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Use of SNOMED CT UK Edition for Scored Assessments Implementation Guidance

Amendment History:

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This document will be made available to the user community via the UKTC Implementation Forum

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Related Documents:

These documents will provide additional information.

Ref no	Doc Reference Number	Title	Version
1	NPFIT-SHR-QMS-PRP-0015	Glossary of Terms Consolidated.doc	V13
2	NPFIT-SHR-QMS-SDC-0072	NHS CFH Document Style Guide	2.0
3	Joint Initiative Council TC215, HL7, IHTSDO, CEN CDISC	Shared Health Informatics glossary	Pending release
4	NPFIT-FNT-TO-TOSCTI-0001.03	Clinical Content Terminology Binding: Practical Considerations	1.0
5	N/A : Paper submitted to IHTSDO Anaesthesia SIG https://thecap.basecampqh.com/projects/447707/file/27630844/Modelling%20of%20Multivariate%20Assessment%20Scales.doc	Modelling of Multivariate Assessment Scales - Anaesthesia SIG	dated 03/04/2009
6	NPFIT-FNT-TO-SCG-0026.02	Terminology Binding Requirements and Principles	1.0
7	NPFIT-FNT-TO-DSD-0174.01	Review Comments Sheet: Guidance on the SNOMED CT content relating to Assessments NPFIT-FNT-TO-DSD-0160.01	1.0
8	Unpublished	Minutes of UKTC's UK Edition Committee 22/04/2009	N/A
9	As distributed with SNOMED CT UK Edition	SNOMED CT User Guide	Latest

Glossary of Terms:

See Ref 3

Term	Acronym	Definition
	OCCO	Office of the Chief Clinical Officer (NPfIT)
	CRS	NHS CRS : Care Records Service
	COTS	Commercial Off The Shelf [COTS] Products
	EHRs	Electronic Healthcare Records Systems
	NMEPfIT	North, Midlands and East Programme for IT
	DS&P NHS DS&P	NHS Data Standards & Products, part of the NHS Technology Office
	UKTC	United Kingdom Terminology Centre, the UK arm of IHTSDO the international owners of SNOMED CT. UKTC is a function within NHS DS&P
Binding Terminology Binding		Terminology binding (in the context of this document) is the association between an SNOMED CT expression and an item in an information model, whether a standard model or a proprietary one such as a screen design recorded on a spreadsheet.
Default suggested interpretation		Clinical findings anticipated as the interpretations of a particular Scored Assessment outcome

Table of Contents

1	Purpose	8
2	Audience	8
3	Summary	8
4	Background	9
5	Context and assumptions	10
5.1	Language relating to assessment topics	10
5.2	Structure of Scored Assessments	10
5.3	Entries which are outside the scope of SNOMED CT.....	11
5.4	Record keeping of assessments; in paper, electronic, or and as a mix of these media.....	11
5.4.1	Permutations of Assessment Record media: paper & electronic	12
5.5	Commercial, Off-the-Shelf [COTS] Products	13
5.6	Citations: Assumptions on the ability to make, store and render citations in EHRs	13
5.7	Information Models and Terminology Bindings for Scored Assessments	15
5.8	Entries in Scored Assessments which restate existing data.....	17
5.9	Entries which are in scope for SNOMED CT but also exist as administrative data	17
6	Tactical Solution: SNOMED CT in scored assessments	18
6.1	Tactical Solution - Observables.....	19
6.1.1	Use of 'Total' in term strings for Observables	20
6.1.2	Observables which are explicitly for scores	20
6.1.3	Assessment Version identifiers for observables	20
6.2	Tactical Solution - Procedures.....	21
6.2.1	Assessment Version identifiers for procedures	21
6.3	Findings.....	22
6.3.1	Findings and Assessment names	22
6.3.2	Findings as clinical statements	22
6.3.3	Findings as an interpretation	22
6.3.4	Findings with linkages to related records in the EHR	23
6.3.5	Default Suggested Interpretation: Findings anticipated as the interpretations of a particular Scored Assessment outcome	23
6.4	Staging and Scales.....	25

6.4.1 Assessment Version identifiers for Staging and Scales	25
6.5 'The Authority' for version identifiers.....	25
6.6 Correspondence between content from different top level hierarchies of SNOMED CT.....	25
6.7 Grouper Concepts	26
7 Challenges for Version Identification of scales	27
7.1 Version states.....	28
8 Extent of use of SNOMED CT with Scored Assessments	29
8.1 Overall score, scored sub-components & leaf level components	29
8.2 Missing and null data points for scores.....	29
8.3 Univariate and Multivariate scored assessments	30
8.4 Minimal coding	30
8.5 Maximal coding	30
9 Reporting.....	31
10 SNOMED CT UK Edition, current content status.....	32
11 Document Lifecycle & Feedback	32
Appendix A Summary of distinct types of terminology binding	33

Tables

Table 1 Example instances of Observable with value	19
Table 2 Example instances of Procedure coded items.....	21
Table 3 An example of original design having intended findings.....	23

Figures

Figure 1 Illustration of what are leaf level and sub-components in the abstracted structure of a Scored Assessment	11
Figure 2 Process of SNOMED CT binding to a design expressed as a paper based, proprietary notation	16
Figure 3 Process of SNOMED CT binding to a design expressed as a standard information model	16
Figure 4 Illustration of <i>Observable entities</i> , and <i>Findings</i> and where they may be used during the processes of observation and clinical interpretation.	18
Figure 5 Illustration of the existing subscores within SNOMED CT UK Edition of 04/2009	19

1 Purpose

The purpose of this document is to provide guidance on the use of the UK Edition of SNOMED CT where it is to be bound to Scored Assessment designs.

The document sets out information which is important and relevant to those who are involved in design of systems, and which is not readily available from other sources. Some of this is contextually important but not directly SNOMED CT focussed. The guidance aspects are SNOMED CT focussed.

2 Audience

This guidance has been written for those who are preparing specifications and designs of CRS or other EHR products for use within the UK and which will include Scored Assessments. A basic knowledge of SNOMED CT and of system design is assumed.

3 Summary

It is advisable for implementers to be fully versed in the policies set out throughout Section 6, and also to check their understanding of all the topics in the remainder of this document, as they are all relevant to implementation to some extent.

An agreed tactical solution for the use of SNOMED CT in the representation for data from Scored Assessments is presented here in Section 6. Hitherto no such guidance has existed; both the usage and the SNOMED CT editorial activity have been inconsistent. Section 6 sets out specific editorial policies for the addition of SNOMED CT to the UK Edition, and for its use.

