1	2009-12-08	<ul style="list-style-type: none"> <li>Section 2.2 Approach to Technical Model Analysis and Design: completed.</li> <li>Section 4.1: updated ELEMENT class descriptions to align with Care Components Specification.</li> <li>Section 4.1.6: added default expression constraint.</li> <li>Section 4.2.4 Representing Prospects: completed</li> <li>Section 4.2.5 Representing Period of Validity: added</li> </ul>
0.5	2009-12-17	Up-versioned to 0.5 for external release.

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**Related Documents:**

These documents will provide additional information.

Ref no	Doc Reference Number / Source	Title	Version
1.	LRA Release	Logical Record Architecture for Health and Social Care: Artefacts Overview	
2.	External document	Health informatics — Electronic health record communication — Part 1: Reference model, EN 13606-1:2007	
3.	External document	HL7 Version 3 Standard: Data Types - Abstract Specification, Release 2, Normative Ballot 2 - May 2008	
4.	External document	Health informatics – Harmonized data types for information interchange, INTERNATIONAL DRAFT STANDARD ISO 21090, 2007-09-24	
5.	LRA Release	LRA Terminology Binding Technical Specification	
6.	LRA Release	LRA Technical Model Infrastructure Specification Part1:Care Components	
7.	LRA Release	LRA Technical Model Infrastructure Specification Part 2: Participations	
8.	Internal document	SNOMED CT Bindings for Common Recording Patterns	
9.	External document	Terminology Binding Requirements and Principles	
10.	External document	SNOMED CT User Guide	
11.	External document	SNOMED CT Technical Reference Guide	
12.	External document	SNOMED CT Technical Implementation Guide	
13.	External document	SNOMED CT Transforming	

		Expressions to Normal Forms	
14.	External document	SNOMED CT Abstract Logical Models and Representational Forms	
15.	External document	HL7 Version 3 Standard: Clinical Document Architecture, Release 2, Normative Ballot 2 - May 2008	
16.	External document	The <i>openEHR</i> Reference Model - EHR Information Model, Release 1.0.2	
17.	External document	A Clinicians Guide to Record Standards - Part 2: Standards for the structure and content of medical records and communications when patients are admitted to hospital. Academy of Royal Medical Colleges and NHS.	
18.	NPFIT-NCR-DES-0135.07	NHS Care Record Elements	
19.	NPFIT-EP-DB-0007.01	Representation in Electronic Patient Records of Allergic Reactions and Intolerance of Pharmaceutical Products	

### Glossary of Terms:

List any new terms created in this document. Mail the NPO Quality Manager to have these included in the master glossary above [1].

Term	Acronym	Definition

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# **1 About this document**

## **1.1 Purpose**

The purpose of this document which forms Part 1 of a two-part LRA Technical Model Developer's Manual, is to provide Technical Modellers with guidance on how to design Technical Model artefacts for LRA content releases. Part 2 of the Developer's Manual provides detailed instructions on how to construct Technical Model artefacts for LRA content releases.

## **1.2 Audience**

This document is intended for use by LRA Technical Modellers and Terminology Specialists.

## **1.3 Content**

This document comprises the following sections:

- Introduction
- Terminology Expression Constraint Design
- Technical Analysis of Care Record Information Requirements
- Technical Model Refinement
- Technical Model Patterns



## 2 Introduction

The purpose of LRA Technical Models is to provide logical record structure definitions for supporting 'meaning-based retrieval', i.e. retrieval involving selection and processing of parts of a record (or a set of records) based on the meaning of the contained information and the links between them.

This document provides guidance on the analysis and design of the two types of Technical Model defined by the LRA infrastructure specifications.

### 2.1 LRA Technical Model Types

#### 2.1.1 Domain Models

Domain Models are domain-level realisations of Reference Models. Although they can be created manually it is less error prone and more efficient to instantiate Domain Model elements from predefined templates, preferably based on design or common recording patterns.

The goal of domain modelling is to design logical record structure definitions that are optimised for reuse to represent information consistently across different domains of use, which may include different specialties, care settings, recording practices or intended uses. Intended uses may include:

- Reusing previously entered information in current record-keeping (e.g. to 'pre-populate' a past history or family history)
- Sharing care records upon patient / service user transfer.
- Integrating data from multiple sources (e.g. to assemble a list of current medications).
- Sharing records within multidisciplinary teams.
- Reporting care records data in central returns for secondary uses (population analyses)
- Local secondary uses of care records data, e.g. audit, accreditation, etc.

Domain Models are therefore in general underspecified in that they require further refinement to satisfy the specific information requirements of particular domains of use.

#### 2.1.2 Constrained Domain Models

Constrained Domain Models are Domain Models that have been constrained to satisfy correctly and completely the stated requirements within a particular domain-of-use. Constrained Domain Models are defined in a separate LRA Interface package as constrained specialisations of existing Domain Models. Any instance of a Constrained Domain Model element is therefore an indirect instance of a more general Domain Model class (i.e. superclass).

## 2.2 Approach to Technical Model Analysis and Design

The guidelines for analysing and representing LRA Technical Model requirements detailed in this manual aim to provide an approach that is able to:

- satisfy requirements for models that are applicable to many domains of use (e.g. diagnosis, blood pressure observation, medication administration, etc) and for models that are specific to a particular domain of use (e.g. haemodialysis substitution fluid control);
- analyse and represent requirements independently of their input form, e.g. data model, spreadsheet, narrative, etc;
- analyse and represent requirements independently of the level of detail to which they are specified;
- analyse and represent requirements independently of their source, e.g. logical analysis model, database schema, data collection form, etc;
- integrate LRA knowledge modelling (business analysis), EN13606-based technical model design and SNOMED CT terminology constraint design;
- deliver reproducible results in the form of:
  - Domain Models that are optimised for reuse and that support meaning based retrieval using SNOMED CT; and
  - Constrained Domain Models that satisfy correctly and completely the stated requirements and which are optimised for meaning based retrieval using SNOMED CT.

Specification of the guidelines is problem focused in that the analysis and representation of each of the component parts of a requirement are described rather than focusing on the underlying components (such as SNOMED-CT and the Reference Models) on which the analysis and design are based. The guidelines also emphasise the use of design patterns and common patterns of clinical recording (section 6) as generally reusable solutions to commonly encountered types of requirement.

The guidelines are divided into the following sections which together form the LRA Technical Model Analysis and Design approach.

1. Technical Analysis of Care Record Information Requirements (section 4) to select and elaborate the most appropriate design choice for representing the requirement.
2. Technical Model Refinement (section 5) involving refinement the focus concept (of the BOUND\_DATA\_ELEMENT meaning attribute) and domain model attribute redefinition.
3. The use of Technical Model Patterns (section 6) to address commonly encountered types of requirement.

## **2.3 Known Issues**

### **2.3.1 Diagnoses and Problems and Issues**

In this document, a direct relationship to the Care Record Elements documentation and usage is made. The use of the concepts 'Diagnoses' and 'Problems and Issues' are particular examples. It is envisaged that in a future revision new more general SNOMED CT concepts might be available to be used, with appropriate relationship to existing CRE-based clinical data being achieved through an appropriate equivalence mechanism.

### **2.3.2 Links and additional attributes**

Additional SNOMED CT attributes are needed to support links in LRA. This guidance includes one such link: 'has record role'.

This attribute is not currently published in the SNOMED CT International Release. In future, one or more additional attributes may be added to the UK Extension or to the International Release to more appropriately address this requirement.

Any such illegally formed SNOMED CT Concept IDs are preceded by the # symbol to avoid errors when validating against SNOMED CT content. The intention is they should be replaced by valid concept identifiers when these are available.

### **2.3.3 Sections Requiring Elaboration**

The following sections of the document require elaboration:

- All sections involving Medication

## 3 Terminology Expression Constraint Design

A key aspect of the design of LRA Technical Models is the specification of constraints to restrict the semantics and if necessary form of the SNOMED CT instance expressions allowed for the terminology bound model attributes. The following sections summarise the key features and dependencies of terminology expression constraint design.

### 3.1 Use of Post-Coordination

The main aspects of SNOMED CT post-coordination used to support the encoding of care record information with LRA Technical Models are:

- Context wrapper
  - The SNOMED CT context model explicitly represents the situation/context that applies to individual model elements.
- Clinical focus concept
  - A clinical finding, observable, event, or procedure.
- Refinements
  - Values applied to SNOMED CT concept model attributes that add detail and specificity to the focus concept.
  - Refinement includes adding specificity to an existing defining relationship and applying values to other attributes sanctioned by the concept model.

Refinement also includes 'indirect' use of attributes such as the application of laterality to a finding or procedure. In this case, the laterality logically applies to the finding or procedure site.

The result from all this is a set of constraints which can be expressed in a form which can then be engineered to ensure LRA design and implementation conformant to what has been chosen. The complete set of constraints is defined in the appendix to this document.

### 3.2 Expression Constraints

The LRA currently supports the specification and application of the *semantic* and *literal* expression constraint types defined by the terminology binding mechanism developed for use within the LRA. [5] These constraint types restrict the semantics and form respectively of the instance expressions allowable for terminology bound model attributes.

All attributes capable of being terminology bound of all model elements inherit default expression constraints from the underlying Reference Model. These constraints are listed for the appropriate classes described section 4.1. Any constraint subsequently defined to restrict further the permissible semantics and / or form in which they are expressed must conform to the default constraint(s). If no other constraint is specified for a model attribute then the default constraint will apply. Whilst ensuring that any

instance expression applied to the attribute is conformant with the Reference Model, the default constraint is unlikely to be sufficiently restrictive to satisfy any real world requirement.

This document provides guidance on specifying constraints for a range of care record requirements. All constraints are expressed using the Extended SNOMED CT Compositional Grammar (see section 7.1) although their underlying serialisation uses an XML grammar.

### **3.2.1 Expression Constraint Types**

#### **3.2.1.1 Semantic Expression Constraints**

*Semantic expression constraints* restrict what it is permissible for an instance expression to state. A semantic expression constraint asserts that only terminology expressions that have a meaning that falls within a domain specified by the constraint can be used as values for the model attribute to which the constraint applies. A semantic expression constraint is therefore concerned only with ensuring that the meaning conveyed instance conforms to the set of permissible meaning defined by the constraint and whether that meaning is conveyed as a pre-coordinated or post-coordinated expression.

#### **3.2.1.2 Literal Expression Constraints**

*Literal expression constraints* restrict the literal form of an instance expression. A literal expression constraint specifies the permitted or required post-coordination of any instance expression used as a value for the model attribute to which the constraint applies. Literal expression constraints and semantic expression constraints are interrelated in that

- a semantic expression constraint may indirectly constrain the literal expression (e.g. if the prohibiting a specific semantic facet prohibits that aspect of post-coordination); and
- A literal expression constraint imposes some constraints on semantics (e.g. if post-coordination is not permitted, then meanings for which no pre-coordinated concept exists in SNOMED CT cannot be represented).

Literal expression constraints can be used to limit variation in forms of expression and thus simplify implementation. They can also be used to require explicit post-coordination where issues with the consistency and completeness of SNOMED CT content are expected to interfere with a mission critical processing requirement.

### **3.2.2 Open Versus Closed Constraints**

The following convention is used in this document which goes beyond the current SNOMED CT standard. The constraints on an expression or a refinement within an expression constraint may be 'open' or 'closed'. An 'open' constraint implies that an attribute that is permitted by the SNOMED CT Concept Model but not mentioned in the constraint is permitted to have the range of value specified by the Concept Model. A 'closed' constraint implies that only those attributes explicitly mentioned may be present.

### 3.2.3 Constraint Inheritance

A requirement to test multiple inherited constraints is likely to increase the burden of validation. Expression constraints can be represented in one of three different normal forms.

- Short-form - includes only refinements to inherited constraints.
  - This is the most efficient in terms of authoring and management of constraints.
- Intermediate-form – includes and refines inherited constraints but does not restate rules that are part of the concept model.
  - This is efficient for both processing and distribution because its only dependencies are on a single common set of concept model constraints.
- Long-form - includes all applicable rules, including those inherited from the concept model.
  - This is potentially more efficient for processing since it does not have any dependencies.

The Terminology Binding Technical Specification [5] supports short, intermediate and long forms, using a single XML schema which includes an attribute specifying the form. The constraints used in this document use the intermediate normal form except where otherwise stated.

## 3.3 Instance Expressions

This guidance also includes many examples of instance expressions, using the SNOMED CT Compositional Grammar without extensions.

### 3.3.1 Close To User Form

It is often possible to express any given SNOMED CT instance expression in a number of equivalent forms. The close-to-user form is a more natural form for clinicians to use and is more readily understood by human readers and is used for many of the instance examples in this document. Although semantic expression constraints are intended to constrain the meaning rather than the form of the expression, if too restrictive they may unintentionally prevent the use of some close to user forms. For example, the organising concept 4908009 | history of (situation) | and its subtypes has a temporal context value of 410513005 | in the past |. A semantic constraint requiring that instances in which the time of the event was unknown have a temporal context value of 410587003 | in the past | (or a subtype thereof) would prohibit the use of any concepts from this hierarchy. This is taken into account in the constraints specified in section 4.2.3.

### 3.3.2 Default Context

When a SNOMED CT expression appears in a record without any explicitly stated context, then the concept is considered to have a “soft-default” context.

For a clinical finding this means that the finding has actually occurred, is occurring to the subject of record and it is occurring currently or at a stated past time.

The soft default context for a procedure means that the procedure was completed, was performed on the subject of record (the patient), and was done in the present time or at a stated past time.

Regardless of any forms used by instance expressions, semantic expression constraints always make explicit any permitted contexts.

For further information the reader should refer to Section 2.5.2 of *SNOMED CT Abstract Logical Model and Representational Forms* and to *SNOMED CT Transforming Expressions to Normal Forms*.

### **3.4 Extended SNOMED CT Compositional Grammar**

The grammar used in this guidance is an extension beyond the current standard and is unlikely to be formally accepted for SNOMED CT for several years. The annex to this guidance document defines the extended grammar and should be used as an authoritative reference for the use of the grammar in LRA.

### **3.5 Reliance on Unpublished Work**

The terminology guidance in this document makes use of the work of the IHTSDO Machine Readable Concept Model Project Group. This work is not yet generally published or approved and therefore no specific further reference to this area can be made in this guidance document. Although not part of the Standard SNOMED CT release, a machine and human readable representation of the International SNOMED CT concept model can be retrieved from the IHTSDO collaborative space following the link <https://TheCAP.seework.com/P25441247> . Please note this is a secure site - a user account should be requested first from [support@ihtsdo.org](mailto:support@ihtsdo.org), including "Machine and Human Readable Concept Model" in the requested project areas (see <http://www.ihtsdo.org/about-ihtsdo/collaborative-space/> for details).

## 4 Technical Analysis of Care Record Information Requirements

This section provides guidance on the analysing care record information requirements, according to the following sequence, in order to select and elaborate the most appropriate design choice for representing the requirement.

- Identifying the type of care record information.
- Understanding and representing temporality requirements.
- Understanding and representing subject of information requirements.
- Understanding and representing uncertainty and negation requirements.

### 4.1 Care Record Information Types

This section describes the main types of care record information which are represented for the purpose of meaning-based information retrieval using terminologically bound and semantically linkable specialisations of the EN 13606-1:2007 ELEMENT class. The ELEMENT hierarchy is in turn based on some of the main axes of the SNOMED CT hierarchy.

#### 4.1.1 Finding Observations

Clinical findings are observations about a patient made by a Care Professional, patient, or a carer. They include information provided by the patient or carer, clinical observations, clinical findings on examination, investigation results and administrative findings. They also include findings resulting from formal assessment procedures such as whether a patient has been assessed under a section of the Mental Health Act.

The LRA Care Components model makes a distinction between 'finding observations' and 'property observations'. This distinction is based on whether the finding is recorded as a nominal statement (e.g. 'family history of asthma', 'pain in chest or exertion', 'tender in right iliac fossa') or as a combination of a name and a separate value (e.g. 'systolic blood pressure' = 130 mmHg, 'pulse rate' 65/min).

This distinction affects the information model requirement, as it determines whether there is a need for a separate value field. Thus nominal statements are represented using a FINDING\_OBSERVATION\_ELEMENT (which does not have a value); while name-value pairs are represented using a PROPERTY\_OBSERVATION\_ELEMENT (which has a value). This distinction also affects the terminology binding, since the set of SNOMED CT expressions that can be sensibly used to represent a nominal clinical finding is disjoint from the set of expressions that can be used to label values. Many values named by SNOMED CT expressions are best represented using quantities or ordinal scales. However, in other cases, the value itself may also be coded using a SNOMED CT expression and there may be a close resemblance between these information model supported name-value pairs and the attributes in a post-coordinated expression.

This section is concerned only with the use of the FINDING\_OBSERVATION\_ELEMENT. Therefore, it covers any finding which is often



described in the record by a phrase or nominal statement in which there is no discrete boundary between the representation of the act of observation and the result observed. A separate section discusses the use of the `PROPERTY_OBSERVATION_ELEMENT`.

SNOMED CT contains a hierarchy of 'clinical findings' that fit neatly into this section. However, there are also concepts in the 'event' hierarchy which may be recorded as nominal statements and thus fit within the same logical class (e.g. 'death', 'exposure to toxin'). In the broader scope of the LRA the use of the `FINDING_OBSERVATION_ELEMENT` may also extend to observations that would not usually be thought of as 'clinical' in nature.

Some types of observation clearly fall into one of these categories. However, there are many borderline cases where there are two different ways that the same information may be recorded. From a general semantic perspective, the distinction is far from clear-cut and there are many cases where comparison of data recorded in these different ways may be highly relevant. This requires an extension to the current SNOMED CT concept model, to more completely capture these equivalences. However, in many cases the comparison depends on knowledge (e.g. normal values determine whether a given systolic blood pressure is equivalent to the nominal statement 'systolic blood pressure normal'). This is outside the scope of the current work but is an area where developments may eventually support more sophisticated querying, provided the methods of recording are consistent.

