

Briefing Note for EAG

April 2022

Updated Proposal - SNOMED CT Laboratory Findings Use of 'Reference Range' for Reporting

Purpose:

This briefing will outline new proposals for updating the content of the hierarchy 118245000 |Measurement finding (finding)| based on feedback from the Community of Practice (MF/CMAG) and the April EAG Meeting in London.

Background:

There was agreement at the April 2022 EAG meeting for the need to ensure that content in the hierarchy of 118245000 |Measurement finding (finding)| should be both specific and unambiguous and therefore the proposed restructuring of the descriptions and modeling was deemed to be appropriate.

However, there was concern that much of the existing content may be open to misinterpretation. It was agreed that the overwhelming majority of the community of practice would interpret the content in terms of a measurement that was above, below, or within the reference range. However, a small number of users may interpret the content differently e.g. 68256003 |Increased glucose level (finding)| may be used to indicate that the current value is increased in relation to the previous measurement rather than it is above the reference range, or 165399006 |Hemoglobin normal (finding)| could be used to indicate that the level, although above the reference range is normal for a patient with chronic renal failure. Therefore, it was agreed, for patient safety reasons, that the existing content should be inactivated and replaced with unique unambiguous concepts representing the measurement findings.

Readers are requested to review the updated proposals and indicate in the boxes provided whether they accept the proposals or where they do not, to add additional comments and suggestions in the box provided. As there are a number of interdependencies between the

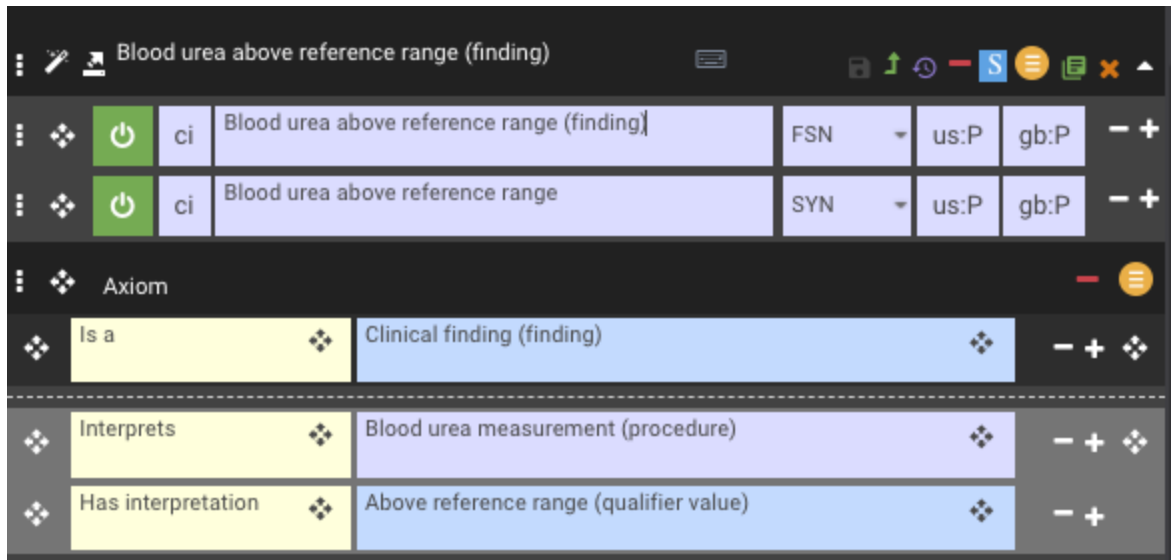
different elements of the proposal, it is suggested that the whole document is reviewed before returning to each individual proposal.

Existing SNOMED CT laboratory findings content:

There are currently 1457 concepts within 118245000 |Measurement finding (finding)|. Of these the following comply with the naming convention of above, within, below, or outside the reference range:

- Within 17
- Above 57
- Below 35
- Outside 11

These are all modeled using the agreed pattern for measurement findings as illustrated below:



There are a total of 1337 concepts that may require inactivation and replacement.

Updated Proposal for migration

Concept may represent a finding that is either above or below the reference range

There was general consensus amongst EAG members at the April 2022 meeting that existing content that did not have an explicit FSN/PT of “x above or below reference range” could be interpreted to mean that there had been a change in level (increased or decreased) relative to some previous, measurement. While it was accepted that the incidence of these interpretations is likely to be small, it was agreed that for patient safety reasons these concepts should be inactivated and replaced by a concept that conforms to the pattern agreed above for measurement findings.