As well as background information in section 4 a range of issues are put into context in Section 5, where assumptions are also stated.

The extent to which SNOMED CT should be used, the minimal and maximal uses are discussed in Section 8, and the permutations of use of paper or electronic records, and the effect this may have is set out in Section 5.4.

Section 9 summarises the extent to which content in the UK Edition matches the policy set out for scored assessments at the time of writing, and citations which connect a clinical finding with a scored assessment are in section 11.

Agreement of the editorial principles relating to the solution presented has been attained from the UK Terminology Centre (UKTC) Edition Committee. The need for this tactical solution is a response to the EHR systems suppliers' non-attainment of high maturity in their implementation of either a compositional reference terminology, or other aspects of non-proprietary information models.

Focus here is only on scored types of assessment; further guidance to cover other types may follow.

Beyond this tactical solution a strategic one reliant on use of compositional features of SNOMED CT is under consideration¹. Simple transition paths from the tactical to strategic solution are understood by the UK Edition Committee to be credible.

A number of different editorial approaches to scored assessment concepts are apparent within the April 2009 SNOMED CT UK Edition, these will be addressed incrementally in the UK bringing them into conformance to this tactical solution, or later to the strategic solution. This will be under the work prioritisation and normal governance of the UKTC.

The UKTC will manage the relationship between content of the SNOMED CT UK Edition and the SNOMED CT international edition.

4 Background

Existing assessment designs are being built into CRS systems and the specification or configuration steps for this require the appropriate association between elements of the assessment and SNOMED CT concepts i.e. 'concept binding'. This in turn requires a standard approach to the representation of scored assessment concepts in SNOMED CT.

This guidance has been prepared in the period since October 2008 in consultation with the NHS Data Standards & Products' Internal Liaison Group, the UKTC Edition Committee, and the UKTC Implementation Forum, and results from their appraisal of a number of options. This guidance intersects or primes some work of the Logical Record Architecture [LRA] project.

During the development of this guidance an array of issues relating to version identification became apparent and these have been addressed here.

Rationale for the development of a tactical solution is discussed in Section 6. A strategic approach based on more extensive reliance on post-coordination in the EHR is also planned.

The tactical approach supports EHRs which are not yet featuring SNOMED CT post-coordination, and have similar limitations. The engineering lead-time, and perhaps the level of immediate commitment to change extant EHR designs is relevant to the need for tactical solutions.

The option to declare that scored assessments can only be encoded with SNOMED CT once post-coordination, or other SNOMED CT techniques have been built into EHR products was discounted by UKTC as not conducive to common commitments to collaborative development, at this time.

Work to use SNOMED CT in EHR designs has recently focussed on binding the terminology to assessment designs in liaison with the gaining of copyright by the NHS Office of the Chief Clinical Officer.

¹ Minutes of UK Edition Committee 22/04/2009 Ref 8

5 Context and assumptions

A number of assumptions are set out in this section to contextualise the guidance specific to SNOMED CT and incidentally this section may also be found to have value as guidance of itself.

A succinct definition of a Scored Assessment is a data collection template designed with predefined questions which are answered with responses, and these each contribute to a score according to an algorithm. The Scored Assessments which are within scope here will be those that are in common use and have been shown to be reliable clinical tools. These assessments are commonly used to discriminate between a range of options for the care to be given.

The legal and professional requirements for retention of full records are separate from, but related to this guidance. Policy on retention of original records is not addressed here.

It is assumed that the users of this guidance will be competent in and conversant with the use of SNOMED CT, information models, of design to use citations where needed, and will have sound judgement in application of these guidelines.

5.1 Language relating to assessment topics

The language commonly used in relation to assessment scales has a number of ambiguities, this is merely noted here. A common glossary used for both HL7 and SNOMED CT is under development [Ref 3]. Examples of confusion arise from the interchangeable use of 'scale', 'scale score' and 'score' across various documents.

5.2 Structure of Scored Assessments

Scored Assessments are structured with a hierarchy for their data elements; the hierarchy may have any number of levels:

- There will always be an element at the top: the overall score which is recorded as a SNOMED CT observable
- There will always be a set of items at the leaf level (see Figure 1 for illustration of 'leaf') which contribute to the overall score, according to an algorithm
- There may be any number of intermediate data elements within the Scored Assessment design, these will be subscores.

In practice the number of subscores, and the number of layers in which these are nested are limited. Practicalities relate to the time allotted to data collection within clinical practice (and hence a tendency towards brevity), plus the need to avoid complexity in the scoring algorithm.

NB the hierarchy of a Scored Assessment (Figure 1) is not enforced as the hierarchy these concepts take when authored in SNOMED CT (Figure 5) as the principles applied in the SNOMED ontology construction are entirely different from those of the scoring algorithm.

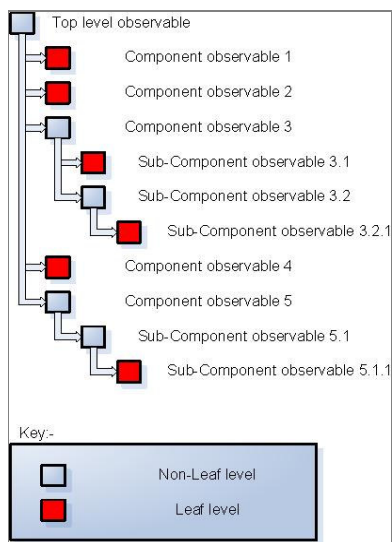


Figure 1 Illustration of what are leaf level and sub-components in the abstracted structure of a Scored Assessment

5.3 Entries which are outside the scope of SNOMED CT

In some cases an entry in a Scored Assessments will be recorded in order to yield a score, but would not otherwise warrant entry into the EHR as a clinical statement. This can be due their extremely specific nature.

In other cases an entry in an assessment design may be a compound statement such as 'patient has suffered A or B or some combination of A, C and D'. These are inherently ambiguous if a separate statement about A and about B cannot be made and so fall outside the scope of SNOMED CT.

In each of these cases, while it is possible to propose introduction of a SNOMED CT observable to represent these, it will normally be rejected. The general topic of what content deserves to be coded in SNOMED CT is discussed further in Section 8.