#### **4.1.1.1 Class Description**

The `FINDING_OBSERVATION_ELEMENT` class is an `OBSERVATION_ELEMENT` whose coded meaning is constrained to represent a SNOMED CT finding or event situation. The focus concept of the finding situation must be subsumed either by 404684003 | clinical finding | or by 272379006 | event |.

`FINDING_OBSERVATION_ELEMENT` is used to represent both normal and abnormal clinical states found on examination or deduced from clinical reasoning (e.g. 'clear sputum', 'normal breath sounds', 'poor posture', 'diabetes mellitus') and events to which the patient or service user may have been to subject (e.g. 'physical abuse', 'exposure to mercury').

The value attribute is constrained to the null flavor NA | not applicable | so as to prohibit its use within the LRA whilst maintaining conformance to EN 13606-1:2007.

#### **4.1.1.2 Significant Attributes**

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this <code>RECORD_COMPONENT</code> has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a <code>RECORD_COMPONENT</code> instance that has been derived in some way from a pre-existing

			RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the finding situation (i.e. the finding or event and its context).
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the finding observation actually occurred or was true, if different from the session time of the COMPOSITION.
value	ANY	1.1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based information retrieval.

#### 4.1.1.3 Use of Terminology

The coded expression maintained by the FINDING\_OBSERVATION\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```

243796009 | situation with explicit context | :
{ 246090004 | associated finding |
= ( ( < 404684003 | clinical finding | )
OR ( < 272379006 | event | )
)
, 408729009 | finding context | = < 410514004 | finding context value |
, 408731000 | temporal context | = < 410510008 | temporal context value |
, 408732007 | subject relationship context | = < 125676002 | person |
}

```

To enable the creation of conformant instance expressions for particular finding situations, individual FINDING\_OBSERVATION\_ELEMENTs restrict further the values of the associated finding (as described section 5.1) and the values of the context attributes. Individual FINDING\_OBSERVATION\_ELEMENTs also may add literal expression constraints restrict the literal form of the instance expression.

A finding situation comprises a *clinical finding* (e.g. wheeze, fractured tibia, ulcer of foot, etc) and the *context* of the finding which may be represented either explicitly or implicitly by the instance expression. When a clinical finding is represented in a patient record, certain assumptions are usually made about what it means in relation to the person who is the subject of that record. Thus, a finding of "wheezing" in a record, it is assumed to mean that the subject of that record was wheezing at the time of examination. However, other contexts alter significantly the meaning of the finding situation. For example:

- *Family history of diabetes mellitus*
- *History of bronchitis*
- *No headache*
- *No family history of diabetes mellitus*

An instance expression may state explicitly that the finding is present and occurring currently (i.e. at the time of examination session) and applies to the subject of the record (the patient). This context is represented explicitly in the normal form by the following attributes and applied to the *associated finding* by the *situation with explicit context*:

- finding context
- temporal context
- subject relationship context

Alternatively a contracted form of the instance expression may omit the associated context in which case a 'soft default' context applies that means that the finding is present and occurring currently (or at a stated time in the past) and applies to the subject of the record.

Unlike instance expressions, semantic expression constraints specified in the intermediate form by the LRA always state explicitly all context constraints.

Use of these attributes is explained fully in the SNOMED CT Technical Implementation Guide. [12] Their specific use within the LRA is detailed in sections 4.2, 4.3 and 4.4 of this document.

#### **4.1.2 Property Observations**

Property observations record the results of measurements, investigation or other observations where there is requirement to separately specify the nature of the observation (e.g. 'systolic blood pressure', 'pulse rate') and its value (e.g. 130 mm[Hg], 65/min). The expressed value may represent a result or a parameter setting and may either have been measured or asserted.

The LRA Care Components model makes a distinction between 'finding observations' and 'property observations'. This distinction is based on whether the finding is recorded as a nominal statement (e.g. 'family history of asthma', 'pain in chest or exertion', 'tender in right iliac fossa') or as a combination of a name and a separate value (e.g. 'systolic blood pressure' = 130 mmHg, 'pulse rate' 65/min). This distinction affects terminology binding, since the set of SNOMED CT expressions that can be sensibly used to label values are observable entities and measurement procedures rather than clinical findings.

This section is concerned only with the use of the PROPERTY\_OBSERVATION\_ELEMENT. It covers findings which are specified with a distinct value. A separate section discusses the use of the FINDING\_OBSERVATION\_ELEMENT to represent nominal statements. This distinction between these types of observations is explained in more detail in the section 4.1.1.

SNOMED CT contains a hierarchy of 'observable entities' that directly address the requirements for property observations. However, the coverage of 'observable entities' is currently incomplete and needs to be complemented by use of concepts from the 'measurement procedures' and 'evaluation procedures' hierarchies. This class therefore also permits evaluation procedures and laboratory procedures to be used as the focus concept as a proxy to represent the observable resulting from the procedure.

The value attribute may be expressed as a quantity (with units), an interval (with units), an ordinal scale or where appropriate by another SNOMED CT expression.

#### 4.1.2.1 Class Description

The PROPERTY\_OBSERVATION\_ELEMENT class is an OBSERVATION\_ELEMENT whose coded meaning is constrained to represent a SNOMED CT observable situation and whose value attribute represents an observed or asserted data value.

The focus concept of the observable situation must be subsumed either by 363787002 | observable entity | or by 386053000 | evaluation procedure | or 108252007 | laboratory procedure | (for any 'observation' that does not have a corresponding 'observable entity').

PROPERTY\_OBSERVATION\_ELEMENT is used to represent the results of investigations undertaken to find out more information about a patient's state of health or wellbeing (e.g. 'blood glucose concentration', 'jugular venous pressure', 'Apgar at 10 minutes') and device or procedure related parameter settings (e.g. 'haemodialysis blood flow rate').

The value attribute may be assigned a value of any data type other than QSET<TS> or any specialisation of QSET<TS>.

#### 4.1.2.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the observable situation (i.e. the property observed and its context).
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the property observation actually occurred or was true, if different from the session time of the COMPOSITION.
value	ANY	1.1	The value of the observed property specified by the meaning code.  The attribute may be assigned any data type other than QSET<TS> or any specialisation of QSET<TS>.

Common patterns for Property Observations defined in this document constrain these fields.

#### 4.1.2.3 Use of Terminology

The coded expression maintained by the PROPERTY\_OBSERVATION\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```
243796009 | situation with explicit context | :
{ 246090004 | associated finding |
= ( ( < 363787002 | observable entity | )
OR ( < 386053000 | evaluation procedure | )
OR ( < 108252007 | laboratory procedure | )
)
, 408729009 | finding context | = < 410514004 | finding context value |
, 408731000 | temporal context | = < 410510008 | temporal context value |
, 408732007 | subject relationship context | = < 125676002 | person |
}
```

To enable the creation of conformant instance expressions for particular finding situations, individual PROPERTY\_OBSERVATION\_ELEMENTs restrict further the values of the associated finding (as described section 5.1) and the values of the context attributes. Individual PROPERTY\_OBSERVATION\_ELEMENTs also may add literal expression constraints restrict the literal form of the instance expression. The constraint permits an evaluation procedure or laboratory procedure to be the focus concept when it is used as a proxy for the observable entity resulting from the procedure.

When a property observation is represented in a patient record, certain assumptions are usually made about what it means in relation to the person who is the subject of that record. Thus, if the finding "systolic blood pressure 120 mm[Hg]" is present in a record, it is assumed to mean that the subject of that record was found to have this. This assumed meaning might be stated in full as "the subject of the record currently has a systolic blood pressure of 120 mm[Hg]". However, other contexts may alter significantly the meaning of the observable situation. For example:

- *Target* blood pressure
- Result of genetic screening applied to *a family member*.
- Result of infectious disease testing applied to *a partner or other contact*

As with clinical findings (section 4.1.1.3), instance expressions may represent the finding context, temporal context and subject relationship context explicitly or implicitly in which case the soft default applies. The contracted form that omits explicit reference to the context attributes is more usual in written records. Semantic expression constraints specified in the intermediate form by the LRA always state explicitly all context constraints. The use of context attributes is explained fully in the SNOMED CT Technical Implementation Guide. [12] Their specific use within the LRA is detailed in sections 4.2, 4.3 and 4.4 of this document.

The value attribute also may specify a SNOMED CT coded expression in which case it must conform to the following constraint:

```
( << 281296001 | result comments | ) OR ( << 260245000 | findings values | )
```

However, caution must be exercised before choosing this pattern of representation by applying the following test(s).

- If a requirement for the representation of an observation can be satisfied only by a `BOUND_DATA_ELEMENT` with a meaning attribute that specifies an observable situation and a value attribute whose value is *not* a SNOMED CT coded expression then a `PROPERTY_OBSERVATION_ELEMENT` must be used.
- Otherwise, if a requirement for the representation of an observation can be satisfied either by a `BOUND_DATA_ELEMENT` with a meaning attribute that specifies an observable situation and a value attribute whose value is a SNOMED CT coded expression (conforming to the above constraint) or by a `BOUND_DATA_ELEMENT` with a meaning attribute that specifies a finding situation then a `FINDING_OBSERVATION_ELEMENT` must be used.

Where a care record information requirement can in theory be satisfied either by `PROPERTY_OBSERVATION_ELEMENT` with a value containing a SNOMED CT coded expression or by a `FINDING_OBSERVATION_ELEMENT`, the second approach is designed to favour the latter so that representations are not arbitrarily divided into a 'question' (meaning) and an 'answer' (value). This increases the likelihood of generating comparable data from multiple sources. Weighing against this is the observation that requirements (and thus requirement owner expectations) often favour a 'question / answer' framing – in particular this is the case for requirements based on established assessment exercises. To address this expectation gap subsequent SNOMED CT and LRA releases are expected to include mechanisms for:

1. detecting equivalence between logically equivalent `FINDING_OBSERVATION_ELEMENT` and `PROPERTY_OBSERVATION_ELEMENT` clinical findings, and / or
2. allowing the association of `FINDING_OBSERVATION_ELEMENT`s and (semantically inert) SNOMED CT observable situation concepts.

#### 4.1.3 General Activities

Activities or procedures are described in the NHS Care Record Elements document (v3) as follows:

*Therapeutic, preventative, investigative, informative, curative or palliative actions or interventions delivered to or acted upon a person to determine, support, clarify or effect change upon, their health status.*

Within the LRA, any activity *not* intended to result in an observation and *not* associated with the supply or administration of a material is represented using `GENERAL_ACTIVITY_ELEMENT`. Such activities include:

- **Treatments:** procedures that are intended to have a therapeutic, preventative, curative or palliative effect; includes invasive, non-invasive, psychosocial and cognitive treatments.
- **Provision of advice and information to patients and carers:** the activity of providing advice and information about a patient's health or social care, to the patient or to their specified carer.

- **Administrative Procedures:** procedures, typically of a clerical nature, that support the investigation and/or treatment of a patient.

#### 4.1.3.1 Class Description

The GENERAL\_ACTIVITY\_ELEMENT class is an ACTIVITY\_ELEMENT whose coded meaning is constrained to represent any procedure situation not represented by one of the other non-abstract specialisations of ACTIVITY\_ELEMENT.

The inherited value attribute is constrained to the null flavor NA | not applicable | so as to prohibit its use within the LRA whilst maintaining conformance to EN 13606-1:2007.

#### 4.1.3.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT.  Contains a SNOMED CT expression representing the nature of the procedure situation (i.e. the procedure and its context).
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the activity described was undertaken or was true, if different from the session time of the COMPOSITION.
value	ANY	1.1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based information retrieval.

#### 4.1.3.3 Use of Terminology

The coded expression maintained by the GENERAL\_ACTIVITY\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```

243796009 | situation with explicit context | :
{ 363589002 | associated procedure |
= ( ( < 71388002 | procedure | )
AND ( ! < 386053000 | evaluation procedure | )
AND ( ! < 108252007 | laboratory procedure | )
AND ( ! < 432102000 | administration of substance | )
AND ( ! < 433590000 | administration of substance via specific route | )
AND ( ! < 33633005 | prescription of drug | )

```

```

AND ( ! < 75658007 | prescription of therapeutic agent | )
AND ( ! < 103742009 | renewal of prescription | )
AND ( ! < 243704004 | provision of appliances | )
AND ( ! < 183253002 | provision of medical equipment | )
AND ( ! < 404919001 | wheat-free diet | )
AND ( ! < 223456000 | provision of a special diet | )
AND ( ! < 440298008 | dispensing of pharmaceutical/biologic product | )
)
, 408730004 | procedure context | = < 288532009 | context values for actions |
, 408731000 | temporal context | = < 410510008 | temporal context value |
, 408732007 | subject relationship context | = < 125676002 | person |
}

```

To enable the creation of conformant instance expressions for particular finding situations, individual GENERAL\_ACTIVITY\_ELEMENTs restrict further the values of the associated finding (as described section 5.1) and the values of the context attributes. Individual GENERAL\_ACTIVITY\_ELEMENTs also may add literal expression constraints to enable the creation of conformant instance expressions representing particular finding situations.

When a procedure is mentioned in a patient record, assumptions are made about what it means in relation to the subject of that record. Thus, in the absence of other information, the mention of the procedure "cholecystectomy" may be assumed to mean that "the subject of the record had a cholecystectomy at a stated time". Use of other contexts changes significantly the meaning of the procedure situation. For example:

- Hip replacement *planned*
- History of vasectomy
- Nutritional assessment *completed*
- Appendectomy *not done*

The default context for a *procedure* means that the procedure was completed, was performed on the subject of record (the patient or service user), and was done in the present time or at a stated past time. This is implied by all procedure instance expressions in which the context is omitted. The context is represented explicitly in normal form instance expressions and in all semantic expression constraints by applying the following attributes to the *associated procedure* using the *situation with explicit context* wrapper:

- procedure context
- temporal context
- subject relationship context

Use of these attributes is explained fully in the SNOMED CT Technical Implementation Guide. [12] Their specific use within the LRA is detailed in sections 4.2, 4.3 and 4.4 of this document.

#### 4.1.4 Investigation Activities

Investigation activities are procedures that are undertaken with the primary aim of finding out more information about a patient or service user's state of health or wellbeing and which therefore result (or are intended to result) in one or more



observations. Investigations include invasive, non-invasive, psychosocial and cognitive investigation procedures.

Within the LRA, activities intended to result in an observation are represented using the INVESTIGATION\_ACTIVITY\_ELEMENT.

#### 4.1.4.1 Class Description

The INVESTIGATION\_ACTIVITY\_ELEMENT class is an ACTIVITY\_ELEMENT whose coded meaning is constrained to represent a SNOMED CT procedure situation that resulted in (or is intended to result) in one or more observations (of type OBSERVATION\_ELEMENT). The focus concept of the observable situation must be subsumed either by 386053000 | evaluation procedure | or 108252007 | laboratory procedure | or by 363787002 | observable entity | (for any evaluation activity that does not have a corresponding 'evaluation procedure').

The value attribute is constrained to the null flavor NA | not applicable | so as to prohibit its use within the LRA whilst maintaining conformance to EN 13606-1:2007.

#### 4.1.4.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the nature of the procedure situation (i.e. the procedure and its context).
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the activity described was undertaken or was true, if different from the session time of the COMPOSITION.
value	ANY	1.1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based information retrieval.

#### 4.1.4.3 Use of Terminology

The coded expression maintained by the INVESTIGATION\_ACTIVITY\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```
243796009 | situation with explicit context | :
{ 363589002 | associated procedure |
```

```

= ( ( < 386053000 | evaluation procedure | )
OR ( < 108252007 | laboratory procedure | )
OR ( < 363787002 | observable entity | )
)
, 408730004 | procedure context | = < 288532009 | context values for actions |
, 408731000 | temporal context | = < 410510008 | temporal context value |
, 408732007 | subject relationship context | = < 125676002 | person |
}

```

To enable the creation of conformant instance expressions for particular finding situations, individual INVESTIGATION\_ACTIVITY\_ELEMENTs restrict further the values of the associated finding (as described section 5.1) and the values of the context attributes. Individual INVESTIGATION\_ACTIVITY\_ELEMENTs also may add literal expression constraints to enable the creation of conformant instance expressions representing particular finding situations. The constraint permits an observable entity to be the focus concept when it used as a proxy for the procedure used to observe that entity.

The context may be omitted from instance expressions (in which case the default applies) or it may be explicitly stated using the appropriate context attributes as described in section 4.1.3.3. All semantic expression constraints must specify explicitly the permitted contexts.

#### 4.1.5 Material Activities

Within the LRA materials activities are those activities associated with the supply or administration of materials (represented by instances of MATERIAL\_ENTITY\_ELEMENT). This applies to all procedures that involve or require reference to specific substances or device and includes the management of aids, appliances, orthoses and prostheses, as well as medications.

Material activities are represented using the MATERIAL\_ACTIVITY\_ELEMENT.

##### 4.1.5.1 Class Description

The MATERIAL\_ACTIVITY\_ELEMENT class is an ACTIVITY\_ELEMENT whose coded meaning is constrained to represent a SNOMED CT procedure situation involving the administration of a product or substance or the provision of a material entity to a subject. Instances of material entity (including products and substances) are represented by the MATERIAL\_ENTITY\_ELEMENT.

The value attribute is constrained to the null flavor NA | not applicable | so as to prohibit its use within the LRA whilst maintaining conformance to EN 13606-1:2007.

##### 4.1.5.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been

			derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the nature of the supply or administration procedure situation (i.e. the supply or administration procedure and its context).
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the supply or administration activity described was undertaken or was true, if different from the session time of the COMPOSITION.
value	ANY	1.1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based information retrieval.