This will apply to all concepts (407) that have the following words within the FSN or PT:

- Increase
 /increased 138
- Raised 41
- Elevated 13
- High 43
- Very high 2
- Decrease
 /decreased 113
- Reduced 4
- Low 81
- Very low 1

It was also agreed that the above words would not be used in a description attached to one of the newly created concepts.

The most appropriate reason for the inactivation of this content is “Ambiguous” with a historical association of “Possibly Equivalent To”. However, in order to satisfy full semantic equivalence, this would require the creation of content that represents a measurement that is “relative” to some other previous measurement, e.g. “x increased (higher) than the previous measurement”. The purpose of SNOMED CT within this domain is to provide concepts that represent objective, concise, and unambiguous statements about results that reflect the current state of the patient. Therefore, at this point in time, content that represents a finding that is relative to a previous result will not be considered.

Current authoring platform tooling supports the allocation of a single “Possibly Equivalent To” target concept. The allocation of “Ambiguous” alerts the user/vendor that the meaning of the inactivated concept is considered to be ambiguous. If only one target replacement concept is provided this means that in the view of the author the alternative “Possible Equivalent To” target(s) is deemed to be outside the scope of SNOMED CT. If this is the case the user may

replace the target concept with a concept that better matches their intended meaning. The proposal for this content is therefore as follows:

1. Content that currently utilizes reference range nomenclature will remain as is.
2. Where a non-synonymous synonym exists this will be inactivated.
3. All other content will be inactivated.
4. The inactivation reason will be “Ambiguous”.
5. There will be a single “Possibly Equivalent To” for the newly created target concept that represents an above or below reference range interpretation.
6. No additional synonyms will be added.

Do you accept the proposal	Yes/No
If no, please explain your concern	

The concept represents an interpretation of ‘within reference range:

There are 139 concepts which are modeled with |Has interpretation (attribute)| and 281301001 |Within reference range (qualifier value)|. Of these, 3 have an FSN of “X within reference range”, the remaining 136 concepts have an FSN of either ‘X normal’ or ‘Normal x’.

Because the FSN/PT does not state that “normal” represents “within reference range” there is a small possibility that it has been used to mean “normal” within the context of a particular disorder. For example; “normal” potassium in a patient with kidney disease is likely to be higher than that of a patient without kidney disease.

However, the use of “normal” to mean “within reference range” is widely accepted clinically, and therefore consideration should be given to keeping a synonym that includes the word “normal”.

For these reasons the proposal for concepts that are of the form ‘x normal’ or ‘Normal x’ is the same as for concepts that may represent above or below reference range:

1. Content that currently utilizes reference range nomenclature will remain as is.
2. Where a non-synonymous synonym exists this will be inactivated.
3. All other content will be inactivated.

4. The inactivation reason will be “Ambiguous”.
5. There will be a single “Possibly Equivalent To” for the newly created target concept that states “within reference range” .
6. Additional synonyms:
 - a. No additional synonyms
 - b. Add an additional synonym that includes the word “normal”

Do you accept the proposal with option 6a	Yes/No
Do you accept the proposal with option 6b	Yes/No
If no, please explain your concern	

Concepts that represent a “borderline” level.

The following qualifiers exist:

- 442777001 |Borderline high (qualifier value)|
- 371932001 |Borderline normal (qualifier value)|
- 442779003 |Borderline low (qualifier value)|

There are 42 concepts that use either 442777001 |Borderline high (qualifier value)| or 442779003 |Borderline low (qualifier value)|. The qualifier concept 371932001 |Borderline normal (qualifier value)| has not been used.

Borderline is defined as a result that is very close to a boundary between two defined states such as between “within reference range” and “above reference range”. A “borderline high” description implies that the result is on the boundary between “within reference range” and “above reference range” and “borderline low” is on the boundary between “within reference range” and “below reference range”.

The clinical relevance of these findings is that one might wish to monitor the patient to establish whether the trend is towards the normal reference range or away from the normal reference range.

The qualifier 371932001 |Borderline normal (qualifier value)| should not be used as it could mean either borderline between within and above or between within and below the reference range.

It is proposed that the concept is not inactivated and the FSN and PT be updated:

- For borderline high concepts:
 - “X borderline between above reference range and within reference range”
- For borderline low concepts:
 - “X borderline between below reference range and within reference range”
- Add a preferred term to match the FSN.
- Inactivate any non-synonymous synonyms
- Retain the original FSN description as a synonym.

Do you accept the proposal	Yes/No
If no, please explain your concern	

It should be noted that concepts that use either 442777001 |Borderline high (qualifier value)| or 442779003 |Borderline low (qualifier value)| will not classify as subtypes of concepts representing “outside reference range” findings.