5.4 Record keeping of assessments; in paper, electronic, or and as a mix of these media.

Scored assessments have commonly been filled out on paper rather than electronic media. Moving to the electronic medium changes some of the information demands: When using paper the scoring algorithm is most likely to be integral to, and explicit on the printed pro-forma, plus any local guidance policy or procedures should be easily accessible. With EHRs the algorithm may be built in as part of the system behaviour.

With a transition to electronic records, to enable correct interpretation, an adequate set of this contextual information needs to also be integral to the electronic record i.e. the identification of the scale, and the version of the scale within SNOMED CT. Where the record was written on a paper pro-forma this should be explicit or apparent by reference to the paper on which the original record was made.

5.4.1 Permutations of Assessment Record media: paper & electronic

It is reasonable to assume that three record keeping environments may persist:

- paper only
- electronic only
- mixed use of paper and electronic

In the case of a mixed use of paper and electronic records it is likely to involve the assessment recorded in full on paper, with transcription of some or all of these data into the electronic record. Professional record keeping standards will guide the exact permutations to be used. It is of course possible for the paper form to be scanned in too.

The points made here about co-existing record systems have no direct impact on the substantial proposals set out in this paper, but illustrate that the constraints described in the design for paper use may not be wholly adequate for electronic designs

A number of permutations include:

- Only the final score value in the EHR
- Only the procedure is in the EHR
- Sub-component values entered to EHR, final value in the EHR (whether system calculated or not)
- Entire assessment conducted using the EHR
- Overall finding alone entered to the EHR without reference to the assessment
- Overall Observable score plus an associated finding (directly or indirectly cited)
- Assessment procedure plus general finding (directly or indirectly cited)

None of these schemes are advocated here as good practice, they are listed only to illustrate possible configurations. Mostly the range of situations listed above should be reflected in the information modelling such as validation rules for data entry, and not the terminological representation.

The implication of there being such permutations is that behaviour of interfaces should be governed by the particulars of each scheme. These schemes do not however create different needs of SNOMED CT content.

If only parts of a scored assessment are to be transcribed into the electronic record then it should not be assumed that the full scoring algorithm is enforced in the EHR.

The array of permutations must all be underpinned by a single terminology binding design for a particular assessment version with the following characteristics:

- The terminology binding is separate from the information modelling
- The binding is conducted to meet the maximal expected need at any time
 - For a sufficiently complete coded fraction of the longitudinal patient record
 - For Interoperability specifications
 - For Reporting
- Existing bindings should not be subject to change merely because of extension to the number of bound elements

5.5 Commercial, Off-the-Shelf [COTS] Products

COTS products would ideally be assessed against a published maturity model or compliance model for their implementation of SNOMED CT or other aspects of a contemporary non-proprietary information model. This is not possible at the time of writing. Despite this absence of a maturity model the state of readiness to deploy SNOMED CT post-coordination within COTS products is known to be limited.

Most COTS products known to the author, within their 2009 engineering cycle, do not feature storage and analysis of assessment data in non-proprietary information models with SNOMED CT bindings.

5.6 Citations: Assumptions on the ability to make, store and render citations in EHRs

In the guidance on findings [section 6.3.3] the ability to record citations between statements is discussed in outline only. It is explicit that findings are not to be pre-coordinated with an assessment name or version. Where it is required to record a finding and for it to be associated to the named assessment, then a citation is needed.

Situations where citations may be used in Scored Assessments would include:

A finding of *'At low risk for fall' [439430008]* recorded into the EHR by a clinician as well as assessment results for a *'Falls Risk Assessment Score for the Elderly (FRASE) – Community'* The citation will then link these two clinical statements together.

Alternatively the finding could coexist with a record of the action of completing a particular scored assessment.

In each case a citation will assert something about the linkage between the two statements. It is possible for the citation to link two statements which have been created by people in widely differing roles, or at different times, or from different clinical domains.

The mechanism to associate a clinical Finding with either a Procedure or an Observable by one of :-

- Citation expressed in a product using its proprietary information model
- Citation expressed in a standard information model

Examples of standard information model constructs include

- HL7 Link Assertion mechanism
- HL7 ActRelationship
- EN13606 LINK Class
- NHS LRA COMPONENT_RELATIONSHIP_ELEMENT²

Citations are expected to be persisted in the EHR record along with the statements which they connect; this paper offers no further guidance on the issues of citation retraction or revision.

² Formal Status of this element of the LRA is pending at the time of writing

5.7 Information Models and Terminology Bindings for Scored Assessments

The authoritative design of a scored assessment will usually be in the form of an academic paper, an annotated paper form design, or similar. Formalised information models may also be used to express the design i.e. its content, rendition and behaviour. These formalised models support not only clinical data such as SNOMED CT, but also data such as ordinal values, dates, demographics, and social circumstance. Few, if any authoritative designs for scored assessments are originally stated using a formalised information model however; they may be transcribed into one, as illustrated in Figure 3.

It cannot be assumed that the expressivity of one information model is exactly matched by any other. When transcribing a design of a scored assessment from one model to another it may be necessary and legitimate to model only part of a design in the target information model. The representation in the target must of course be suited to its purpose. For example it is possible for an original assessment design to include processing rules and for these to be from a set of nested logical and arithmetic operators which are not available in the target information model. In this case it may be adequate to append these rules in as narrative.

One consequence of not being able to represent the full set of rules from an original design in a standard information model (the target) is that this inhibits any (notional) automated application building or testing³. Instead building and testing will entail human interpretation and intervention. These steps are illustrated in Figure 3 as the 'Semi-automated EHR design preparation' process.

Clinical information within an information model may be expressed using SNOMED CT, this is referred to as 'terminology binding' and is within the remit of the NHS Logical Records Architecture [LRA] work, and is discussed in more detail in Ref 4. Appendix A sets out a scheme of distinct types of terminology binding, presented here for information only.

As illustrated in Figure 2, there is no dependency on the transcription of the Scored Assessment design into a standard information model for completion of the Terminology Binding: In many cases it is possible to bind SNOMED CT directly to an original design expressed in its own notation, without reliance on a formal information model (see also section 5.4.1).

Figure 2 and Figure 3 illustrate the steps in binding of SNOMED CT to either the original design or also to the transcription of this into a standard information model.

1 ³ Some information models are associated with tools which will transform a particular information design into a set of screen build instructions, including instructions on screen behaviour which will enforce the constraints expressed in the information design.