#### 4.1.5.3 Use of Terminology

The coded expression maintained by the MATERIAL\_ACTIVITY\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```

243796009 | situation with explicit context | :
{ 363589002 | associated procedure |
= ( ( 432102000 | administration of substance | )
OR ( 433590000 | administration of substance via specific route | )
OR ( 33633005 | prescription of drug | )
OR ( 75658007 | prescription of therapeutic agent | )
OR ( 103742009 | renewal of prescription | )
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 | )
)
, 408730004 | procedure context | = < 288532009 | context values for actions |
, 408731000 | temporal context | = < 410510008 | temporal context value |
, 408732007 | subject relationship context | = < 125676002 | person |
}

```

To enable the creation of conformant instance expressions for particular finding situations, individual INVESTIGATION\_ACTIVITY\_ELEMENTs restrict further the values of the associated finding (as described section 5.1) and the values of the context attributes. Individual MATERIAL\_ACTIVITY\_ELEMENTs also may add literal expression constraints to enable the creation of conformant instance expressions representing particular finding situations.

The context may be omitted from instance expressions (in which case the default applies) or it may be explicitly stated using the appropriate context attributes as described in section 4.1.3.3. All semantic expression constraints must specify explicitly the permitted contexts.

An *administration of substance via specific route* focus concept can be refined by the application of an additional concept model attribute, *route of administration*, as discussed in section 5.1.2.4.

#### 4.1.6 Material Entities

Material entities are defined as physical entities acting in the capacity of passive recipients of actions performed by other physical entities acting in the capacity of active subjects. Such actions include extraction, manufacture, supply, distribution, administration, use, investigation, disposal, etc.

Material entities are represented using the MATERIAL\_ENTITY\_ELEMENT. Physical entities acting (typically with some degree of autonomy) in the capacity of active subjects are represented as specialised instances of class IDENTIFIED\_ENTITY (see section 4.1.11). A physical entity may therefore be represented using either class depending on the capacity in which it acts. Note that although patients or service users act as recipients of care activities, their participation is not passive (and usually requires consent) and as such they are also represented using specialised instances of IDENTIFIED\_ENTITY.

##### 4.1.6.1 Class Description

The MATERIAL\_ENTITY\_ELEMENT class is a BOUND\_DATA\_ELEMENT whose coded meaning is constrained to represent a physical entity (i.e. an independent physical continuant) that that is either a:

- therapeutic pharmaceutical or biologic product;
- substance of relevance to health and social care, including active ingredients of drugs and medicaments, biological and dietary substances and allergens;
- specimen; or
- device, e.g. durable equipment, implantable devices, disposable supplies, etc.

The value attribute is redefined to represent the amount of the material entity present within a mixture or compound regardless of any amount administered or supplied.

##### 4.1.6.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing

			the nature of the physical entity.
value	QTY	0..1	The amount of the material entity present within a mixture or compound regardless of the amount involved in any associated activity.

#### 4.1.6.3 Use of Terminology

The coded expression maintained by the MATERIAL\_ENTITY\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

```
(( (< 373873005 | pharmaceutical / biologic product | )
OR ( < 49062001 | device | )
OR ( < 123038009 | specimen | )
OR ( < 105590001 | substance | )
OR ( < 276339004 | environment | )
)
```

The code 373873005 | pharmaceutical / biologic product | subsumes the UK drug extension concepts (dm+d).

#### 4.1.7 Record Artefacts

A record artefact is a virtual construct which is used to organise or label the content of a care record so as to aid navigation, viewing and readability without affecting the meaning of the content. Record artefacts, which are represented using the RECORD\_ARTEFACT\_ELEMENT, may be linked to aid navigation. However, in the case of electronic records, the same content may appear under multiple headings.

From the perspective of meaning based retrieval, the fact that an item of clinical content, such as 'asthma' is associated with a particular record artefact, such as an artefact representing a record heading of 'Family History' has no significance. A finding of 'Family history of asthma' may only be deduced from the value of the meaning attribute of the FINDING\_OBSERVATION\_ELEMENT and not from any 'meaning' that might be implied by the record artefact.

Record artefacts, nevertheless, add value in enabling a human reader to easily locate a finding of say 'Family history of asthma' listed under a 'Family History' heading within a record or report. The heading can also be used to signify to the reader that the explicit meaning of the information differs from say another entry listed under 'Past History'.

Uses of the record artefacts include:

- Labelling different clinical findings to indicate their roles in a particular encounter or episode of care (e.g. 'primary diagnosis', 'secondary diagnosis', etc).
- Naming particular sections of a procedure note or clinical assessment to organise the information for input or review (e.g. 'history of present complaint', 'review of systems', etc).
- Specifying record nodes that represent problems or issues to which collections or relevant entries can be attached.

Record artefact labels can be relevant to retrieval and reuse for particular purposes. For example, when composing a discharge summary or extracting activity statistics from a record it is important to distinguish between the 'primary diagnosis' and

'secondary diagnoses'. However, these labels do not alter the nature or veracity of the finding. Thus a patient with 'Type 1 diabetes mellitus', has the same condition whether it is recorded as the 'Primary diagnosis' or 'Secondary diagnosis'. The only difference is whether this is the main reason for the current episode of care.

Record artefact labels and their targets are linked using COMPONENT\_RELATIONSHIP\_ELEMENT instances.

#### 4.1.7.1 Class Description

The RECORD\_ARTEFACT\_ELEMENT class is a BOUND\_DATA\_ELEMENT whose coded meaning is constrained to represent the name of a SNOMED CT record artefact type. The focus concept must be subsumed by 419891008 | record artifact |. Instances of RECORD\_ARTEFACT\_ELEMENT are used to organise or label other ELEMENTs so as to aid navigation, viewing and readability but are not permitted to affect the meaning of the content.

Examples of RECORD\_ARTEFACT\_ELEMENT include 'Problems' and 'Primary diagnosis'.

The value attribute is constrained to the null flavor NA | not applicable | so as to prohibit its use within the LRA whilst maintaining conformance to EN 13606-1:2007.

#### 4.1.7.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the type of record artefact.
value	ANY	1..1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based information retrieval.

#### 4.1.7.3 Use of Terminology

The coded expression maintained by the RECORD\_ARTEFACT\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

< 419891008 | record artifact |

### 4.1.8 Semantic Links

Semantic links represent asserted binary relationships between RECORD\_COMPONENT instances. For example, a semantic link can be used to indicate that a particular instance of a one finding is believed to have been caused by a specific disorder or action. They can also represent the reason for a particular action.

Semantic links are represented using the COMPONENT\_RELATIONSHIP\_ELEMENT. This is a composite structure containing two LINK instances, one to reference the subject of the relationship and the other to reference the object. The relationship type is maintained by the meaning attribute. The SNOMED CT link assertion hierarchy (< 416698001 | link assertion |) defines a number of appropriate concepts and work is currently in progress to investigate the requirement for any additional concepts that the LRA might require. Appendix B of the Care Component Specification [] lists a set of candidate concepts which following further development to ensure semantic consistency will be proposed for inclusion in the International Edition of SNOMED CT or its UK Extensions. In the intervening time the COMPONENT\_RELATIONSHIP\_ELEMENT meaning attribute is bound to a value set containing those concepts subsumed by the link assertion hierarchy plus a limited set of (currently) non-SNOMED CT concepts defined in section 6.2 of this document.

#### 4.1.8.1 Class Description

The COMPONENT\_RELATIONSHIP\_ELEMENT class is an ELEMENT whose coded meaning is constrained to represent an asserted relationship between two other RECORD\_COMPONENTs. The association role links collection is therefore constrained to two member LINKs, one of which references the subject RECORD\_COMPONENT and the other the object.

Because the COMPONENT\_RELATIONSHIP\_ELEMENT is a RECORD\_COMPONENT in its own right, it can be asserted, revised or maintained separately from both the related RECORD\_COMPONENTs.

#### 4.1.8.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
meaning	CD.CV.SCT	1..1	A coded representation of the primary semantically processable meaning conveyed by the ELEMENT. Contains a SNOMED CT expression representing the type of relationship between the subject and object COMPONENT_RELATIONSHIP_ELEMENT.
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the relationship was asserted, if different from the session time of the COMPOSITION.
value	ANY	1..1	The value attribute is constrained to the null flavor NA   not applicable   so as to prohibit its use within data capture or meaning based



			information retrieval.
links-> foreach(role.code = LraRoleCode. SUBJECT).target	II	1..1	Reference to the RECORD_COMPONENT that is the subject of the relationship.
links-> foreach(role.code = LraRoleCode. OBJECT).target	II	1..1	Reference to the RECORD_COMPONENT that is the object of the relationship.

#### 4.1.8.3 Use of Terminology

The coded expression maintained by the COMPONENT\_RELATIONSHIP\_ELEMENT meaning attribute must conform to the following default semantic expression constraint:

< 416698001 | [link assertion](#) |

#### 4.1.9 Unbound Data

Unbound data is any data not described using a SNOMED CT coded concept or expression. This includes text, images, multi-media and terms and expressions codified using systems other than SNOMED CT (e.g. ICD-10, OPCS, etc). The LRA also specifies a controlled set of unbound domain model elements which are not specified directly by the underlying Reference Model and whose semantics are outside the scope of terminological representation using SNOMED CT. These elements which include Text, InterpretationRange and FutureEventTime behave in effect as reusable domain model attributes.

##### 4.1.9.1 Class Description

The UNBOUND\_DATA\_ELEMENT class is an ELEMENT whose data value is not described by (i.e. bound to) a SNOMED CT coded concept or expression. The value attribute supports any type of content including text (plain or with mark up) or binary data intended to be presented for human viewing or some other form of interpretation. Also it supports terms and expressions codified using systems other than SNOMED CT.

It is important to note that the data content of an UNBOUND\_DATA\_ELEMENT is not necessarily unstructured (i.e. not machine processable). It may be processable by dedicated text (e.g. NLP), media or other data processing software that understands the content structure. Furthermore such processing may result in the output of assertions that can be expressed using one or more specialised instances of BOUND\_DATA\_ELEMENT and therefore amenable to meaning-based retrieval. However, from the perspective of meaning-based retrieval within the record, the content of the originating UNBOUND\_DATA\_ELEMENT is semantically opaque.

##### 4.1.9.2 Significant Attributes

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.



			Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
obs_time	IVL<TS>	0..1	The date and time, or interval, at which the relationship was asserted, if different from the session time of the COMPOSITION.
value	ANY	1..1	The data value of the element.

#### 4.1.10 Entries

An entry, as defined by EN 13606-1:2007, represents:

*The information recorded in an EHR as a result of one clinical action, one observation, one clinical interpretation, or an intention. This is also known as a clinical statement.*

Examples of an entry include a symptom, an observation, one test result, a prescribed drug, an allergy reaction, a diagnosis, a differential diagnosis, a differential white cell count and a blood pressure measurement.

Entries are represented using the EN 13606-1:2007 defined ENTRY class. Within the LRA, ENTRYs define reusable sets of ELEMENTs and are contained directly by COMPOSITIONs.

##### 4.1.10.1 Class Description

The ENTRY class contains (as ITEMS) the information acquired and recorded for a single observation or observation-set (battery or time series), a single clinical statement such as a portion of the patient's history or an inference or assertion, or a single action that is intended or has actually been performed. An ENTRY may have zero ITEMS if it is a revision of an ENTRY previously recorded in error.

By implication of the Reference Model, each and every ELEMENT instance within an ENTRY must share the same information provider (i.e. source of information) and refer to the same subject of information.

The items collection of the ENTRY class is constrained for use by the LRA to contain member instances of type ELEMENT only.

#### 4.1.11 Participating Roles

The individuals, organisations and devices that actively participate in health and social care activities do so via the designated roles they play. For example, a person entity instance may be designated and play the role of a care professional in one part of a subject of care's record and yet be designated and play the role of a third party in another part. Where necessary, roles provide the means by which participating entities can be identified.

Roles are represented using predefined specialisations of the abstract IDENTIFIED\_ENTITY class defined by EN 13606-1:2007. Individuals and organisations are always represented by the roles they play. Physical or software devices acting in the capacity of active subjects also are represented as specialised instances IDENTIFIED\_ENTITY. Physical entities acting in the capacity of passive recipients of actions performed active subjects are represented using the MATERIAL\_ENTITY\_ELEMENT (see section 4.1.6).

#### 4.1.11.1 Class Description

Any Identified Party, which may be an Organisation, Person, or Device or Software.

#### 4.1.12 Compositions

A composition, as defined by EN 13606-1:2007, represents:

*The set of information committed to one EHR by one agent, as a result of a single clinical encounter or record documentation session.*

Examples of compositions include progress notes, laboratory test result forms, radiology reports, referral letters, clinic visits, clinic letters, discharge summaries, functional health assessments and diabetes reviews.

Compositions are represented using the EN 13606-1:2007 defined COMPOSITION class.

#### 4.1.12.1 Class Description

A COMPOSITION represents the set of RECORD\_COMPONENTs composed (authored) during one clinical encounter or documentation session, and committed within one EHR.

The COMPOSITION is constrained for use within the LRA to comprise a set of ENTRY instances each of which contains one or more ELEMENTs.

From the perspective of meaning based information retrieval the most significant attribute is the session\_time. As well as recording explicitly the date and time or interval during which the clinical encounter or documentation session occurred, the session\_time indicates the date and time, or interval, at which the recorded activity occurred or was true *unless* specified explicitly by the ELEMENT obs\_time. If stated, the obs\_time may be less precise (e.g. the year in which a past illness occurred) and may refer to a period of time or to a point in time.

#### 4.1.12.2 Significant Attributes

The class attributes deemed to be of significance to LRA Technical Model design are listed below.

Name	Data type	Multiplicity	Description
synthesised	BL	1..1	This attribute value shall be TRUE if this RECORD_COMPONENT has been created in order to comply with this standard, but this point in the EHR hierarchy has no corresponding node in the EHR from which it was extracted.  Within the LRA this attribute is used to indicate a RECORD_COMPONENT instance that has been derived in some way from a pre-existing RECORD_COMPONENT.
session_time	IVL<TS>	0..1	The date and time or interval during which the clinical encounter or documentation session occurred.

## 4.2 Representing Temporality

A recorded observation or activity may be a contemporary record of an event (i.e. one that was created during or shortly after the event); or it may be a retrospective record of an event that occurred at some time in the past; or it may be a record of some prospect that it is anticipated may occur at some time in the future. Similarly the time at which the event occurred or is anticipated to occur may be known (and specified with a given level of precision) or unknown. This temporality of the information therefore needs to capture and express:

- the time of the session during which the information was recorded;
- the time of the event, if known, or otherwise indicate that it is unknown;
- whether the information is contemporary or retrospective or whether it asserts some anticipated event; and
- the period of validity of a prospect (such as a plan or goal) or entity.

The temporality and the context of the finding or procedure represented by the observation or action also must align.

The attributes used to represent the temporality of care record information are:

- COMPOSITION session\_time and ELEMENT obs\_time (which together can be used to infer the event time);
- the temporal context and finding or procedure context of the meaning attribute value for representing contemporary and retrospective information;
- finding or procedure context and the UNBOUND\_DATA\_ELEMENT FutureEventTime for representing prospective events; and
- UNBOUND\_DATA\_ELEMENT ValidPeriod for representing the period of validity of prospects or entity

### 4.2.1 Session Time

The session\_time of the containing COMPOSITION represents the date and time or interval during which the clinical encounter or documentation session occurred. It also records the time during which each ELEMENT within a COMPOSITION was created unless stated explicitly by the obs\_time.

### 4.2.2 Event Time

The date and time of an event is stated using the COMPOSITION session\_time or the obs\_time. The obs\_time records date and time, or interval, at which the recorded event actually occurred or was true, if different from the session time of the session\_time. By implication, therefore, the time of the event is taken to be the session\_time unless specified otherwise by the obs\_time and the obs\_time is stated only if its value differs from the session time. If stated, the obs\_time may be less precise than the session\_time especially for events that occurred in the past, e.g. the year in which a past illness occurred. The obs\_time may also be stated explicitly to indicate the precise time of each of a number of observations or activities within an extended encounter. The rule for determining the time of an event is as follows:

Let eventTime: IVL<TS>

```

-- if obs_time is stated
if obs_time.ocllsDefined()
    -- if obs_time is stated with null flavor (i.e. UNK | unknown |)
    if obs_time.isNull()
        eventTime = unknown
    else
        eventTime = obs_time
else
    eventTime = entry.composition.session_time

```

#### 4.2.2.1 **Event Time Unknown**

To indicate that the event time is unknown the obs\_time is stated with a null flavor UNK | unknown |. This indicates that there exists an obs\_time which although unknown is nevertheless distinct from the session\_time.

#### 4.2.2.2 **Derived Event Times**

For batteries in which a property observation serves as a grouper (e.g. blood pressure) for a number of property observation parts (e.g. systolic pressure and diastolic pressure) and all of the parts have a common event time then each part must be stated with an obs\_time of null flavor DER | derived |. This indicates that the event time of each part is derivable, i.e. either from the COMPOSITION session\_time or, if stated, from the obs\_time of the property observation representing the battery.

#### 4.2.2.3 **Event Times Specified by Observable Entities**

LRA ELEMENT models do not represent explicitly SNOMED CT concepts that specify the times of past or current events, such as 248986005 | estimated date of conception (observable entity) |. Instead the event, such as 13693004 | conception (observable entity) |, is itself is represented and the event time specified as described in this section.

### 4.2.3 **Representing Contemporary and Retrospective Information**

The *temporal context* of the meaning attribute value is used to indicate whether a recorded observation or activity is a contemporary record of an event occurring at the time of the session and which was therefore considered to be current at the session\_time; or whether it is a retrospective record of an event that occurred at some time in the past. The primary use of this attribute, is to indicate that an entry contains retrospective information (e.g. past history), without specifying an actual date of an occurrence. [8] The default constraint for the temporal context is:

```
408731000 | temporal context | = < 410510008 | temporal context value |
```

The permissible value is restricted further depending upon whether the information represents a contemporary or retrospective record of the event as described in the following sections.

For contemporary and retrospective observations the *finding context* of the meaning attribute is used to indicate whether the associated clinical finding is known or unknown and if known whether it is present or absent as defined by the following constraint:

408729009 | finding context | = ( ( < 36692007 | known | ) OR ( << 261665006 | unknown | ) )

For activities the *procedure context* of the meaning attribute is used to indicate the degree of completion, or status of the associated procedure. Activities that have actually occurred or are in the process of occurring (versus being planned or cancelled) are indicated using an appropriate subtype of *post-starting action status* as defined by the following constraint:

408730004 | procedure context | = ( ( < 410523001 | post-starting action status | ) OR ( << 385660001 | not done | ) OR ( << 410537005 | action status unknown | ) )

#### 4.2.3.1 Representing Contemporary Information

Contemporary information is indicated by a temporal context value that conforms to the following constraint:

408731000 | temporal context | = ( ( << 410512000 | current or specified | ) AND ( ! < 410513005 | past | ) )

The permissible value is restricted further depending upon whether the time of the event is known or unknown.

The finding or procedure context must conform to the constraint specified above.

##### 4.2.3.1.1 Contemporary Information with Known Event Time

For contemporary information that includes the date and time, or interval, at which the event occurred (i.e. either implicitly by specifying the session\_time and omitting the obs\_time or explicitly by specifying a value for the obs\_time) the constraint is restricted to exclude values that imply current unspecified or past specified times only:

408731000 | temporal context | = ( ( << 410512000 | current or specified | ) AND ( ! < 410585006 | current – unspecified | ) AND ( ! < 410587003 | past - specified | ) )

##### 4.2.3.1.2 Contemporary Information with Unknown Event Time

If the date and time or interval of the event are unknown and therefore specified by obs\_time with a null flavor UNK | unknown |, the temporal context value must conform to the following constraint which excludes those temporal context values that imply a specified time only:

408731000 | temporal context | = ( ( << 410512000 | current or specified | ) AND ( ! < 410586007 | specified time | ) )

#### 4.2.3.2 Representing Retrospective Information

Retrospective information is indicated by a temporal context value that conforms to the following constraint:

408731000 | temporal context | = ( ( << 410511007 | current or past | ) AND ( ! < 15240007 | current | ) )

The permissible value is restricted further depending upon whether the time of the event is known or unknown or if a negative past history is being recorded.

For activities that have occurred (or not occurred) in the past the value of the procedure context is further constrained to exclude the concept in progress and its subtypes:

```
408730004 | procedure context | = ( (< 410523001 | post-starting action status | ) OR (<<
385660001 | not done | ) OR (<< 410537005 | action status unknown | ) AND (! < 385651009 | in
progress | ) )
```

#### 4.2.3.2.1 Retrospective Information with Known Event Time

Retrospective information that includes the date and time, or interval, at which the event is reported to have occurred (i.e. either implicitly by specifying the session\_time and omitting the obs\_time or explicitly by specifying a value for the obs\_time) is represented by a temporal context that conforms to the following constraint that excludes temporal context values that imply a past unspecified time only:

```
408731000 | temporal context | = ( (<< 410511007 | current or past | ) AND (! < 410588008 | past -
unspecified | ) AND (! < 15240007 | current | ) )
```

The finding or procedure context must conform to the constraint specified above.

#### 4.2.3.2.2 Retrospective Information with Unknown Event Time

If the date and time or interval of the past event are unknown and therefore specified by obs\_time with a null flavor UNK | unknown |, the temporal context value must conform to the following constraint which excludes those temporal context values that imply a past - specified time only:

```
408731000 | temporal context | = ( (<< 410511007 | current or past | ) AND (! < 410512000 | current
or specified | ) )
```

The finding or procedure context must conform to the constraint specified above.

#### 4.2.3.2.3 Retrospective Information Representing Negative Past History

For observation instances representing *negative past history*

- the obs\_time must be stated with null flavor UNK | unknown |;
- the temporal context value must conform to

```
408731000 | temporal context | = ( (<< 410589000 | all times past | ) ); and
```

- for observations the finding context value must conform to

```
408729009 | finding context | = ( (<< 410516002 | known absent | ) OR (= < 428263003 |
NOT suspected | ) ); or
```

- for activities the procedure context value must conform to

```
408730004 | procedure context | = ( (<< 385660001 | not done | ) )
```

Note that the finding or procedure context should not be constrained at design time to permit only a negative past history, however, if expressed by an instance the above constraints apply. Furthermore, any instance conforming to the above constraints is deemed to represent a negative past history.

## 4.2.4 Representing Prospects

Prospects describe current expectations of possible future events rather the actual events themselves. For observations these include goals, expectations and risks. For activities prospects include plans, requests and other intentions. Prospects are indicated by the use of certain finding context values and procedure context values

for observations and activities respectively. Representing the timing of future events, if known involves the use the UNBOUND\_DATA\_ELEMENT FutureEventTime.

#### 4.2.4.1 Finding Context for Prospective Observations

For observations the prospect of a finding is indicated using one of the *finding context* values (or a subtype thereof) specified by the following constraint:

```
408729009 | finding context | = ( (<< 410519009 | at risk | ) OR (<< 410517006 | expectation | ) OR (<< 410518001 | goal | ) )
```

#### 4.2.4.2 Procedure Context for Prospective Activities

For activities the *procedure context* of the meaning attribute is used to indicate the degree of completion, or status of the associated procedure. Activities that have yet to occur are indicated using an appropriate subtype of *pre-starting action status* for the procedure context value as defined by the following constraint:

```
408730004 | procedure context | = ( (< 410522006 | pre-starting action status | ) OR ( < 410537005 | action status unknown | ) )
```

An instance example of a planned hip replacement representing using a post-coordinated procedure with explicit context is shown below.

Example 1 Planned hip replacement

```
= 243796009 | situation with explicit context | :
{ 363589002 | associated procedure | = 397956004 | prosthetic arthroplasty of the hip |
, 408730004 | procedure context | = 397943006 | planned |
, 408731000 | temporal context | = 15240007 | current |
, 408732007 | subject relationship context | = 410604004 | subject of record | }
```

#### 4.2.4.3 Future Event Time

In conformance with EN 13606, the times of expected future events are formally specified using a separate ELEMENT to help ensure that such dates and times can be reliably and safely identified by decision support systems.

A prospect (e.g. expectation, goal, risk, intended event, etc) is represented as an observation or activity with an appropriate finding or procedure context value as described above. The time(s) of the expected future event, if known, is specified by semantically linking an instance of the UNBOUND\_DATA\_ELEMENT FutureEventTime to the prospect. A FutureEventTime may specify the point in time or time interval of a single event or it may specify a timing pattern for a number of future events such as a periodic repeating interval for a prescribed medication administration.

LRA ELEMENT models do not therefore represent explicitly SNOMED CT concepts such as the following that imply expected future events:

- 185353001 | appointment date (finding) |
- 161714006 | estimated date of delivery (observable entity) |
- 390901002 | negotiated date for cessation of smoking (observable entity) |
- 355381000000108 | date of next anticoagulant clinic appointment (procedure) |
- 356051000000109 | date of next disease modifying antirheumatic drug monitoring clinic appointment (procedure) |

### 4.2.5 Representing Period of Validity

The period of validity such as the start and end date of a plan or the expiration date of a drug is represented by semantically linking an instance of UNBOUND\_DATA\_ELEMENT ValidPeriod to the observation, activity or material entity.

LRA ELEMENT models do not therefore represent explicitly SNOMED CT concepts that represent valid periods such as the following:

- 427416004 | therapeutic substance expiration date (observable entity) | or
- 116767008 | blood product unit expiration time (observable entity) |

### 4.2.6 Property Observations

As stated in section 4.1.2.2, the PROPERTY\_OBSERVATION\_ELEMENT value attribute is prohibited from being assigned a time based type (i.e. a QSET<TS> or any specialisation thereof) and therefore cannot be used to represent the time of past, current or prospective events. This does not preclude the use of the attribute to represent a duration as a physical quantity with a time unit. For example, the duration of stress test should be represented as a PROPERTY\_OBSERVATION\_ELEMENT value with the unit expressed in seconds, minutes or other suitable time unit.

## 4.3 Representing Subject of Information

Within the LRA the subject of a finding or procedure are represented using either one or a combination of the *subject relationship context* value of the BOUND\_DATA\_ELEMENT meaning attribute and a subject\_of\_information RELATED\_PARTY instance associated with the containing ENTRY.

The subject relationship context attribute represents the relationship between the subject of a clinical finding or procedure and the subject of the record.

The RELATED\_PARTY representation serves two different functions:

- Firstly in all instances it can be used to identify the related party that is the subject of the ENTRY - this is useful even if the nature of the relationship is defined using the SNOMED CT subject relationship context elsewhere.
- Secondly for ENTRYs whose ELEMENT content is not SNOMED CT encoded (and hence a subject relationship context is not defined), the subject\_of\_information is able to specify the relationship type.

Table 1 specifies the co-occurrence constraints for representing subject of information in the form of a truth table. The purpose of the constraints is to ensure that the structural and terminological representations do not conflict with or duplicate one another.

Table 1 Truth table for representing subject of information

Condition	Information represented by a BOUND_DATA_ELEMENT	yes	yes	yes	no	no	no
	Subject of information = subject of record	yes	no	no	yes	no	no
	Requirement to identify the subject of information	N/A	no	yes	N/A	no	yes
Result:	Use SNOMED CT subject relationship context	yes		yes	no	no	



	Use EN 13606 subject_of_information: RELATED_PARTY	no	yes	no	yes
--	--	----	-----	----	-----

If the information is represented by a `BOUND_DATA_ELEMENT` and the subject is the subject of the record then the subject of the information is indicated by the subject relationship context of the meaning attribute with a value that conforms to the following constraint:

408732007 | subject relationship context | = 410604004 | subject of record |

If the subject is *not* the subject of the record then the subject of the information is indicated by the subject relationship context with a value that conforms to the following constraint:

408732007 | subject relationship context | = << 303071001 | person in the family |

If the information is represented by an `UNBOUND_DATA_ELEMENT` then the subject of the information is implied to be the subject of the record unless indicated otherwise by a subject\_of\_information `RELATED_PARTY` instance associated with the containing `ENTRY`.

If the subject of information represented by an `UNBOUND_DATA_ELEMENT` is *not* the subject of the record then the subject of information is indicated by the relationship attribute of the associated `RELATED_PARTY` instance with a value that conforms to the constraint:

<< 303071001 | person in the family |

The subject\_of\_information `RELATED_PARTY` instance associated with the containing `ENTRY` must be used for both `BOUND_DATA_ELEMENT`s and `UNBOUND_DATA_ELEMENT`s if there is a requirement to identify the subject of information. However for `BOUND_DATA_ELEMENT`s the value of `RELATED_PARTY` relationship attribute must be set to null flavor `DER` | derived | to indicate that the information derivable – in this case from the subject relationship context of the `BOUND_DATA_ELEMENT` meaning attribute). This avoids having to duplicate the value.

The instance expression below represents the observation that the father of the subject of the record has ischemic heart disease. The fact that this observation applies to the father (rather than the record subject) is represented by a subtype of person in the family.

#### Example 2 Father has ischemic heart disease

```
408732007 | subject relationship context | = 66839005 | father |
243796009 | situation with explicit context | :
{ 246090004 | associated finding | = 414545008 | ischemic heart disease |
  , 408729009 | finding context | = 410515003 | known present |
  , 408731000 | temporal context | = 410513005 | past |
  , 408732007 | subject relationship context | = 66839005 | father | }
```

For unbound data the `RELATED_PARTY` subject\_of\_information attribute would specify the value:

66839005 | father |

Within an instance of a `BOUND_DATA_ELEMENT` it is also possible to represent a family history of ischemic heart disease using the following simpler, close to user form.

#### Example 3 Family history of ischemic heart disease

57177007 | family history of | : 246090004 | associated finding | = 414545008 | ischemic heart disease |

This can be refined to indicate the affected family member is the father as in the following instance expression.

Example 4 Father has ischemic heart disease

```
57177007 | family history of | :
246090004 | associated finding | = 414545008 | ischemic heart disease |
, 408732007 | subject relationship context | = 66839005 | father |
```

This expression has exactly the same meaning as the first, more verbose, example and conforms to the semantic expression constraint for a subject of information that is not the subject of the record.

## 4.4 Representing Uncertainty and Negation

Technical Models may need to support uncertainty and / or negation requirements. As shown in section 4.2.3 the finding context of contemporary and retrospective observations is used to assert the presence or absence of the associated finding with varying degrees of certainty. Similarly the procedure context can be used to assert that a procedure was *not done*.

### 4.4.1 Uncertainty and Negation in Observation Instances

An observation instance with a finding context value conforming to the following constraint indicates that the finding is / was actually present (versus being ruled out or considered):

```
408729009 | finding context | = ( << 410515003 | known present | )
```

*Known present* subsumes the term *probably present* as well as *definitely present* and *confirmed present*. A finding about a patient who is said to *probably* have asthma can therefore be represented as in the following instance expression.

Example 5 Patient (i.e. subject of record) is said to *probably* have asthma

```
= 243796009 | situation with explicit context | :
{ 246090004 | associated finding | = 195967001 | asthma |
, 408729009 | finding context | = 410592001 | probably present |
, 408731000 | temporal context | = << 410585006 | current - unspecified |
, 408732007 | subject relationship context | = 410604004 | subject of record | }
```

Negative history or negative past history, on the other hand, is indicated by a finding context value that conforms to:

```
408729009 | finding context | = ( ( << 410516002 | known absent | ) OR ( << 428263003 | NOT
suspected | ) )
```

As noted in section 4.2.3.2.3 a negative past history also requires that the obs\_time state a null flavor UNK | unknown | and that the temporal context value conforms to the constraint:

```
408731000 | temporal context | = ( ( << 410589000 | all times past | ) )
```

Note that only the most general constraint should be applied to the finding context of an OBSERVATION\_ELEMENT as it cannot be known in advance whether an instance will affirm or negate a stated finding:

```
408729009 | finding context | = ( ( << 36692007 | known | ) OR ( << 261665006 | unknown | ) )
```

#### 4.4.2 Uncertainty and Negation in Activity Instances

An activity instance with a finding context value conforming to the following constraint indicates that the procedure is either *in progress* or has *ended*:

```
408730004 | procedure context | = ( (< 410523001 | post-starting action status | ) )
```

*In progress* subsumes the term *started* and *suspended* while *ended* subsumes *done* and *discontinued*. A procedure that has been completed is thus represented by a procedure context conforming to the constraint:

```
408730004 | procedure context | = (<< 385658003 | done | )
```

To assert that a procedure was not done, the procedure context value must conform to:

```
408730004 | procedure context | = (<< 385660001 | not done | )
```

For a negative past history this also requires that the obs\_time state a null flavor UNK | unknown | and that the temporal context value conforms to the constraint:

```
408731000 | temporal context | = (<< 410589000 | all times past | )
```

To assert that the action status of a procedure is unknown, the procedure context value must conform to:

```
408730004 | procedure context | = (<< 410537005 | action status unknown | )
```

Only the most general constraint should be applied to the procedure context of an ACTIVITY\_ELEMENT as the status of the activity cannot be known in advance:

```
408730004 | procedure context | = ( (< 410523001 | post-starting action status | ) OR (<< 385660001 | not done | ) OR (<< 410537005 | action status unknown | ) )
```

## 5 Technical Model Refinement

### 5.1 Refinement of Clinical Focus

The clinical focus concept of the `BOUND_DATA_ELEMENT` meaning attribute is the value of the associated finding or procedure attribute of the situation with explicit context. For `OBSERVATION_ELEMENT`s and `ACTIVITY_ELEMENT`s the following steps may be taken to increase the expressiveness and specificity of the clinical focus concept to help satisfy a given care record information requirement:

- selecting for the focus concept, the SNOMED CT concept that most closely matches the stated requirement;
- including and applying values to SNOMED CT concept model attributes that add detail and specificity to the focus concept; and
- 'indirect' use of concept model attributes such as the application of laterality to a finding or procedure - in this case, the laterality logically applies to the finding or procedure site (this is a close to user representation).

Refinement by the application of values to concept model attributes and the indirect use of concept model attributes only applies focus concepts that belong to a SNOMED CT hierarchy for which concept model attributes are defined. This includes focus concepts belonging to the following hierarchies:

- Clinical finding
- Procedure
- Pharmaceutical/biologic product
- Event
- Specimen

The current SNOMED CT Concept Model does not specify any defining attributes for concepts in the following hierarchies that can participate as 'focus concepts' in LRA designs and consequently attribute refinement cannot be applied to any focus concepts that belong to them.

- Observable entity
- Record artefact

The concept model attributes that may be refined depend on hierarchy to which the focus concept belongs not on whether the concept is the value of an associated finding or the value of an associated procedure. Consequently an evaluation procedure or laboratory procedure focus concept acting as an associated finding within a `PROPERTY_OBSERVATION_ELEMENT` can still only be refined using the concept model attributes that define it as some type of procedure. Equally, an observable focus concept acting as an associated finding within a `PROPERTY_OBSERVATION_ELEMENT` or an associated procedure within an `INVESTIGATION_ACTIVITY_ELEMENT` cannot be refined.

The following sections describe the refinement of a number of selected concept model attributes of clinical finding, procedure and pharmaceutical / biologic product

focus concepts to address some commonly encountered care record information requirements.

**This guidance is not exhaustive and likely to be expanded in future versions of this document to provide guidance on other concept attribute refinements used where specialised or extended within the LRA. For further guidance on the attributes described the reader is recommended to consult the SNOMED CT User Guide [10] and various domain-specific editorial policy / modelling guides.**

### 5.1.1 Refinement of Clinical Findings

The following guidance applies to FINDING\_OBSERVATION\_ELEMENTS in which the focus concept within the meaning attribute is a subtype of *clinical finding*.

#### 5.1.1.1 Finding Site

The finding site attribute specifies the body site affected by a condition. The refinement of a clinical finding with a finding site is defined by the following constraint.