Therapeutic medication levels:

Where the measurement findings relate to therapeutic medication levels, new 281299008 |Therapeutic range comments (qualifier value)| values have been added and they will be used as values for the 363713009 |Has interpretation (attribute)|:

- 281303003 |Above therapeutic range (qualifier value)|
- 281306006 |Below therapeutic range (qualifier value)|
- 281304009 |Within therapeutic range (qualifier value)|

These will be used to model finding concepts used to monitor the levels of medications used in the treatment of clinical disorders.

Do you accept the proposal	Yes/No
If no, please explain your concern	

Concepts that represent a measurement or level that is “Abnormal”:

Please note that this discussion only applies to the subhierarchy of 118245000 |Measurement finding (finding)|.

Describing a result as “abnormal” is not a true expression of ambiguity but a statement that the result is outside the reference range. However, within the context of measurement values, it should be interpreted as meaning either above or below the reference range.

Feedback has indicated that there are some use cases in which being able to record that a result is “abnormal” might have some utility:

1. To indicate that a panel (e.g. thyroid or liver function panel) has one or more elements that have returned a result that is outside the reference range.
2. As a reason for referral e.g. referral to a renal physician might have a reason of “abnormal renal function tests”.
3. To support analytics e.g. give me all the patients who have had an abnormal “full blood count” in the last year.

Commenting on each in turn:

1. *Abnormal panel results*: Panel specifications vary between jurisdictions and even within a jurisdiction may differ between laboratories. In addition, we have not yet agreed on a way of representing panels within SCT.
2. *Reason for referral*: Stating the reason for referral is related to abnormal tests may be reasonable, but it would be more informative to state that the abnormal results are consistently above or below the reference level.
3. *Supporting analytics*: The use of Expression Constraint Language (ECL) is a much more expressive and specific method of querying SNOMED CT that makes hierarchical retrieval redundant. However, it is recognized that not all clinical systems have or make this functionality available to end-users.

Therefore, the options are as follows:

1. Inactivate all instances of “abnormal” within the subhierarchy of 118245000 |Measurement finding (finding)| as “ambiguous” and provide “Potentially_equivalent_to” the above and below reference range findings.
2. Support abnormal findings at the body system level e.g. thyroid function, renal function, etc, but inactivate all other instances of “abnormal” as above.
3. As for 2 above but with the addition of “abnormal” for the top-level (grouper concept) substance levels e.g. 365811003 |Finding of glucose level (finding)|
4. Provide “abnormal” for all relevant measurement findings.

Please indicate which option you would accept	
If none, please provide your alternative proposal	

Supplementary questions:

1. Where a concept does not state whether the analyte is in plasma or serum, which should we choose.

Plasma or Serum or both	
If none of the above, please provide your alternative proposal	

2. Should “blood” be interpreted as “whole blood” e.g. 166711002 |Blood urea normal (finding)|

“Blood = “whole blood”	Y/N
If not, please provide your alternative proposal	

Approvals	Date	Name
Chief Terminologist	18 May 2022	James T. Case
Director of Content and Mapping		

Paul Amos 2022-05-16

Appendix - “Abnormal ‘ - Example of option 3

The following hierarchy might represent an example of the updated subhierarchy of 118245000 |Measurement finding (finding)|using option 3 for “abnormal”:

365811003 |Finding of glucose level (finding)|

Glucose outside reference range (syn Glucose level abnormal)

Glucose above reference range

Cerebrospinal glucose above reference range

Blood glucose above reference range

Glucose tolerance test above reference range

Fasting blood glucose above reference range

Random blood glucose above reference range

Glucose tolerance test above reference range

Pregnancy glucose tolerance test above reference range

Impaired glucose tolerance test (*primitive*)

Urine glucose above reference range

Glucose below reference range

Cerebrospinal glucose below reference range

Blood glucose below reference range

Fasting blood glucose below reference range

Random blood glucose below reference range

Glucose within reference range (Syn: Glucose level normal)

Cerebrospinal fluid glucose within reference range (syn: Cerebrospinal fluid glucose level normal)

Blood glucose within reference range (syn: Normal blood glucose level)

Fasting blood glucose within reference range (Syn: Fasting blood glucose level normal)

Random blood glucose within reference range (syn: Randon blood glucose level normal)

Glucose tolerance test within reference range (syn: Glucose tolerance test normal)

Pregnancy glucose tolerance test within reference range (syn: Pregnancy glucose tolerance level normal)

Urine glucose within reference range (syn: Urine glucose level normal)