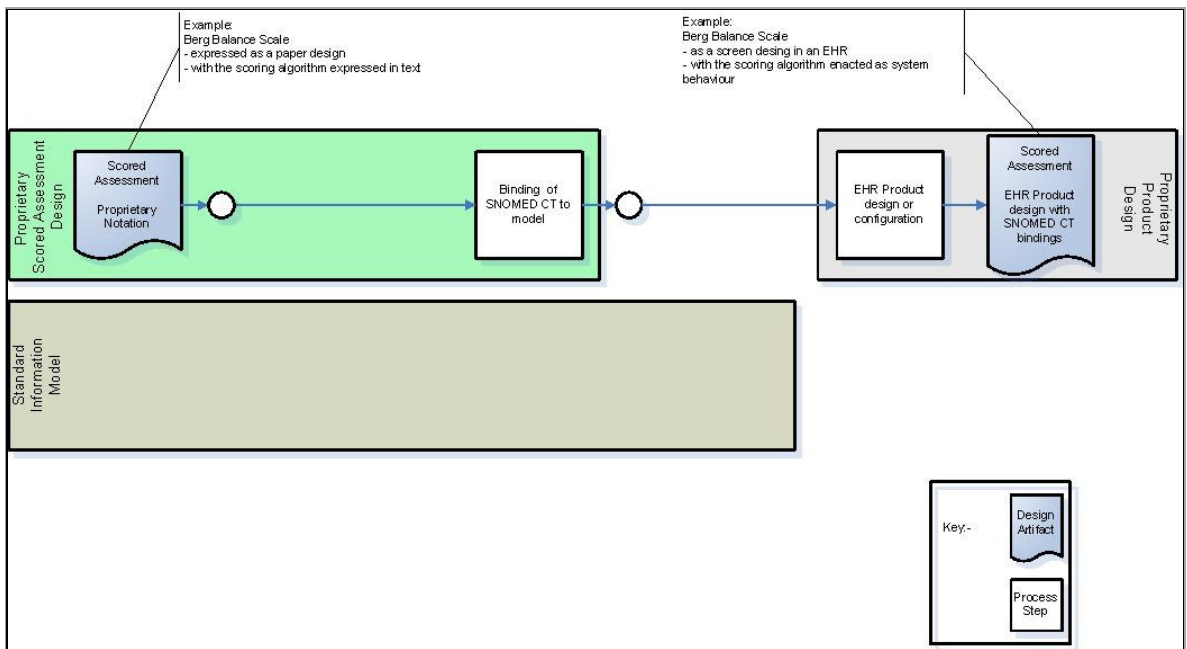


Figure 2 Process of SNOMED CT binding to a design expressed as a paper based, proprietary notation

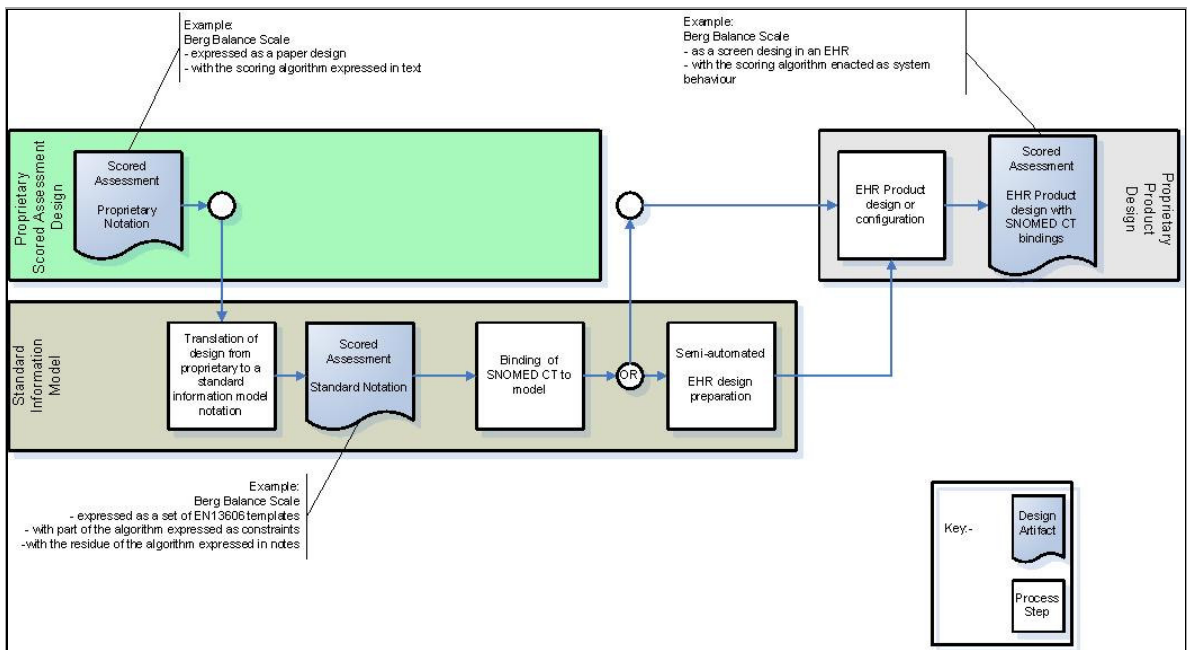


Figure 3 Process of SNOMED CT binding to a design expressed as a standard information model

5.8 Entries in Scored Assessments which restate existing data

Distinctions between Data Restatement, and Data Re-presentation

It is a well established design aspiration that existing data in an EHR should be used to pre-populate some (if not all) items in an electronically recorded assessment. This is a **re-presentation** of data already held. However, this aspiration is not yet commonly achieved in EHRs. Consequently a fraction of the data entered into assessments is commonly a **re-statement** of data which is already held elsewhere in the same EHR, or in another records system. It may also be that relevant data is in the EHR but not in a form which allows the system to automate its use to pre-populate an assessment form.

This guidance does not set out to define when it is appropriate to allow re-statement rather than re-presentation.

5.9 Entries which are in scope for SNOMED CT but also exist as administrative data

It is frequently found that some data which could exist as clinical statements is in fact held in other parts of an EHR, such as age or sex held as demographic data. This should be seen merely as the peculiarities of a proprietary information model and does not alter the implementation guidance.

6 Tactical Solution: SNOMED CT in scored assessments

In recognition of the limited functionality⁴ of current systems which require imminent deployment for the recording and processing of information related to scored assessments a tactical solution is presented here. A strategic solution will follow initiated by, or brought to the UKTC Edition Committee in due course.