```
< 404684003 | clinical finding |
  363698007 | finding site |
  = ( << 442083009 | anatomical or acquired body structure | )
```

The finding site value is taken from either the *anatomical structure* hierarchy or the *acquired body structure* hierarchy both of which are subsumed by the top level concept of *body site*.

#### 5.1.1.2 Finding Laterality

The *laterality* attribute is used in the pre-coordinated definition of *body structure* concepts. In post-coordinated expressions, it can potentially be used to modify body structures, procedures, diseases, and findings. Laterality applied to a finding site directly conforms to the following constraint:

```
< 404684003 | clinical finding |
  363698007 | finding site |
  = ( << 442083009 | anatomical or acquired body structure | )
    : 272741003 | laterality | = < 182353008 | side |
```

When applied to disease or finding concepts that refer to a single body structure, the laterality is actually modifying the underlying body site rather than the finding itself. The general constraint for the indirect application of laterality is expressed as a *literal expression* constraint with the following form.

```
< 404684003 | clinical finding | : 272741003 | laterality | = < 182353008 | side |
```

The body structure to which the laterality is applied, either directly or indirectly, must be bilaterally symmetrical body structure, i.e. exist on opposite sides of the body.

Fracture of left femur and right tibia may therefore be represented as shown in the following instance expression.

#### Example 6 Fracture of left femur

```
= ( 243796009 | situation with explicit context |
  { 246090004 | associated finding | = ( 71620000 | fracture of femur | :
    272741003 | laterality | = 7771000 | left | )
    , 408729009 | finding context | = 410515003 | known present |
    , 408731000 | temporal context | = 410584005 | current - specified |
    , 408732007 | subject relationship context | = 410604004 | subject of record | } )
```

Laterality can be used to modify clinical finding concepts that involve more than one body site, but only if both sites have the same value for laterality (both left, both right, or both bilateral).

Clinical findings that involve multiple sites with differing values for laterality must be represented as separate observation instances rather than being post-coordinated within a single instance. A second fracture, say of the right tibia, would therefore require another finding observation instance as shown.

#### Example 7 Fracture of right tibia

```
= 243796009 | situation with explicit context |
{ 246090004 | associated finding | = ( 31978002 | fracture of tibia |
272741003 | laterality | = 24028007 | right | )
, 408729009 | finding context | = 410515003 | known present |
, 408731000 | temporal context | = 410584005 | current - specified |
, 408732007 | subject relationship context | = 410604004 | subject of record | }
```

Laterality constraints must be specified if there is a requirement to specify unambiguously the side of the body to which the finding or procedure applies.

#### 5.1.1.3 Causative Agent

This attribute identifies the direct causative agent of a disease. It does not include vectors, e.g. a mosquito that transmits malaria. Permissible values for the attribute are specified by the following constraint:

```
< 404684003 | clinical finding |
246075003 | causative agent |
= ( ( < 410607006 | organism | )
OR ( < 78621006 | physical force | )
OR ( < 105590001 | substance | )
OR ( < 373873005 | pharmaceutical / biologic product | )
OR ( < 260787004 | physical object | ) )
```

The causative agent constraint is used and further refined in the domain model representation of allergy and adverse reaction events and propensities. This is illustrated by the following instance expression that represents an adverse reaction propensity to penicillin.

#### Example 8 Adverse reaction to penicillin

```
= 243796009 | situation with explicit context |
{ 246090004 | associated finding | = ( 419511003 | propensity to adverse reactions to drug |
:
246075003 | causative agent | = 373270004 | penicillin -class of antibiotic- | )
, 408729009 | finding context | = 410515003 | known present |
, 408731000 | temporal context | = 410512000 | current or specified |
, 408732007 | subject relationship context | = 410604004 | subject of record | }
```

#### 5.1.2 Refinement of Procedures

The following guidance applies to ACTIVITY\_ELEMENTs and PROPERTY\_OBSERVATION\_ELEMENTs in which the focus concept within the meaning attribute is a subtype of *procedure*.

### 5.1.2.1 Method

This attribute represents the action performed to accomplish the procedure. It does not include the access (e.g. percutaneous), approach (e.g. translumbar), equipment (e.g. sutures), or physical forces (e.g. laser energy).

```
< 71388002 | procedure | :
    260686004 | method | = < 129264002 | action |
```

### 5.1.2.2 Procedure Site

The *procedure site – Direct* attribute identifies the anatomical structure or site at which the action of the procedure is *directly* aimed. Permissible values for the attribute are specified by the following constraint:

```
< 71388002 | procedure | :
    , 405813007 | procedure site - Direct | :
    = ( << 442083009 | anatomical or acquired body structure | )
```

The attribute should be used for body structures that are to be removed or have been removed by a procedure with a *method of removal-action* or one of its subtypes (e.g. *excision*, *surgical biopsy*, etc.). Removals of tissue lesions (cysts, tumours, etc.) also are considered to be removals of the site, and should therefore use procedure site - direct.

The *procedure site – Indirect* attribute identifies the anatomical site which is acted upon, but is not the direct object of the procedure. Typically a procedure also specifies the direct site of the action. Permissible values for the attribute are specified by the following constraint:

```
< 71388002 | procedure | :
    , << 405813007 | procedure site - Direct | :
    = ( << 442083009 | anatomical or acquired body structure | )
```

### 5.1.2.3 Procedure Laterality

The laterality attribute is used in the pre-coordinated definition of body structure concepts. In post-coordinated expressions, it can potentially be used to modify body structures, procedures, diseases, and findings. Laterality applied to a procedure site directly conforms to the following constraint:

```
< 71388002 | procedure | :
    , << 363704007 | procedure site | :
    = ( << 442083009 | anatomical or acquired body structure | ) :
    272741003 | laterality | = < 182353008 | side |
```

The *procedure site* attribute subsumes both *procedure site – Direct* and *procedure site – Indirect*. The general constraint for indirect application of procedure laterality is expressed as follows:

```
< 71388002 | procedure | :
    272741003 | laterality | = < 182353008 | side |
```

Laterality can be used to modify procedure concepts that involve more than one body site, but only if both sites have the same value for laterality (both left, both right, or both bilateral). Procedures that involve multiple sites with differing values for laterality must be represented as separate activity instances rather than being post-coordinated within a single instance.



#### 5.1.2.4 Route of Administration

The *route of administration* of a substance is a defining attribute of *administration of substance via specific route (procedure)* and its descendants as specified by the following constraint.

<< 433590000 | [administration of substance via specific route](#) |  
410675002 | [route of administration](#) | < 284009009 | [route of administration value](#) |

This constraint therefore applies only to those MATERIAL\_ACTIVITY\_ELEMENTS in which the focus concept within the meaning attribute is a subtype of *administration of substance via specific route*.

#### 5.1.3 Refinement of Pharmaceutical / Biologic Products

The following guidance applies to MATERIAL\_ENTITY\_ELEMENTS in which the focus concept within the meaning attribute is a subtype type of *pharmaceutical / biologic product*.

##### 5.1.3.1 Has Dose Form

Has dose form specifies the dose form of a product with a value from the set specified by the following constraint:

< 373873005 | [pharmaceutical / biologic product](#) |  
411116001 | [has dose form](#) | < 105904009 | [type of drug preparation](#) |



## 6 Technical Model Patterns

### 6.1 Primary Design Patterns

A Primary Design Pattern is a class template designed for instantiating individual Domain Model or Constrained Domain Model elements (i.e. domain model classes) that conform to the pattern. A Primary Design Pattern can be created from and assert additional constraints, as described in this document, on any non-abstract Reference Model class. For non-abstract specialisations of `BOUND_DATA_ELEMENT`, for example, the meaning attribute may be further constrained to represent a common usage pattern of the class, e.g. family history, plan, goal, etc.

#### 6.1.1 `BOUND_DATA_ELEMENT` Primary Design Patterns

The following sections describe a selected number of primary design patterns for `BOUND_DATA_ELEMENT`s. Each pattern encapsulates a particular set of the design choices described in section 4 with the aim of providing a generalised solution to a commonly encountered requirement type. Having selected and applied the pattern the next steps are to refine it by applying one or more of the methods described in section 5 and to consider its links with other elements using the secondary design patterns described in section 6.2 (note that determination of secondary design patterns ).

##### 6.1.1.1 *Pattern Index*

Table 1 lists a number of selected `BOUND_DATA_ELEMENT` primary design patterns. The patterns are listed under a number of categorisations including care record information type, current / past history, and subject of record such that a given pattern may appear in more than one categorisation.

Table 2 Selected `BOUND_DATA_ELEMENT` Primary Design Patterns

Categorisation	Pattern
Finding Observation	Finding Observation – Current or past Finding Observation - Current Finding Observation - Past Finding Observation - Family History of
Property Observation	Property Observation – Current or past Property Observation - Current Property Observation - Past
General Activity	General Activity - Current General Activity - Past  General Activity - Family History
Investigation Activity	Investigation Activity - Current Investigation Activity - Past
Current or Past	Finding Observation – Current or past

	Property Observation – Current or past Finding Observation - Family History of General Activity - Family History of
Current	Finding Observation - Current Property Observation - Current General Activity - Current Investigation Activity - Current
Past History	Finding Observation - Past Property Observation - Past General Activity - Past Investigation Activity - Past
Family History	Finding Observation - Family History of General Activity - Family History of

### 6.1.1.2 Pattern Definitions

#### 6.1.1.2.1 Finding Observation – Current or past

Field	Constraint
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date and time where available
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( ( < 404684003   clinical finding   ) OR ( < 272379006   event   ) ) , 408729009   finding context  : = ( ( < 36692007   known   ) OR ( << 261665006   unknown   ) ) , 408731000   temporal context   = < 410510008   temporal context value   , 408732007   subject relationship context   = 410604004   subject of record   }

#### 6.1.1.2.2 Finding Observation - Current

Field	Constraint
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date and time where available
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( ( < 404684003   clinical finding   ) OR ( < 272379006   event   ) ) , 408729009   finding context   = ( ( < 36692007   known   )

Field	Constraint
	<pre> OR ( &lt;&lt; 261665006   unknown   ) ) , 408731000   temporal context   = ( ( &lt;&lt; 410512000   current or specified   ) AND ( ! &lt; 410513005   past   ) ) , 408732007   subject relationship context   = 410604004   subject of record   } </pre>

### 6.1.1.3 Finding Observation - Past

Field	Constraint
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date and time where available
meaning	<pre> = 243796009   situation with explicit context   : { 246090004   associated finding   = ( ( &lt; 404684003   clinical finding   ) OR ( &lt; 272379006   event   ) ) , 408729009   finding context   = ( ( &lt; 36692007   known   ) OR ( &lt;&lt; 261665006   unknown   ) ) , 408731000   temporal context   = ( &lt;&lt; 410511007   current or past   ) AND ( ! &lt; 15240007   current   ) ) , 408732007   subject relationship context   = 410604004   subject of record   } </pre>

### 6.1.1.4 Finding Observation - Family History of

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date and time where available
meaning	<pre> = 243796009   situation with explicit context   : { 246090004   associated finding   = ( ( &lt; 404684003   clinical finding   ) OR ( &lt; 272379006   event   ) ) , 408729009   finding context   = ( ( &lt; 36692007   known   ) OR ( &lt;&lt; 261665006   unknown   ) ) , 408731000   temporal context   = &lt; 410510008   temporal context value   , 408732007   subject relationship context   = &lt;&lt; 303071001   person in the family   } </pre>

### 6.1.1.5 Property Observation – Current or past

Field	Constraint
uid	
type	PROPERTY_OBSERVATION_ELEMENT
session_time	COMPOSITION

Field	Constraint
obs_time	Clinically relevant date/time required
value	SOME VALUE - QUANTITY/ORDINAL/CODED
Meaning	= 243796009   situation with explicit context   : { 246090004   associated finding   = ( ( < 363787002   observable entity   ) OR ( < 386053000   evaluation procedure   ) OR ( < 108252007   laboratory procedure   ) ) , = ( ( < 36692007   known   ) OR ( << 261665006   unknown   ) , 408731000   temporal context   : = < 410510008   temporal context value   , 408732007   subject relationship context   = 410604004   subject of record   }

### 6.1.1.6 Property Observation - Current

Field	Constraint
uid	
type	PROPERTY_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date/time required
value	SOME VALUE - QUANTITY/ORDINAL/CODED
Meaning	= 243796009   situation with explicit context   : { 246090004   associated finding   = ( ( < 363787002   observable entity   ) OR ( < 386053000   evaluation procedure   ) OR ( < 108252007   laboratory procedure   ) ) , = ( ( < 36692007   known   ) OR ( << 261665006   unknown   ) , 408731000   temporal context   = ( ( << 410512000   current or specified   ) AND ( ! < 410513005   past   ) ) , 408732007   subject relationship context   = 410604004   subject of record   }

### 6.1.1.7 Property Observation - Past

Field	Constraint
uid	
type	PROPERTY_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date/time required
value	SOME VALUE - QUANTITY/ORDINAL/CODED
Meaning	= 243796009   situation with explicit context   : { 246090004   associated finding   = ( ( < 363787002   observable entity   ) OR ( < 386053000   evaluation procedure   ) OR ( < 108252007   laboratory procedure   ) ) , = ( ( < 36692007   known   ) OR ( << 261665006   unknown   ) , 408731000   temporal context

Field	Constraint
	<code>= ( (&lt; 410511007   current or past   ) AND ( ! &lt; 15240007   current   ) ) , 408732007   subject relationship context   = 410604004   subject of record   }</code>

### 6.1.1.8 General Activity - Current

Field	Constraint
uid	
type	GENERAL_ACTIVITY_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant date and time where available
Meaning	<code>= 243796009   situation with explicit context   :  { 363589002   associated procedure    = ( ( &lt; 71388002   procedure   )  AND ( ! &lt; 386053000   evaluation procedure   )  AND ( ! &lt; 108252007   laboratory procedure   )  AND ( ! &lt; 432102000   administration of substance   )  AND ( ! &lt; 433590000   administration of substance via specific route   )  AND ( ! &lt; 33633005   prescription of drug   )  AND ( ! &lt; 75658007   prescription of therapeutic agent   )  AND ( ! &lt; 103742009   renewal of prescription   )  AND ( ! &lt; 243704004   provision of appliances   )  AND ( ! &lt; 183253002   provision of medical equipment   )  AND ( ! &lt; 404919001   wheat-free diet   )  AND ( ! &lt; 223456000   provision of a special diet   )  AND ( ! &lt; 440298008   dispensing of pharmaceutical/biologic product   )  )  , 408730004   procedure context    = ( ( &lt; 410523001   post-starting action status   ) OR ( &lt; 385660001   not done   ) )  , 408731000   temporal context    = ( ( &lt; 410512000   current or specified   ) AND ( ! &lt; 410513005   past   ) )  , 408732007   subject relationship context   = 410604004   subject of record   }</code>

### 6.1.1.9 General Activity - Past

Field	Value
uid	
type	GENERAL_ACTIVITY_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant time where available – prior to COMPOSITION
Meaning	<code>= 243796009   situation with explicit context   :  { 363589002   associated procedure    = ( ( &lt; 71388002   procedure   )  AND ( ! &lt; 386053000   evaluation procedure   )  AND ( ! &lt; 108252007   laboratory procedure   )  AND ( ! &lt; 432102000   administration of substance   )  )</code>

Field	Value
	<pre> AND ( ! &lt; 433590000   administration of substance via specific route   ) AND ( ! &lt; 33633005   prescription of drug   ) AND ( ! &lt; 75658007   prescription of therapeutic agent   ) AND ( ! &lt; 103742009   renewal of prescription   ) AND ( ! &lt; 243704004   provision of appliances   ) AND ( ! &lt; 183253002   provision of medical equipment   ) AND ( ! &lt; 404919001   wheat-free diet   ) AND ( ! &lt; 223456000   provision of a special diet   ) AND ( ! &lt; 440298008   dispensing of pharmaceutical/biologic product   ) ) , 408730004   procedure context   = ( ( &lt; 410523001   post-starting action status   ) OR ( &lt;&lt; 385660001   not done   ) OR ( &lt;&lt; 410537005   action status unknown   ) AND ( ! &lt; 385651009   in progress   ) ) , 408731000   temporal context   = ( &lt;&lt; 410511007   current or past   ) AND ( ! &lt; 15240007   current   ) ) , 408732007   subject relationship context   = 410604004   subject of record   } </pre>

#### 6.1.1.10 General Activity - Family History of

Field	Value
uid	
type	GENERAL_ACTIVITY_ELEMENT
session_time	COMPOSITION
obs_time	Relevant clinical date and time
Meaning	<pre> = 243796009   situation with explicit context   : { 363589002   associated procedure   = ( ( &lt; 71388002   procedure   ) AND ( ! &lt; 386053000   evaluation procedure   ) AND ( ! &lt; 108252007   laboratory procedure   ) AND ( ! &lt; 432102000   administration of substance   ) AND ( ! &lt; 433590000   administration of substance via specific route   ) AND ( ! &lt; 33633005   prescription of drug   ) AND ( ! &lt; 75658007   prescription of therapeutic agent   ) AND ( ! &lt; 103742009   renewal of prescription   ) AND ( ! &lt; 243704004   provision of appliances   ) AND ( ! &lt; 183253002   provision of medical equipment   ) AND ( ! &lt; 404919001   wheat-free diet   ) AND ( ! &lt; 223456000   provision of a special diet   ) AND ( ! &lt; 440298008   dispensing of pharmaceutical/biologic product   ) ) , 408730004   procedure context   = ( ( &lt; 410523001   post-starting action status   ) OR ( &lt;&lt; 385660001   not done   ) OR ( &lt;&lt; 410537005   action status unknown   ) AND ( ! &lt; 385651009   in progress   ) ) , 408731000   temporal context   : </pre>

Field	Value
	<pre> = &lt; 410510008   temporal context value   = &lt;&lt; 303071001   person in the family   } </pre>

### 6.1.1.11 Investigation Activity - Current

Field	Constraint
uid	
type	INVESTIGATION_ACTIVITY_ELEMENT
session_time	COMPOSITION
obs_time	Clinically relevant time where available
Meaning	<pre> = ( 243796009   situation with explicit context   :   { 363589002   associated procedure       = ( ( &lt; 386053000   evaluation procedure   )       OR ( &lt; 108252007   laboratory procedure   )       OR ( &lt; 363787002   observable entity   ) )     , 408730004   procedure context         = ( ( &lt; 410523001   post-starting action status   ) OR (&lt;&lt; 385660001   not         done   ) )     , 408731000   temporal context       = ( ( &lt;&lt; 410512000   current or specified   ) AND ( ! &lt; 410513005   past         ) )     , 408732007   subject relationship context   = &lt; 125676002   person   } ) </pre>

### 6.1.1.12 Investigation Activity - Past

Field	Constraint
uid	
type	INVESTIGATION_ACTIVITY_ELEMENT
session_time	COMPOSITION
obs_time	Date and time specified or unspecified
Meaning	<pre> = 243796009   situation with explicit context   :   { 363589002   associated procedure       = ( ( &lt; 386053000   evaluation procedure   )       OR ( &lt; 108252007   laboratory procedure   )       OR ( &lt; 363787002   observable entity   ) )     , 408730004   procedure context   = ( ( &lt; 410523001   post-starting action       status   ) OR (&lt;&lt; 385660001   not done   ) OR (&lt;&lt; 410537005   action status       unknown   ) AND ( ! &lt; 385651009   in progress   ) )     , 408731000   temporal context       = ( &lt;&lt; 410511007   current or past   ) AND ( ! &lt; 15240007   current   ) )     , 408732007   subject relationship context   = 410604004   subject of       record   } </pre>

## 6.2 Secondary Design Patterns

A secondary design pattern describes the semantic relationship between a RECORD\_COMPONENT instance that is the subject of the relationship and a RECORD\_COMPONENT instance that is the object of the relationship within a Domain Model. A given relationship may be involved in one or more secondary

design patterns; and a given RECORD\_COMPONENT may be involved as a subject and / or object in zero or more Secondary Reuse Patterns.

This area of the guidelines is under development and the following sections summarise those limited areas where design guidance can be given.

### 6.2.1 Finding Observation Links

Findings may be the source or target of any number of COMPONENT\_RELATIONSHIP\_ELEMENTS. These relationships are used in any case where there is a requirement to indicate or assert an association between two findings or between a finding and any other type of record component.

The SNOMED CT concept 416083004 | **has reason** is recommended for use as shown in the following example. No guidance on any other link assertion sub-types is included as a matter of policy pending further study of the whole area for LRA Release 3.

#### Example: Renal failure due to past history of pyelonephritis

Table: Chronic renal failure

Field	Value
uid	f7b5adf0-7e0c-4038-a47f-aa37edaac572
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Flavor of null:UNK or DER
Meaning	= 243796009   <b>situation with explicit context</b>  : { 246090004   <b>associated finding</b>   = 90688005   <b>chronic renal failure syndrome</b>   , 408729009   <b>finding context</b>   = 410515003   <b>known present</b>   , 408731000   <b>temporal context</b>   = 15240007   <b>current</b>   , 408732007   <b>subject relationship context</b>   = 410604004   <b>subject of record</b>   }

Table: 'has reason'

Field	Value
uid	7ec1df29-0899-46ed-9044-22cee994b936
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	Flavor of null:UNK or DER
Meaning	= 416083004   <b>has reason</b>
sourceUid	f7b5adf0-7e0c-4038-a47f-aa37edaac572
targetUid	8be02600-e112-4693-b676-ae6fa477d05b

Table: Past history of pyelonephritis

Field	Value
uid	8be02600-e112-4693-b676-ae6fa477d05b
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	Flavor of null:UNK or DER



Field	Value
Meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 45816000   pyelonephritis   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 410513005   past   , 408732007   subject relationship context   = 410604004   subject of record   }

### 6.2.2 Property Observation Links

Property observations may be the source or target of any number of COMPONENT\_RELATIONSHIP\_ELEMENTS. These relationships are used in any case where there is a requirement to indicate or assert an association between two property observations or between a property observations and any other type of record component.

Many of the uses of relationships for Property Observation will be similar to those used for finding observations. However, relationships may also be used for several purposes that are specific to (or at least more commonly required with) property observations.

- Linking a property observation to the activity (e.g. measurement procedure) from which it was derived.
- Linking a property observation to a specific clinical perspective (e.g. a blood pressure taken during an operative procedure)
- Linking several property observations into a logical group (e.g. the systolic and diastolic components of a blood pressure).
- Relating a property observation to a request for an investigation.

As already indicated, guidance will be available in a LRA Release 3 revision of this document.

### 6.2.3 Investigation Links

Procedures may be the source or target of any number of COMPONENT\_RELATIONSHIP\_ELEMENTS. These relationships are used in any case where there is a requirement to indicate or assert an association between two procedures or between a procedure and any other type of record component.

The nature of relationship is specified by the *meaning* field. The time that the relationship was asserted is specified by the *session\_time* field. If the relationship itself has a clinically relevant time this can be specified using the *obs\_time* field.

Some uses of relationships are similar for all types of activity:

- Linking subsidiary parts of more general procedure together (e.g. linking anaesthetic related activities to a surgical procedure).
- Linking a procedure to finding, problem or disorder it is intended to address (e.g. associating a prescription for antibiotics with a specified infection).
- Linking records are different stages or preparing for and completing and activity (e.g. request, plan, start and completion).
- Some relationships are specific to investigation activities:

- Linking an investigation activity to property observation resulting from that activity.

As already indicated, guidance will be available in a LRA Release 3 revision of this document.

## 6.2.4 Record Artefact Links

The following concepts required to support use of record artefacts

Concept	Usage
416271009   <a href="#">has problem member</a>	A link between a record entry and a problem (represented as a record artefact) of which it forms a part.
416586004   <a href="#">has problem name</a>	A link between the record artefact that represent a problem and another record component which provides the current name for that problem.
# 100999   <a href="#">has record role</a>	<i>Proposed addition</i> A link between a record component and a record artefact which asserts a role the record component has in the record as a whole

## 6.3 Common Patterns of Clinical Recording

This section describes common patterns of clinical recording which can be constructed from primary and secondary design patterns, applying additional constraints as necessary.

The patterns which are adapted from the common patterns detailed SNOMED CT Bindings for Common Recording Patterns [8], serve as design specifications for LRA Domain Models and many of them are implemented as such. Each pattern describes its rationale based on common recording and clinical practice and specifies any primary and secondary patterns from which it is constructed.

### 6.3.1 Problems and Issues

#### 6.3.1.1 Introduction

Problems and Issues are needs or related requirements to be resolved or noted, and are perceived as a problem or issue by a patient, carer or a Care Professional.

The description of Problems in the NHS Care Record Elements document has been used as the base on which this area has been defined for LRA.

A problem or issue may be the reason that the patient seeks help from a Care Professional or may be an ongoing problem which the patient is coping with. This can be either the patient's complaint or the Care Professional's observation, and includes items such as disease states, medical conditions, and responses and reactions to therapies.

Whilst a Problem or Issue is a key element of the NHS Care Record, it may be related to information recorded elsewhere. The Problem or Issue will typically be as recalled by the patient or as identified by a Care Professional (e.g. as a Diagnosis or a Finding). As the patient's condition develops, more may be known about a Problem or Issue and this may lead to that Problem or Issue being renamed. Following the approach used in the Care Record Element document (and by primary care in the UK), a problem is modelled as an aspect of an item of clinical data, in other words

the Problem Member is a pointer to where this relevant clinical data has been recorded.

The definition of Problems and Issues in the NHS Care Record Elements document covers the tracking of unmet needs, as well as organisation aspects of the medical record. General Practice systems in the UK implement Larry Weed's problem orientated medical record.

The representation of problems requires three different types of information and the relationships between them to be represented. The types of information are:

- The problem header
- The problem title
- Problem membership

### **6.3.1.2 Problem header**

The Problem header is represented in LRA as a `RECORD_ARTEFACT_ELEMENT`. There is one problem header for each discrete problem or issue. The header itself does not contain specific clinical information and exists only as a node to which other record components are linked to represent the problem title and problem membership. The *meaning* field of the record artefact must contain the following fixed expression.

162991000000102 | [Problems and Issues](#) |

The problem header element acts as a node which represents each problem that appears in the problem list. However, the name of the problem (as shown in the problem list) is carried in a separate record component that is linked to the problem header. This enables the name to change without changing the organisation of other items of information related to the problem.

### **6.3.1.3 Problem name**

The problem name is the clinical label currently assigned to a given item in the problem list. The problem name is a record element in its own right and can also be considered as a problem member. It is recognisable as the problem name because it is linked to the problem header by a `COMPONENT_RELATIONSHIP_ELEMENT` with a *meaning* field containing the following fixed expression:

416586004 | [has problem name](#) |

The problem name is usually a clinical finding (such as the name of a disorder) represented by a `FINDING_OBSERVATION_ELEMENT`. However, where appropriate, a procedure represented using a `GENERAL_ACTIVITY_ELEMENT` (or another specialisation of `ACTIVITY_ELEMENT`) may be used to name a problem.

Previous sections of this document provided guidance on the use of both of these LRA care record information types.

The problem name may change over a period of time. Initially the problem name may be the main complaint as expressed by the patient (e.g. chest pain), and may progress to a specific clinical label (e.g. acute anteroapical myocardial infarction). When the problem is created and each time the problem name changes, the relevant finding is linked to the problem header as the problem name. The previous name is thus replaced but the same finding may remain a valid member of the problem.

The *problem name* may be any record component that conforms to the Care Components model. The representation of a finding or procedure is not altered by the decision to use it as the name of a problem.

#### 6.3.1.4 Problem members

Problem members are any type of record component that are linked to the problem header by a COMPONENT\_RELATIONSHIP\_ELEMENT with a *meaning* field containing the following fixed expression:

416271009 | [has problem member](#) |

The same record component may be a member of more than one problem.

#### 6.3.1.5 Refinement

The *problem name* and *problem members* may be refined in any way permitted for the relevant focus concept. This includes support for direct lateralisation where this is appropriate. See details and examples in the sections on Clinical Findings.

The need for a succinct name to appear in a problem list may limit the practical use of complex post-coordinated expressions as *problem names*.

The *problem header* must not be refined.

#### 6.3.1.6 Links to problem name and problem members

The *problem name* and *problem members* are linked to the *problem header* using instances of the COMPONENT\_RELATIONSHIP\_ELEMENT which conform to one of the following constraints:

Table Problem name relationship

Field	Value
uid	c4344375-4e12-42ed-8e5e-822f4cfd987e
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	Use clinically significant time where available
meaning	= 416586004   <a href="#">has problem name</a>
sourceUid	Refers to the problem header
targetUid	Refers to the problem name

Table Problem member relationship

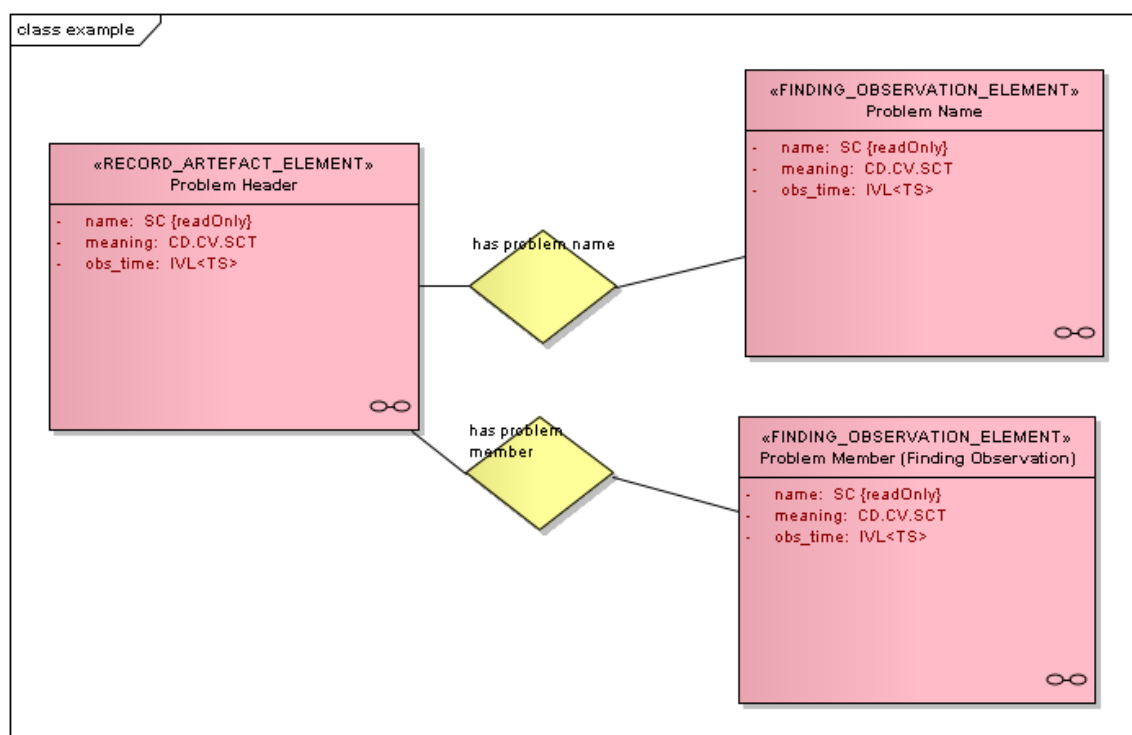
Field	Value
uid	e385b47e-349b-40ef-9e8c-8d9aae49a52b
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	Use clinically significant time where available
meaning	= 416271009   <a href="#">has problem member</a>
sourceUid	Refers to the problem header
targetUid	Refers to the problem member

At any point in time there will be only one current instance of the *problem name relationship*. However, there may be any number of active instances of the *problem member relationships* (and any number of previous *problem name relationships*).

*Problem names* and *problem members* are subject to same constraints that would apply to record component of the Care Record Information types. There is no

specific Primary Pattern or other guidance as part of this Problems section of the document.

The pattern for Problems and Issues is illustrated in the diagram below.



### 6.3.1.7 Examples

#### Pattern example: Renal failure problem group

This example represents a single problem list entry ("renal failure") with a collection of four other record entries represented as part of the same problem.

Table: Problem header

Field	Value
uid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
type	RECORD_ARTEFACT_ELEMENT
session_time	COMPOSITION
obs_time	10/09/2009 - time 14:25
meaning	= 162991000000102   <a href="#">Problems and Issues</a>

Table Chronic renal failure (Problem Name)

Field	Value
uid	9ea18251-9595-4cd2-92aa-4b7763a0f27e
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	10/09/2009 - time 14:25
meaning	= 243796009   <a href="#">situation with explicit context</a>  : { 246090004   <a href="#">associated finding</a>   = 90688005   <a href="#">chronic renal failure syndrome</a>

Field	Value
	, 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }

Table: Problem name relationship

Field	Value
uid	146b964b-19da-479a-a32d-4a4f80060ec2
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 416586004   has problem name
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	9ea18251-9595-4cd2-92aa-4b7763a0f27e

Table: First Problem member relationship: acute renal failure

Field	Value
uid	feead09d-d953-4141-b558-ca03b61e9b97
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 416271009   has problem member
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	9ea18251-9595-4cd2-92aa-4b7763a0f27e

Table: Past history of pyelonephritis

Field	Value
uid	265b00d9-5c8d-42d3-a511-a44d7d098370
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 45816000   pyelonephritis   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 410513005   past   , 408732007   subject relationship context   = 410604004   subject of record   }

Table Second Problem member relationship: Past history of pyelonephritis