Adoption of the SNOMED CT editorial policy on which this guidance for the tactical solution is based has generated SNOMED CT content changes. Part of the existing work of the UKTC is management of the impacts from concept retirements and other content changes such as these.

In the following sections distinctions are drawn between SNOMED CT concepts falling under different top level hierarchies such as 'Observable entity', 'Procedure', 'Clinical finding' and 'Staging and Scales'.

Distinct uses and meanings for *observable entity*, and for *finding* exist in SNOMED CT and are frequently found to be confusing to the uninitiated.

An observable entity can be associated with the value which was observed.

A finding states a clinical assertion which does not have any need of an associated value.

Further guidance on this distinction is in the SNOMED CT User Guide [Ref 9]

Implementers may find that the SNOMED CT model for findings and observables is not intuitive, a simple illustration is presented in Figure 4

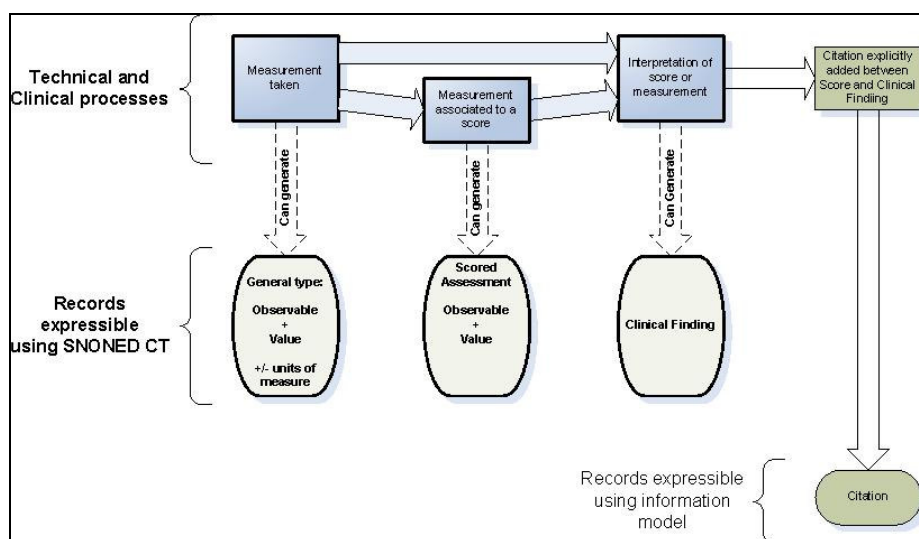


Figure 4 Illustration of *Observable entities*, and *Findings* and where they may be used during the processes of observation and clinical interpretation.

⁴ e.g. little or no ability to bind post-coordinated SNOMED CT expressions into their data models

6.1 Tactical Solution - Observables

Concepts from the Observables hierarchy shall be used in conjunction with an appropriate observation value⁵. The observable plus the value will be combined in the information model rather than being combined as a SNOMED CT expression. Examples of the value would include a numeric score '40', or an ordinal value 'high'.

Table 1 Example instances of Observable with value

Observable	SNOMED CT Concept	Value
SNOMED CT Fully specified name		(not expressed in SNOMED CT)
Glasgow coma score (observable entity)	248241002	10
Observation of Waterlow pressure sore risk score (observable entity)	201221000000101	17

The concept for an observable may be required for the overall assessment value, and optionally for any scored sections from it (see Waterlow example in Figure 5), at any section and subsection level down to leaf level (see Figure 1) .

x	[UK] Waterlow age score
x	[UK] Waterlow appetite score
x	[UK] Waterlow build/weight for height score
x	[UK] Waterlow continence score
x	[UK] Waterlow major surgery/trauma score
x	[UK] Waterlow medication score
x	[UK] Waterlow mobility score
x	[UK] Waterlow neurological deficit score
x	[UK] Waterlow sex score
x	[UK] Waterlow skin type visual risk areas score
x	[UK] Waterlow tissue malnutrition score

Figure 5 Illustration of the existing subscores within SNOMED CT UK Edition of 04/2009

Observables representing the overall assessment shall be pre-coordinated⁶ and described in terms of the name of the scale and also the version of that scale where this is available from an Authority (see 6.5).

Observables for sections of a scale, i.e. subscores, shall be considered for representation in SNOMED CT where there is justification based on expected utility, and conformance to editorial principles.

⁵ this is in line with noted position of the IHTSDO Content Committee, October 2008, Ref 5

⁶ Pre-coordinated here meaning the modelling of these concepts by the terminology authors will include both the name and the version of the assessment.

Observables related to leaf-level component scores shall not routinely be represented in SNOMED CT: They will only be included where there is strong clinical justification.

6.1.1 Use of 'Total' in term strings for Observables

The Observable which represents the overall score for a Scored Assessment will be referred to without the need to add the word 'total' into any of the term strings for this concept.

The overall scores will not express the fact that they are the accumulation of subscores and will simply be expressed as "*Assessment scale X score*". The only time the word 'total' will be used in the expression is when that is part of the formal name of the scheme as provided by the owner/authority

Implementers should take care to assure themselves that the concepts they use are correct, taking care to differentiate between concepts for the overall score from any others, noting that there will not usually be any use of 'total' in SNOMED CT

6.1.2 Observables which are explicitly for scores

The *Observable entity* top level hierarchy is the correct place to find concepts for scored items from a Scored Assessment.

This hierarchy however may also hold concepts which represent the same clinical observable but expressed not as a score, but as an ordinal or numeric value. These often require the statement of units of measure. For example say 'diameter of lump' is one element in the scoring scheme, there may already be an Observable *248530000 | Diameter of lump* which takes values such as '1cm', '1.5cm'. The algorithm for a Scored Assessment may determine the scores based on values, say a value of 1-1.2cm equates to score = 2, while for a value >1.2cm gives score = 1

Implementers should ensure that a measurement such as
'Diameter of Lump'
is not used by mistake in place of an assessment score e.g.
'*Assessment X* Diameter of Lump Score'

6.1.3 Assessment Version identifiers for observables

For observables there will be explicit inclusion of the assessments' version identifier within the terms, not only for FSN terms, but for every synonym.

6.2 Tactical Solution - Procedures

Concepts from the SNOMED CT Procedures hierarchy will be utilised to record say the act of performing a named assessment. These will be pre-coordinated concepts, and will be described in terms of the name of the scale and also the version of that scale where this is available from its Authority (see 6.5).

Procedure concepts will be provided where an observable is deemed appropriate and vice-versa. On this basis the component parts of an assessment such as subscores from multivariate assessments (see 8.2) or leaf-level components may have a procedure concept. This meets the principles in section 6.6 for provision of complete, coherent sets of SNOMED CT content.

Table 2 Example instances of Procedure coded items

Procedure	SNOMED CT Concept	Notes
SNOMED CT Fully specified name		
Assessment using Tinetti balance and gait evaluation - balance scale (procedure)	Does not currently exist	Exact term may differ when professionally authored
Assessment using Walsall community pressure sore risk scale (regime/therapy)	493201000000105	UK specific concept. NB Regimen/Therapy is a subtype of Procedure
Oxford hip scale v3 assessment (procedure) ⁷	Does not currently exist	The style for version identification e.g. 'v3' will be subject in part to UKTC editorial policy

6.2.1 Assessment Version identifiers for procedures

For procedures there will be explicit inclusion of the assessments' version identifier within the terms, not only for FSN terms, but for every synonym.

⁷ This is a notional example, where the version identification has been added but is not one allocated by the originators of the assessment design

6.3 Findings

It is envisaged that the policy on findings set out here will satisfy not only the tactical solution for scored assessments, but will be persistent and used as part of the strategic solution too.

6.3.1 Findings and Assessment names

Findings, whether or not arising from interpretation of results from scored assessments, will be represented without inclusion of the name of an assessment or its version e.g. it is *not intended* to add to SNOMED CT a finding 'hypertension - BHS sitting blood pressure test (finding)'

6.3.2 Findings as clinical statements

Findings are recorded in free-standing clinical statements e.g. 'This patient has hypertension', and most commonly, express a finding attributed to a health care professional. Clinical statements of this type are not a valid way to record the scored items in an assessment.

Findings should be only be used in conjunction with scored assessments as:

- proposed default interpretation for a given score (at the design stage)
- here a citation is used to link a finding to an existing assessment record (by a user)

6.3.3 Findings as an interpretation

There is an element of human interpretation in the expression of findings, hence there is no expectation that findings will be system-generated directly from the results of scored assessments without human endorsement.

Examples of questions requiring human consideration before a valid interpretation⁸ is made include

- Was the assessment conducted in accordance with its protocol, and conducted well enough?
- Was the subject conformant with the target group for the assessment?
- Was the conduct of a particular assessment the most appropriate way to arrive at the clinical finding?
- Has the conduct of the assessment provided strong enough support for a clinical finding in light of other evidence which the clinician may have at hand?

⁸ These are often considered implicitly by the observer, and no record of these and similar information about the conduct of the assessment is stored.

It is possible that EHR designers will give users an ability to both record the results of a scored assessment (i.e. scores), and also to express associated findings.

Particular design options for this are neither endorsed nor discouraged here.

An example would be an EHR which offered a default set of findings to the user for their selection based on the final score from a completed Scored Assessment.

6.3.4 Findings with linkages to related records in the EHR

In some cases a record of the way a recorded finding was arrived at may be desirable, for example when it is desirable to record a finding that relates to a score in a scored assessment.

Such linkages [see also section 5.6] can be created by a user explicitly making the link of a particular finding to other entries in the record, and the link will express the nature of their relationship e.g. 'evidenced by'. A topical example would be a stated finding related by as a clinician's stated interpretation of an observable + result from a measurement procedure. Expression of such a linkage is reliant on a method to express such as citation (see section 5.5). It is possible to have citation methods which are any of:

- Proprietary features of a specific EHR product and its proprietary information model
- Standardised citation methods which are features of a specific information model e.g. using HL7 v3

No preference between these methods is suggested here.

In the case of Scored Assessments it is proposed that any linkage made between a recorded score (an observable) and any finding shall only ever result from an action by the author of the record, and not as a default behaviour of a design.

6.3.5 Default Suggested Interpretation: Findings anticipated as the interpretations of a particular Scored Assessment outcome

The findings which are most likely to be recorded as a result of completing a Scored Assessment are those which the designer of the Assessment had intended to be derived from the score e.g. 'High risk of falls'. These are commonly expressed in the authoritative design as a default interpretation for bands of possible scores⁹. An example is presented in Table 3 below. Subscores in a multivariate scored assessment may similarly take default interpretations.

Examples of findings of this type are those from the Tinetti Balance and Gait assessment scale

Table 3 An example of original design having intended findings

Tinetti Balance and Gait assessment scale	
<i>Range of Observable Scores</i>	<i>Suggested Default Clinical Finding</i>

⁹ In addition to a scored assessment with a numeric result there can also be ones with ordinal results, which are far closer to the expression of a clinical finding.

<=18	High risk of falls
19 to 23 inclusive	Moderate risk of falls
>= 24	Low risk of falls

As these are default interpretations they can usefully be included in EHR designs to guide but not constrain data entry. A mode of use could be that once the scored part of the assessment is complete, for the EHR to offer the user the default interpretation as a statement they may wish to endorse.

It may be possible to express such a *default suggested interpretation* in an information model.

It is conceivable too to create SNOMED CT bindings for these *default suggested interpretations*, whether they are bound to the original design artefact, or to its representation in a formal information model.

6.4 Staging and Scales

In this tactical solution reliant on pre-coordinated SNOMED CT, there is no use of the content from the Staging and Scales hierarchy in the information modelling¹⁰. However the Staging and Scales concepts are understood to be needed for inclusion in interoperability specifications such as message specifications.

To support the less constrained uses of SNOMED CT such as some message definitions, or any post-coordination during the life of the tactical solution, concepts in the Staging and Scales hierarchy will be managed as follows:

Concepts in the Staging and Scales hierarchy will be populated with descriptions containing both the scale name and the version where this is available from the Authority (see 6.5) and in line with the guidance for correspondence with content from other hierarchies set out in section 6.6.

6.4.1 Assessment Version identifiers for Staging and Scales

For concepts in the Staging and Scales hierarchy there will be explicit inclusion of the assessments' version identifier within the terms, not only for FSN terms, but for every synonym.

6.5 'The Authority' for version identifiers

Where the originating authority for a scored assessment design has not provided version identification to the satisfaction of the UKTC there will be recourse to rely on a proxy for this authority, such as the NHS Office of the Chief Clinical Officer (OCCO), to state and maintain version identifiers. These will be provided for use within the jurisdiction of the proxy authority, so the content may reasonably be restricted to, say, the SNOMED CT UK Edition. They should not propagate into the SNOMED CT International Edition.