Field	Value
uid	feead09d-d953-4141-b558-ca03b61e9b97
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED

Field	Value
meaning	= 416271009   has problem member
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	265b00d9-5c8d-42d3-a511-a44d7d098370

**Table: history of clinical finding: = blood in urine**

Field	Value
uid	0e3e3e95-b49b-45ba-9fd5-a7a868282119
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= ( 417662000   history of clinical finding  : 246090004   associated finding   = 34436003   blood in urine   )

**Table: Third Problem member relationship: history of clinical finding:= blood in urine**

Field	Value
uid	d9d725bd-b699-43cc-b3ca-9dc1464e3242
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 416271009   has problem member
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	0e3e3e95-b49b-45ba-9fd5-a7a868282119

**Table: Systolic Blood pressure**

Field	Value
uid	cb86a109-5d0a-4f57-98ef-7acf366d97c8
type	PROPERTY_OBSERVATION_ELEMENT
session_time	09/07/2009 - time 09:00
obs_time	UNSPECIFIED
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 271649006   systolic blood pressure   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }
value	120 Unit: mm[Hg]

**Table: Fourth Problem member relationship: Systolic Blood pressure**

Field	Value
uid	05fa2678-c06e-4819-bea8-f07cdd0649bf
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 416271009   has problem member



Field	Value
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	cb86a109-5d0a-4f57-98ef-7acf366d97c8

**Table: Diastolic Blood pressure**

Field	Value
uid	92f54432-af4f-4b93-b44c-414ff6c574fb
type	PROPERTY_OBSERVATION_ELEMENT
session_time	09/07/2009 - time 09:00
obs_time	UNSPECIFIED
meaning	= 243796009   situation with explicit context   : { 246090004   associated finding   = 271650006   diastolic blood pressure   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }
value	85 Unit: mm[Hg]

**Table: Fifth Problem member relationship: Diastolic Blood pressure**

Field	Value
uid	357d3ffb-a135-4e84-b5ed-c6479dd46233
type	COMPONENT_RELATIONSHIP_ELEMENT
session_time	COMPOSITION
obs_time	UNSPECIFIED
meaning	= 416271009   has problem member
sourceUid	53b7c478-29b1-4402-bb26-d657ccbfcbbf
targetUid	92f54432-af4f-4b93-b44c-414ff6c574fb

## 6.3.2 Diagnoses

### 6.3.2.1 Introduction

The definition that follows has been modified from the description of Diagnoses in the NHS Care Record Elements document (v3) document, by the addition of the underlined text, to clarify the distinction between a diagnostic decision and a treatment decision.

Diagnoses are decisions about the nature of a condition arrived at as a result of a synthesis of signs, symptoms, investigations (i.e. findings), and theoretical knowledge. Conditions that may be diagnoses include diseases, disorders, syndromes and physiological states such as pregnancy.

The recording of a Diagnosis should be seen as being true at a particular point in time. A Care Professional will make a Diagnosis using the information available at that time. Diagnoses will potentially progress over time as new information becomes available.

Diagnoses are represented by a pair of related record components. One of these contains the clinically relevant name of the diagnosis (e.g. pyelonephritis); the other tags this as a diagnosis with a particular status (e.g. primary diagnosis).



The *diagnosis name* is a *FINDING\_OBSERVATION\_ELEMENT* which represents the clinical nature of the diagnosis. This component follows the general pattern for representing clinical findings, given later in this guidance document.

In common with other finding observations, a *diagnosis name* is intended to fully represent the clinically relevant nature of a clinical finding. It needs to be distinguished as a *diagnosis name* of a particular type by appropriate qualification. No terminology guidance can yet be offered in this area pending further study during the LRA Release 3 development phase.

### 6.3.3 Current Conditions

The history of the current condition is an account of the symptoms as experienced by the patient. The informer may be the patient or someone other than the patient (e.g. a parent or carer).

The pattern needs to capture detailed history of the current complaint or condition. The questions asked may result in positive or negative responses. It may be necessary to record extensive amounts of data relating to the condition and the anatomical or physiological system that is affected.

The main issues in this pattern are the detail to which symptom information is recorded and the requirement to record negative or normal symptoms.

This pattern needs to support both current data as well as historical data. Some symptoms may have existed for some time or may have existed at a point in time and are now resolved. Pattern usage therefore extends to the past medical history and system review pattern in that they both record patient history.

The history of current conditions findings is represented in LRA using instances of the *FINDING\_OBSERVATION\_ELEMENT* class.

The clinical focus concept in the *meaning* field represents the nature of the finding. .

The history of the current condition may also contain relevant past history information. This should follow the patterns described in the guidance in this document on **Error! Reference source not found.**

#### 6.3.3.1 Instance Examples

Table: Patient reported seeing blood in their urine recently

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	Flavor of null=UNK
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 34436003   blood in urine   : ) , 408729009   finding context   = 410592001   probably present   , 408731000   temporal context   = 6493001   recent   , 408732007   subject relationship context   = 410604004   subject of record   }

Table: Patient reported pain in left loin

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 10:00
obs_time	Flavor of null=UNK
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 271857006   loin pain  : 272741003   laterality   = 7771000   left   ) , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 410513005   past   , 408732007   subject relationship context   = 410604004   subject of record   }

### 6.3.4 Current Medications

LRA representation of medications is under development and therefore no guidance can be provided in this version of the guidance.

### 6.3.5 Review of Systems (admission note on patient's symptoms)

After the presenting history has been taken, a systems review may be undertaken to elicit additional undeclared symptoms. It is usual to review all the systems in a comprehensive history. It is often sufficient to ask a few high level questions to check that each system is asymptomatic, but it may be necessary to ask detailed questions to explore areas where significant history may exist.

The pattern needs to capture history details of all the major systems. The questions asked may result in positive or negative responses or may be left unanswered. Depending on whether the patient has relevant symptoms relating to a particular system, it may be necessary to record more or less data about an individual system.

This pattern is related to the past medical history and history of the current complaint pattern in that they all record patient history.

The main issues in this pattern are the degree to which summary type information is recorded and the requirement to record negative or normal symptoms.

Some symptoms may have existed for some time or may have existed at a point in time but may no longer be present. The pattern needs to represent this historical data using the SNOMED CT 'temporal context' attribute and the *obs\_time* information model attribute in a similar way to the 'past medical history' pattern.

System review findings are represented using instances of the FINDING\_OBSERVATION\_ELEMENT class.

#### 6.3.5.1 Primary Design Patterns Used

The Review of Systems common recording pattern uses the following primary design patterns:

- Finding Observation – Current or past
- Finding Observation - Current
- Finding Observation - Past

#### 6.3.5.2 Instance Examples

##### History of haematuria: (post-coordinated form)

**Note:** that this is the same representation as example 1 in the 'past medical history' pattern.

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 10:00
obs_time	Null favour = UNK
meaning	= 413350009   finding with explicit context   { 246090004   associated finding   = 53298000   haematuria syndrome  , 408729009   finding context   = 410515003   known present  , 408731000   temporal context   = 410513005   past   }

### History of haematuria: (pre-coordinated form)

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 10:00
obs_time	Null favour = UNK
meaning	= 53298000   haematuria syndrome

### No history of cough:

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/08/2009 - time 10:00
obs_time	Null favour = UNK
meaning	= 413350009   finding with explicit context   { 246090004   associated finding   = 49727002   cough  , 408729009   finding context     = 410516002   known absent  , 408731000   temporal context   = 410589000   all times past   }

## 6.3.6 Examination Findings

### 6.3.6.1 Introduction

Clinical examination is the process by which a health care professional investigates the body of a patient for signs of disease.

The pattern needs to capture examination details of all the major systems. Depending on whether the patient has relevant findings relating to a particular system it may be necessary to record more or less data about an individual system.

### 6.3.6.2 Primary Design Patterns Used

The Examination Findings common recording pattern uses the following primary design patterns:

- Finding Observation - Current

- Finding Observation - Past

### 6.3.6.3 Instance examples

The following example shows the representation of two findings (absence of tenderness in the right loin and severe tenderness in the left loin) and three property observations (a raised temperature and systolic and diastolic blood pressure).

Table: Not tender in right renal area

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	10/07/2009 - time 12:15
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 102830001   renal angle tenderness  : 272741003   laterality   = 24028007   right   ) , 408729009   finding context   = 410516002   known absent   , 408731000   temporal context   = 410586007   current - specified   , 408732007   subject relationship context   = 410604004   subject of record   }

Table: Tender in left renal area

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	COMPOSITION
obs_time	10/07/2009 - time 12:15
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 102830001   renal angle tenderness  : 246112005   severity   = 24484000   severe   , 272741003   laterality   = 7771000   left   ) , 408729009   finding context   = 410605003   confirmed present   , 408731000   temporal context   = 410586007   current   , 408732007   subject relationship context   = 410604004   subject of record   }

Table: Systolic Blood pressure

Field	Value
uid	
type	PROPERTY_OBSERVATION_ELEMENT
session_time	10/07/2009 - time 12:15
obs_time	10/07/2009 - time 12:00
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 271649006   systolic blood pressure   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }
value	150 Unit: mm[Hg]

Table: Diastolic Blood pressure

Field	Value
uid	
type	PROPERTY_OBSERVATION_ELEMENT
session_time	10/07/2009 - time 12:15
obs_time	10/07/2009 - time 12:00
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 271650006   diastolic blood pressure   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }
value	105 Unit: mm[Hg]

Table: Body temp 37.5

Field	Value
uid	0021df8d-f294-4438-81f7-54a2a45b4274
type	PROPERTY_OBSERVATION_ELEMENT(Q)
session_time	COMPOSITION
obs_time	10/07/2009 - time 12:15
meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 386725007   body temperature   , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 15240007   current   , 408732007   subject relationship context   = 410604004   subject of record   }
value	37.5 Unit: Cel

### 6.3.7 Procedure Notes

#### 6.3.7.1 Introduction

Procedure note represent contemporaneous records of a procedure. This includes surgical procedures as well as other procedures and the proposed approach is intended to support notes kept at differing levels of detail.

In the simplest case, a record of the procedure as a whole is terminology bound and the remainder of the note is represented as narrative text. Where subsidiary information needs to be queried, retrieved and reused this is also captured in the note using terminology bound care record elements (but outside the scope of this guidance document).

Procedure notes are related to past records of procedures including past surgical history.

Procedure notes are also related to examination findings. Indeed, a detailed procedure note will often include examination findings arising from observations made during the procedure.

The procedure as a whole represented as an activity. However, a procedure note may also include finding and property observations. The way in which these are represented should be consistent with the general approach to representation of examination findings. Observations about an organ made during a surgical procedure may be qualitatively different from those made on a routine examination. However,

they should be represented using the same types of record component with similar terminology bindings.

### **6.3.7.2 Primary Design Patterns Used**

The Procedures Notes common recording pattern uses the following primary design patterns:

- Finding Observation - Current

### **6.3.7.3 Refinement**

#### **Recording information with a specific date and time**

The actual date and/or time (or period) at or during which the procedure was carried out must be recorded as the *obs\_time*.

- The 'temporal context' value in the *meaning* field should be the concept 'specified time' or one of its subtypes.
- The 'procedure context' must indicate whether the procedure was 'done' (i.e. completed) or is at some other stage (e.g. in progress).
- For recording information without a specific date see section 4.2.3.1.2.
- The 'procedure context' must indicate whether the procedure was 'done' (i.e. completed) or is at some other stage (e.g. in progress).

A detailed narrative description of the procedure may be included in one or more UNBOUND\_ELEMENTS linked to the GENERAL\_ACTIVITY\_ELEMENT

Elements of the detailed procedure note that need to be coded to support separate retrieval, reuse and analysis should be represented by other terminology-bound record components linked to the GENERAL\_ACTIVITY\_ELEMENT class. These linked elements may be of any of the kinds described in the section of this guidance on Common Types of Clinical Information.

For example, an observation made during a procedure should be represented using instances of *FINDING\_OBSERVATION\_ELEMENT* or *PROPERTY\_OBSERVATION\_ELEMENT*.

Guidance on representing the linkage is under study for LRA Release 3.

### **6.3.8 Past Medical History**

Past medical history is an account of a patient's past or concurrent medical conditions or problems and is usually confined to major illnesses. This is usually obtained by questioning the patient or a relative.

The main issue regarding the representation of past history is the relationship between the SNOMED CT temporal context attribute and the *obs\_time* field of the information model. The SNOMED CT temporal context is only relevant when there is no stated *obs\_time*. If there is a known *obs\_time* then this should always be the actual (or approximate) time and the SNOMED CT temporal context should not change this interpretation.

Where the *obs\_time* is known, this should be stated. In these cases, the temporal context may be 'current - specified' or 'past - specified'.

In cases where there is no stated *obs\_time*, the SNOMED CT temporal context indicates the time of the observation relative to the *session\_time* (or the best available proxy for the time of recoding). Therefore, when recording past history without an *obs\_time*, the temporal context 'past' indicates the finding was already regarded as in the past at the time of entry (*session\_time*).

This pattern is related to clinical findings patterns, including those that are the labels for diagnoses or problems as historical findings, diagnoses and problems, which have become part of the patient's medical history. It is similar to the past surgical history and medication history patterns in its use of the SNOMED CT temporal context attribute.

Past medical history is represented using instances of the *FINDING\_OBSERVATION\_ELEMENT* class.

The clinical focus concept in the *meaning* field represents the nature of the past medical condition.

The *session\_time* represents the time of recording.

The *obs\_time* field and the 'temporal context' of the *meaning* field together represent the fact that this is past rather than current information. This information must be represented using one of the patterns described below.

The pattern used to record past information depends on whether the actual or approximate date of occurrence is known and clinically relevant. The pattern used to retrieve past information depends on whether the requirement relates only to information explicitly recorded as past history or also includes information originally entered as current but which is now in the past.

### 6.3.8.1 Primary Design Patterns Used

The Past Medical History common recording pattern uses the following primary design patterns:

- Finding Observation - Past

### 6.3.8.2 Examples

Specified time in the past

Table: Patient reported seeing blood in their urine

Field	Value
uid	62eb5afb-4b86-4091-abe9-027997840999
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	28/06/2009
Meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = 34436003   blood in urine  : , 408729009   finding context   = 410515003   known present   , 408731000   temporal context   = 4105847003   past - specified   , 408732007   subject relationship context   = 410604004   subject of record   }

#### Notes:

Other values of | finding context | may be used to indicate uncertainty about whether the

conditions specified was present. For example, 410590009 | known possible | would indicate a possible past history of haematuria syndrome).

### Unspecified time in the past

Table: Patient reported seeing blood in their urine

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	Flavor of null: UNK
Meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 34436003   blood in urine  : 419066007   finding informer   = 410604004   subject of record   ) , 408729009   finding context   = 410592001   probably present   , 408731000   temporal context   = 410588008   past - unspecified   , 408732007   subject relationship context   = 410604004   subject of record   }



No history of haematuria

Table: Patient reported never having seen blood in their urine

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	Flavor of null:UNK
Meaning	= 243796009   situation with explicit context  : { 246090004   associated finding   = ( 34436003   blood in urine  : 419066007   finding informer   = 410604004   subject of record   ) , 408729009   finding context   = 410516002   known absent   , 408731000   temporal context   = 410587003   all times past   , 408732007   subject relationship context   = 410604004   subject of record   }

### 6.3.9 Past Surgical History

Past surgical history is an account of a patient's past surgical procedures. This is usually obtained by questioning the patient or a relative.

This pattern is related to surgical procedures which over time become part of the patient's surgical history. It is also related to the past medical history pattern with which it has close similarities.

Items of past surgical history are represented using instances of the GENERAL\_ACTIVITY\_ELEMENT class.

The clinical focus concept in the *meaning* field represents the nature of the surgical procedure.

The *session\_time* represents the time of recording.

The *obs\_time* field and the 'temporal context' of the *meaning* field together represent the fact that this is past rather than current information.

For all past surgical history and any other common patterns for past procedures

For guidance on recording past procedures with known date and unknown dates and for recording past procedure history see section 4.2.3.2.

#### 6.3.9.1 Primary Design Patterns Used

The Past Surgical History common recording pattern uses the following primary design patterns:

- General Activity - Past

### Examples

History of hip replacement:

Table: history of hip replacement-past –not specified

Field	Value
uid	
type	GENERAL_ACTIVITY_ELEMENT
session_time	29/06/2009 - time 11:00

Field	Value
obs_time	Flavor of null:UNK
meaning	= 129125009   procedure with explicit context   : { 363589002   associated procedure   = 397956004   prosthetic arthroplasty of the hip  , 408730004   procedure context   = 385658003   done  , 408731000   temporal context   = 410513005   past   }

Table: history of hip replacement-past-specified

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	Flavor of null:UNK
meaning	= 129125009   procedure with explicit context   : { 363589002   Associated procedure   = 397956004   prosthetic arthroplasty of the hip  , 408730004   procedure context   = 385658003   done  , 408731000   temporal context   = 410587003   past - specified   }

### 6.3.10 Family History

This pattern is used to represent significant family history.

The pattern is similar to the pattern for past medical history. The only significant difference is that it specifically refers to a family member other than the subject of the record.

A similar pattern should be used for representing a history of contact with a person or animal known to have a significant infectious disease.

The released data within SNOMED CT contains a pre-coordinated hierarchy for 'family history of' which contains the following first level descendants:

- 416702002 | family history observation |
- 416471007 | family history of clinical finding |
- 297249002 | family history of procedure |
- 287351000000105 | family history of substance misuse (situation) |
- 407559004 | family history unknown |
- 271393002 | family smoking history |
- 160266009 | no family history of |

The family history of observation and finding hierarchies are populated with the more common family history conditions that are of interest to the medical community and the content is modelled so that the normal form of family history of diabetes mellitus is the same as if a post-coordinated expression is created using the situation with explicit context. Note in particular the last concept, which is the root of a hierarchy containing negative family history.

Where the required pre-coordinated content is missing in the family history hierarchy, post-coordinated expressions should be created using the rules below. LRA

compliant systems must be able to receive, retrieve and reuse family history, based on the SNOMED CT context model representation of family history.

In addition to this representation of family member relationships, the LRA reference model has an RELATED\_PARTY class. This allows an association between clinical data and specific subjects of information other than the patient. The reference model assumes that the identification of people, organisations and relevant roles of these entities will be provided by PDS and SDS. However, roles that directly impact the meaning of clinical information fall within the scope of this guidance on modelling clinical information. For example, the relationship between a patient and a family member may be expressed as part of a SNOMED CT expression about family history. Therefore, where these roles are represented for an identified entity, LRA requires the relevant SNOMED CT concept to be used.

Family history must be represented either as a pre-coordinated concept or as a post-coordinated SNOMED CT expression that conforms to the constraints specified in the following sections. Where required, a specific family member may be identified using information model classes.

Most items of family history are represented by instances of the FINDING\_OBSERVATION\_ELEMENT class. However, if an item of family history refers specifically to a procedure, an instance of the GENERAL\_ACTIVITY\_ELEMENT class should be used.

Where a named member of the family is referenced, this should be through the RELATED\_PARTY class, as described in the LRA Technical Model Infrastructure Specification Part 2: Participations LRA document. This representation is additional too (and not a replacement for) the terminology based representation of family history described in the following sections.

### 6.3.10.1 Primary Design Patterns Used

The Family History common recording pattern uses the following primary design patterns:

- Finding Observation - Family History
- General Activity - Family History

### Examples

In the example below, the pre-coordinated expression is equivalent to the context dependant post-coordinated expression below it.

160303001 | FH: Diabetes mellitus |

Table: Family history of diabetes

Field	Value
uid	
type	FINDING_OBSERVATION_ELEMENT
session_time	29/06/2009 - time 11:00
obs_time	Flavor of null:UNK
meaning	413350009   finding with explicit context   { 246090004   associated finding   = 73211009   diabetes mellitus  , 408729009   finding context   = 410515003   known present  , 408731000   temporal context   = 15240007   current  , 408732007   subject relationship context   = 303071001   person

Field	Value
	in the family   }

### 6.3.11 Allergies and Adverse Reactions

Allergies and intolerances are described in *Representation in Electronic Patient Records of Allergic Reactions and Intolerance of Pharmaceutical Products*. This document represents an HL7 Version 3 based model which includes terminology requirements. The document distinguishes between 'Recording an ADR or allergic response to an Item of Medication' and 'Recording a clinician's opinion about future risk of (or propensity to) an allergy or other ADR if the patient is exposed to a substance'.

The document states the following:

It is possible to record allergies using SNOMED CT in a pre-coordinated or post coordinated form. While both methods of recording allergies are possible, the handling of the allergy codes by systems **should** follow the post-coordinated model. For safety, systems should only use pre-coordinated terms where they are identified and warranted by the supplier to be computationally equivalent to the post-coordinated term bearing in mind their use in other systems.

The document also discusses the mapping from pre-coordinated legacy codes, but this process is not within the current scope of this work.

Allergy and adverse reaction patterns are related to other clinical findings that involve substances, physical forces or organisms, e.g. poisoning, infections and radiation damage.

Allergy and adverse reaction patterns are also related to other conditions where there is a relationship between a manifestation of a disorder and an underlying disorder which for periods of time may not be manifest. Examples of this include epilepsy, sickle cell trait and many genetic dispositions.

Allergies and adverse reactions are a source of significant and avoidable ill health. Since they may result from uninformed clinical actions they offer an early opportunity for substantial benefits from effective clinical information systems. Erroneous interpretation of information related to allergies and adverse reactions has a high impact and thus consistent of representation and handling of this information in LRA compliant systems is extremely important.

Concerns have been expressed in the past about the appropriateness of SNOMED CT defining relationship for allergies, adverse reactions and substances. Although these have been greatly improved over the last few years it is important to note that defining relationships do not (and are not designed to) convey knowledge about cross-reactivity of different substances. Therefore, post-coordinated representations that explicitly identify the causative (or suspected causative) agent need to be accompanied by and related to appropriate clinical knowledge resources.

Both allergy propensity and adverse reactions must be represented using the FINDING\_OBSERVATION\_ELEMENT class.

### 6.3.11.1 Refinement

Due to the requirements for inter system transfer of data and the patient safety aspects of supporting clinical decision support on this data, the terminology implementation is limited to the post-coordinated representation of both allergy propensity and adverse reactions with a limited number range of focus concepts and a controlled terminology model.

Both allergy propensity and adverse reactions must be represented using a post-coordinated refinement that complies with the following general constraint.