Where no authority is prepared to issue version identifiers the policy position of the UKTC Edition Committee will be sought on a case by case basis.

6.6 Correspondence between content from different top level hierarchies of SNOMED CT.

The general policy established for SNOMED CT for Scored Assessments is that the content under the various top level hierarchies used will be 'in-step' i.e. concepts sharing the same scale name and scale version will be in each of the expected hierarchies. This is not the current reality; a sparse, unpredictable distribution of scored assessment concepts is found. The transition from this current state to a fully populated state will not be instantaneous.

Request for content inclusion or retirements in accord with this guidance will need to be submitted to the UKTC by the standard method.

¹⁰ The information model is used to express the data and behaviour associated with the assessment design

Where a concept is included under the Observables top level hierarchy, an equivalent will also be included in the Procedures hierarchy, and vice-versa e.g. presence of an Observable.

‘GLASGOW COMA SCALE V2 MOTOR RESPONSE (OBSERVABLE ENTITY)’

should be matched by inclusion of

‘GLASGOW COMA SCALE V2 MOTOR RESPONSE (PROCEDURE)’

Should also be matched by inclusion of

‘GLASGOW COMA SCALE V2 MOTOR RESPONSE (STAGING AND SCALES)’

For each Scale & Version thereof which is used in Observable or Procedure, there shall be a concept added to the Staging and Scales hierarchy.

The editorial policy on inclusion of stated relationships between related concepts such as an Observable and a Procedure is in the remit of the UK Edition Committee. It is not set out here.

Where a candidate SNOMED CT concept under one hierarchy is out of scope for inclusion, the related ones under these related hierarchies would also be expected to fail, and fail on the same grounds. Exceptions to this are not foreseen.

6.7 Grouper Concepts

None of the guidance in this document knowingly calls for or relies on the use of Grouper Concepts from SNOMED CT. Implementers should be aware that grouper concepts are not explicitly distinguished from any others in the UK Edition.

Grouper Concepts are those added into a concept hierarchy as nodes that have beneath them concepts with shared characteristics, while these groupers were not intended to be used as clinical expressions themselves. For example, functional observable (observable entity) – 364644000 is the parent concept for many of the scored assessment observables and is there to group together scored assessments and differentiate them from other examination observables such as musculoskeletal observables.

Any decision to add, retain or retire Grouper Concepts rests with the UKTC and IHTSDO.

7 Challenges for Version Identification of scales

In support of the vision for patient centred clinical information sharing, the future interpretation of any findings resulting from the application of an assessment scale may require explicit identification of the version.

Systems which extend information flows beyond the boundaries of established information domains¹¹ bring new challenges. One of these challenges is the need to make explicit things which had commonly been both implicit, but were nevertheless understood within the domain. Version Identification may be considered an example where it is reliably understood between those working within a particular domain, but not suitably stated for those outside this domain. Few aspects of the use of assessments in the NHS can safely be assumed to be universally consistent. The NHS operates as a federation with considerable local autonomy. Even where an edict has been made in one jurisdiction on what versions of assessment tools are to be used this cannot be assumed to be followed. This heterogeneous situation pertains not only between organisations, but within them too. One organisation may have divergent practice on which assessment versions to use, or will use different versions for different purposes. Along with this, support for retrospective data also makes the explicit statement of version information desirable.

Different versions of the scoring scheme for a given assessment may for the same recorded value change (or in extreme cases invert) the meaning of the score e.g. as happened with the Oxford Hip Score¹². This differs from clinical definitions in general such as hypertension, where the meaning may legitimately drift, but will not invert.

Suitable rigor in assessment version identification and management within the clinical and academic communities cannot be assumed e.g. with the Oxford Hip Score, and has been shown in some cases to be absent. Local adaptation of assessment designs also takes place and this compounds the challenges.

These issues are addressed within the guidance presented in Section 6 addressing specifically :-

- How version identification should be represented where a definitive external authority for these versions exists
- How to ameliorate or remove the ambiguity where no such definitive external authority for versioning exists.

¹¹ An 'information domain' by examples may be; an inter-organisational team with a specialist interest, a single site within a hospital campus, a whole Primary Care Trust geographical boundary, or say dentistry. It could be just a group of ten staff who commonly work together.

¹² Between successive designs of this Scored Assessment, the scoring scheme was radically changed, without a common way to distinguish in the assessment name which particular scoring scheme was in use. Other measures were relied on to ensure the correct interpretation.

7.1 Version states

There are four states for versioning of a particular assessment identified in this paper:

1. Only one version of scale currently exists. This original version may or may not already include an explicit version identifier
2. Named versions exist and these versions are currently under adequate control
3. Named versions exist, but actual usage in the NHS has generated uncontrolled variants – e.g. Barthel (primary or secondary authors)
4. Different versions do exist but have not been allocated distinct version identities – e.g. Oxford Hip/Knee¹³ and Barthel (primary or secondary authors)

An example of the potential misinterpretation of results arises from the evolution of the Oxford Hip, Knee and Shoulder scales. These are three separate scales in widespread use across the NHS and are good examples of Patient Reported Outcome Measures (PROMs).

At least three different identically named variants of each assessment have been found in use, and dependent upon the variant, the same outcome value can indicate significantly different clinical findings. This is a further reason to keep the clinician's expression of findings separate from the recording of scored items, as set out in section 6.3.3.

¹³ http://phi.uhce.ox.ac.uk/ox_scores.php

8 Extent of use of SNOMED CT with Scored Assessments

The following section sets out some guidance on the extent to which SNOMED CT bindings are likely to be needed for any Scored Assessment design.

While it is possible to establish general principles here, the interpretation of these statements will occur during the practice of preparing bindings for specific designs. A consistent interpretation is desirable but how that is achieved is beyond the scope of this document.

8.1 Overall score, scored sub-components & leaf level components

The tactical approach for inclusion of SNOMED CT concepts for observables is set out already in Section 6.1;

the overall score will have a concept, the subscores 'shall be considered for representation in SNOMED CT where there is justification based on expected utility, and conformance to editorial principles', and leaf level 'only when there is strong clinical justification'

The minimal coded record for a scored assessment relates to the single overall score. It is often desirable to also express some scored sub-components. The lowest level to which this can be done is right down to the leaf-level (see Figure 1 for illustration of leaf level).