```
( << 418038007 | propensity to adverse reactions to substance | ) OR ( << 282100009 | adverse reaction to substance | ) ):
246075003 | causative agent |
= ( ( < 105590001 | substance | )
OR ( < 373873005 | pharmaceutical / biologic product | ) )
, 246090004 | associated finding | =
( ( 404684003 | clinical finding | )
OR ( 272379006 | event | ) )
```

Separate common patterns are defined later in this section for propensity to adverse reactions to substance and adverse reaction to substance event.

More specific constraints apply to the causative agent refinement based on the nature of the clinical focus concept. These are specified below.

#### 6.3.11.1.1 Causative agent refinement constraint for drugs

```
( << 419511003 | propensity to adverse reactions to drug | ) OR ( << 62014003 | adverse reaction to drug | ) ):
246075003 | causative agent |
= ( ( ^ 801000001139 | NHS dm+d AMP subset | )
OR ( ^ 701000001134 | NHS dm+d VMP subset | )
OR ( ^ 601000001138 | NHS dm+d VTM subset | )
OR ( ^ 12021000006137 | Drug - allergy and adverse reaction subset | ) )
```

#### 6.3.11.1.2 Causative agent refinement constraint for food substances

```
( << 418471000 | propensity to adverse reactions to food | ) OR << 370540009 | adverse reaction to food | )
246075003 | causative agent | = ^ 2001000000137 | Food allergens subset |
```

#### 6.3.11.1.3 Causative agent refinement constraint for non-food substances

```
( << 418038007 | propensity to adverse reactions to substance | ) OR ( 282100009 | adverse reaction to substance | )
246075003 | causative agent | = ^ 1991000000135 | Non-food substance allergens subset |
```

The agents that may be used to qualify the causative agent attribute of the post-coordinated expressions are described in *Representation in Electronic Patient Records of Allergic Reactions and Intolerance of Pharmaceutical Products* document. The agents may either be drugs, food allergens, non food allergens or general agents.

Agent constraints for general agents (those that are not part of the drug constraint below) are **not** mandated. It is allowable to use codes outside the constraints; however it should be noted that decision support may not be supported.

There is overlap of content between the subsets used for food, non food and drug. Note that it is entirely reasonable for a food to be an ingredient of a drug. Clinical

decision support systems should be aware of this when deciding which allergy records to involve in clinical decision support processes.

#### **6.3.11.2 *Primary Design Patterns Used***

The Allergies and Adverse Reactions common recording patterns use the following primary design patterns, refined by explicitly specifying and applying values to the causative agent concept model attribute (as described in section 5.1.1.3):

- Finding Observation – Current or past

#### **6.3.12 Past Medication History**

[Note: LRA representation of medication has been under development and therefore guidance will be available shortly for the next draft.]

## 7 Appendices

### 7.1 Extended Compositional Grammar

This annex specifies extensions to the SNOMED CT Compositional Grammar which have been used in HL7 TerminInfo and in early NHS work to represent constraints on expressions. This material, previously published in the NHS CFH document on 'Terminology Binding Requirements and Principles' (version 1.0 May 2008) is repeated here for reference.

The source form for the constraints and examples in this document is the richer and more expressive XML representation recommended in the Terminology Binding Technical Specification. However, within the text of the document they are rendered into the Extended SNOMED CT Compositional Grammar (ESCG) described in this appendix. The rendering is derived by applying an XSLT transform to the source representation. The rendered result is easier to read than more verbose XML but, in the case of complex constraints, does result in some loss of specificity. For these reasons, where practical, hyperlinks have been included to reference the XML source files. These hyperlinks may not be navigable in some published forms of the document but are available from the XHTML (.html) and 'HTML Help' (.chm) versions of the document.

The following tables provide an overview of the SNOMED CT Compositional Grammar which is documented in 'SNOMED CT Guide to Abstract Models and Representational Forms' and various enhancements supported by the 'Extended Compositional Grammar' (ESCG).

To enable simple representation of constrained value-sets of concepts and expressions based on post-coordinated refinement.

To support clear documentation of relatively simple constraints, an informal extension has been made to the compositional grammar.

An informal extension has been made to the compositional grammar to represent constraints. The extensions include:

Symbols **<** and **<<** to represent constraints that include subtypes of a specified concept.

The **^** symbol to represent inclusion of members of a Refset (subset).

The **!** symbol to exclusion (i.e. the logical complement of the specified constraint).

Logical **AND** (intersection) and **OR** (union) operations between permitted value-sets.

This human-readable rendering of constraints arose from changes to the grammar proposed in the 'Guide to Use of SNOMED CT in HL7 Version 3' and the NHS CFH report on 'Design of Adverse Reaction Archetypes and Templates for the Vaccination Summary Record'; the pilot project on use of EN13606 and SNOMED CT.

To further improve clarity a colour scheme has been applied to distinguish concept identifiers (grey), terms (blue) and significant operators (red) and term delimiters (green).

Table 100. 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 two exceptions to this are:</p> <p>1) Where digits occur between a pair of pipe symbols, in which case the digits are part of the display name (see <code>  text  </code> row in this table).</p> <p>2) Where a string of digits is immediately preceded by a caret symbol <code>^</code> in which case in the extended constraint grammar this represents a subset (or <i>Refset</i>) identifier (see next table)</p> <p>The simplest expression is a concept identifier on its own. For example: 87628006   bacterial infectious disease  </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: 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: 87628006   bacterial infectious disease   87628006   bacterial infectious disease   87628006   enfermedad infecciosa bacteriana   87628006   maladie infectieuse bactÃ©rienne  </p> <p>Note: In constraint expressions where a subset (or <i>Refset</i>) identifier is used the <code>  text  </code> is the name of the subset (or <i>Refset</i>).</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</p>



Symbol	Notes	Examples
		<p>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 table).</p> <p>The following example specifies a bacterial infectious disease caused by streptococcus pneumoniae.</p> <p>87628006   bacterial infectious disease   :</p> <p>246075003   causative agent   = 9861002   Streptococcus pneumoniae  </p>
,	Attribute separator	<p>A refinement may include 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> <p>87628006   bacterial infectious disease   :</p> <p>246075003   causative agent   = 9861002   Streptococcus pneumoniae  </p> <p>, 363698007   finding site   = 45653009   structure of upper lobe of lung  </p>
( 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 localises and lateralises the site of the disease.</p> <p>87628006   bacterial infectious disease   :</p> <p>246075003   causative agent   = 9861002   Streptococcus pneumoniae  </p> <p>, 363698007   finding site   =( 45653009   structure of upper lobe of lung   :</p> <p>272741003   laterality   = 7771000   left   )</p>
{ grp }	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>

Symbol	Notes	Examples
		<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> <p>271577005   fracture of shaft of tibia and fibula   :</p> <p>{ 116676008   associated morphology   = 30543000   fracture, incomplete  </p> <p>, 363698007   finding site   = 113224005   bone structure of shaft of fibula   }</p> <p>, { 116676008   associated morphology   = 73737008   fracture, spiral  </p> <p>, 363698007   finding site   = 52687003   bone structure of shaft of tibia   }</p>
+	Combination	<p>87628006   bacterial infectious disease   + 50043002   disorder of respiratory system  </p> <p>This means a disorder that is both a bacterial disease and disorder of the respiratory systems. For example "bacterial pneumonia".</p> <p>It does <b>not</b> mean two separate disorders that are for some reasons are being linked. For example, this use of the plus sign would <b>not</b> be the appropriate way to represent that someone has a non-bacterial respiratory disorder (e.g. allergic asthma) and also has a bacterial disease (e.g. impetigo).</p>

Table 101. Compositional Grammar extension - Constraint symbols

Symbol	Notes	Examples
	This 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). 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>
^	The identifier (and optional text) that follows refers to a subset (or <i>Refset</i> ) and any member of that set it permitted.	<p>^ 8181000000134   Encounter disposition  </p> <p>A concept that is a member of the 'Encounter disposition' subset SHALL be used.</p> <p>Note: This symbol cannot be combined with the "&lt;&lt;" or "&lt;" symbols. This could conflict with the membership definition for the set. Where subtypes of members of a set are intended to be included this must be a property of the set (or of its members) and the set must be specified using and 'intension</p>

Symbol	Notes	Examples
		definition'.
<<	This concept or any subtype permitted	<p>&lt;&lt; 71388002   procedure  </p> <p>Either the concept "procedure" or one of its subtypes SHALL be used. Note: this differs from the "&lt;=" 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 unextended compositional grammar</p>
<	Any subtype of this concept (but not the concept itself)	<p>71388002   procedure   : 363704007   procedure site   =( 29836001   hip region structure   : 272741003   laterality   = &lt; 182353008   side   )</p> <p>The procedure site SHALL be the value "hip region structure" and SHALL include the attribute "laterality" The value of "laterality" SHALL be a subtype of "side" but SHALL NOT be "side" itself.</p>
~	Optional attribute (only applicable as a prefix to AttributeName)	<p>71388002   procedure   : &lt;&lt; 363704007   procedure site   =( &lt;&lt; 29836001   hip region structure   :~ 272741003   laterality   = &lt; 182353008   side   )</p> <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>
!	This concept is prohibited and SHALL NOT be used.	<p>71388002   procedure   : 363704007   procedure site   =( 29836001   hip region structure   : ! 272741003   laterality   )</p> <p>The procedure site SHALL be the value "hip region structure" and SHALL NOT include the attribute "laterality".</p> <p>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>
! <	This concept and all its subtypes are prohibited and SHALL NOT be used.	<p>71388002   procedure   : 363704007   procedure site   =( 29836001   hip region structure   : 272741003   laterality   = ! &lt; 66459002   unilateral   )</p> <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>
! ^	The identifier (and	! ^ 10301000003139   Clinical Exclusions

Symbol	Notes	Examples
	optional text) that follows refers to a subset (or <i>Refset</i> ) and NO member of that set it permitted.	A concept that is a member of the 'Clinical exclusions' subset SHALL NOT be used.

Table 102. Compositional Grammar Extension – Constraining elements

Element	Notes and examples
ConceptId	<p>A constraint symbol MAY directly precede a ConceptId. In this 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> <p>Unless otherwise stated, the comparison between an instance expression and a constraint assumes both are transformed to normal forms before testing.</p> <p>A constraint symbol MAY directly precede a ConceptId. In this 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> <p>Unless otherwise stated, the comparison between an instance expression and a constraint assumes both are transformed to normal forms before testing.</p> <p>For example, the following constraint:</p> <p>71388002   procedure   :</p> <p>260686004   method   = &lt;&lt; 129304002   excision - action  </p> <p>Permits expressions such as   cholecystectomy   or 80146002   appendectomy   because the concepts   cholecystectomy   and 80146002   appendectomy   are defined in SNOMED CT release data as subtypes of 71388002   procedure   with 260686004   260686004   method     = 129304002   excision - action   ].</p>
Attribute Name	<p>A constraint symbol MAY directly precede the ConceptId that specifies the name of an attribute. In this case it requires, allows or prohibits 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> <p>A constraint symbol MAY directly precede the ConceptId that specifies the name of an attribute. In this case it requires, allows or prohibits 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> <p>71388002   procedure   : &lt;&lt; 363704007   procedure site   = &lt;&lt; 29836001  </p>

Element	Notes and examples
	<a href="#">hip region structure</a>
Nested Expression	<p>A constraint symbol may directly precede an expression enclosed in parentheses. In this case, it requires, allows or prohibits inclusion of the parenthesised expression (and/or subtypes of that expression) in that logical position in the expression.</p> <p>A constraint symbol may directly precede an expression enclosed in parentheses. In this case, it requires, allows or prohibits inclusion of the parenthesised expression (and/or subtypes of that expression) in that logical position in the expression.</p> <p>Note: From a human-readable perspective it is clearer to specify individual constraints on the elements within the nested expression, rather than to apply a constraint to the nested expression as a whole. However, the nested form avoids repetition of common elements and, in the XML representation provides a more flexible, efficient approach.</p>
Attribute Group	<p>A constraint symbol MAY directly precede an attribute group. In this case, it requires, allows or prohibits inclusion of the specified group (and/or subtypes of that group) in that logical position in the expression.</p> <p>The following example asserts that the group shown or a subtype of that group must be present. Thus this will include any abdominal excision.</p> <p>A constraint symbol MAY directly precede an attribute group. In this case, it requires, allows or prohibits inclusion of the specified group (and/or subtypes of that group) in that logical position in the expression.</p> <p>The following example asserts that the group shown or a subtype of that group must be present. Thus this will include any abdominal excision.</p> <p>71388002   <a href="#">procedure</a>   &lt;&lt; 260686004   <a href="#">method</a>   = 129304002   <a href="#">excision - action</a>  , 405813007   <a href="#">procedure site - Direct</a>   = 113345001   <a href="#">abdominal structure</a>  </p>
Other	<p>The constraints cannot be used elsewhere in the expression. 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>

Table 103. Grammar Extension - Logical constrain combinations

Symbol	Notes	Examples
OR	Where two or more values are permitted, the set of conditions and the individual expressions SHALL both be enclosed in standard curved brackets () and the word "OR" SHALL be placed between the expression.	<p>71388002   <a href="#">procedure</a>  :</p> <p>363704007   <a href="#">procedure site</a>   = ( 29836001   <a href="#">hip region structure</a>  :</p> <p>~ 272741003   <a href="#">laterality</a>   =</p> <p>( 7771000   <a href="#">left</a>   )</p> <p>OR ( 24028007   <a href="#">right</a>   ) )</p> <p>The procedure site SHALL be the value "hip region structure" and MAY include the attribute "laterality" The value of "laterality" SHALL be either "left" or "right".</p>
AND	Where two or more conditions	71388002   <a href="#">procedure</a>  :

Symbol	Notes	Examples
	are both required to apply, the individual expression SHALL be enclosed in standard curved brackets and the word "AND" shall be placed between the expressions. ((exp1) AND (exp2))	<p>363704007   procedure site   = ( 29836001   hip region structure   :</p> <p>~ 272741003   laterality   =</p> <p>( &lt; 182353008   side   )</p> <p>AND ( ! &lt;&lt; 51440002   right and left   ) )</p> <p>The procedure site SHALL be the value "hip region structure" and MAY include the attribute "laterality" The value of "laterality" SHALL be a subtype of "side" AND SHALL NOT be "bilateral" or a subtype of "bilateral".</p>

**7.1.1**