Whether the overall score, an intermediate subscore or a leaf level score, these components are expressed as an observable + value pair.

In deciding what to bind, the clinical utility is the principal consideration. A combination of clinical, SNOMED CT editorial, and informatics judgements are needed for these design decisions.

No attempt to proceduralise the judgement of which elements to use SNOMED CT for is proposed, but preparation of guidance-based-specification may be warranted
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8.2 Missing and null data points for scores

It is the published assessment algorithm which dictates how missing data are to be handled, and this may be built into the information model and/or to product behaviour.

The algorithm is of no direct relevance to the allocation of SNOMED CT bindings, however it further illustrates cases where caution is needed in association of a clinical finding to a score.

In certain circumstances a particular component of an assessment may not be assessable for a particular patient e.g. in the Glasgow Coma Scale intubation of the trachea or severe eye trauma and swelling may inhibit an observation being made.

If the information model and/or the EHR do not apply the scoring algorithm fully, or if the algorithm does not address all the possible conditions of null or erroneous data, it

is possible to generate misleading scores, such as showing a misleading total before all the sub-components have had their scores entered.

8.3 Univariate and Multivariate scored assessments

Some scored assessments are univariate i.e. they generate a single score which indicates a level for a single variable. Others such as the Glasgow Coma Score include an overall score, aggregated across individual component scores, each relating to a discrete topic of clinical relevance. These are multivariate assessments. Multivariate assessments are more likely to need the subscores to have a SNOMED CT binding.

8.4 Minimal coding

At the very least for any scored assessment record there will either be a record of a Procedure (as having been done) or of an Observable + Value.

If only a Finding is recorded (as described in section 6.3.1, i.e. with no record of the name and version of the assessment), then this alone would not constitute a record of a scored assessment.

There will be cases where it is legitimate to only record one or more subscore (or leaf level score), with no overall score e.g. if it was not possible to conduct the full assessment, but only selected component(s). This may also be legitimate where record is split between a paper record, and an EHR system [further discussed in section 5.4.1]. In all cases the EHR designer needs to pay attention to the formal guidance on the use of the particular assessment e.g. its published definition and instructions, and further, the professional record keeping standards for clinicians that apply.

Where an assessment includes particular component(s) which are not suited for expression using SNOMED CT, which does not disqualify the use of SNOMED CT for other components in the same assessment.

8.5 Maximal coding

It is anticipated that over the whole range of Scored Assessments there will be only a very few for which each and every entry is judged to have '*strong clinical justification*' plus meeting the requirement of '*conformance to editorial principles*' for expression in SNOMED CT. For these few, by following provisions of section 6.6 there will be a SNOMED CT Observable for each entry plus a Procedure for each, plus a single concept in the Staging and Scales hierarchy too.

There is no general statement which can be made on the maximal extent to which any assessment should have SNOMED CT bound to its content, this is a design decision to be made on a case by case basis and in light of the attitudes adopted in the rest of the SNOMED CT guidance.

9 Reporting

Reporting from data which conforms to this guidance will share the common features for reporting from SNOMED CT i.e.

Where data is recorded wholly in an information model, not as SNOMED CT, the reporting tools need to be suited to that information model

e.g. for leaf level components which are not in scope of SNOMED CT

Where data is recorded using SNOMED CT but also reliant on the information model, then reporting will require processing of both the SNOMED CT and other parts

e.g. Observable + Value where the Observable is expressed as SNOMED CT

Citations between a SNOMED CT finding and an Assessment score

Where clinical data is expressed using SNOMED CT then the full reporting capability of SNOMED CT is available, subject to the adequacy of the modelling of the concepts

e.g Procedures

The explicit naming of versions will require the reporter to take care to include all versions which are relevant, so for an assessment which has three named versions, it may be necessary to include all three in a query definition. It is also possible to generate an intermediate processing step such as use of a subset or RefSet to associate all related versions of an assessment, then point to that in a query definition. Care should be taken to maintain any intermediate artefacts such as Subsets in line with the current release.

Reporting will require care is taken to address any results where the SNOMED CT authoring is not in line with the policy, such as where the concepts used do not have the expected parent concept. Deficiencies in authoring should be fed back for corrective action by the UKTC using their request submission tools. At the time of writing the correct URL is

<https://www.uktcregistration.nss.cfh.nhs.uk/requests/myRequests.jsf>

10 SNOMED CT UK Edition, current content status

The current content of the SNOMED CT UK Edition has a modicum of incompleteness, and inconsistency in the extent to which it includes and models assessment version information. This is largely due to the evolution from more primitive predecessor terminologies.

The practicality of the guidance in this paper has been considered with respect to (but not unduly constrained by) the editorial burden and UKTC capacity, and the impact of re-modelling, retirements, and additions on existing consumers of SNOMED CT.

11 Document Lifecycle & Feedback

The content of the first release of this document was based on extensive consideration within the community of experts.

Experience gained from the application of this guidance will be used as necessary to generate updated versions. It is anticipated that the provisions set out in the first formal release will not be subverted by subsequent releases of this document.

Feedback setting out experience of implementation and use of this guidance is sought and should in the first instance be sent to the UK Terminology Centre via the Data Standards helpdesk datastandards@nhs.net

Appendix A Summary of distinct types of terminology binding

This section is derived from unreferenced documentation

- **Constraint bindings**

Constraint bindings express the limited selection of expressions which may be entered to the data entry element i.e. data entry validation rules.

- **Fixed bindings**

Fixed bindings bind a one and only one expression to a single data entry element value e.g. for a list of four possible data entry values there would be for each a binding to a single expression.

- **Constructor bindings**

Constructor bindings express how a single expression is to be prepared based on the values entered in more than one data entry element e.g. using the data entered on an area for family history, entered in both a list of clinical findings, plus a list of familial relationships.

- **Selection support bindings**

Selection support bindings are used to support the process of data entry but are not used to restrict what may be entered.

- **Retrieval bindings (to pre-populate data elements from existing data)**

Retrieval bindings express the way in which existing data may be 'pulled through' into a pro-forma.

Retrieval bindings express the conditions to be tested to see if existing data in the patient record matches the meaning of a data entry element e.g. where SNOMED CT is used for the clinical record the retrieval binding for a data entry element 'Diabetes mellitus type II' could have a retrieval binding which seeks all the equivalent ways this is expressed (equivalence tests) and includes too any more specific expressions which conform to (subsumption tests).