Briefing Note for EAG
August 2022

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

Purpose:

This briefing will outline proposals for updating the content of the hierarchy 118245000 |Measurement finding (finding)| based on feedback from the Community of Practice (MF/CMAG) and subsequent EAG meeting discussions.

Background:

SNOMED International is undertaking a Quality Initiative (QI) project focused on addressing concepts within the hierarchy of Clinical Findings. The purpose of the QI project is to improve the structural consistency of existing content and adherence to Editorial Policy.

Applying the principles of the QI project to the domain of laboratory findings gives us the opportunity to update the terminology to reflect current laboratory reporting practices and provide a consistent model for the addition of new content.

During discussions at an earlier EAG meeting, it came to light that previous decisions had been made with regard to modeling in this domain. At a meeting led by the Chief Terminologist in 2010, it was agreed that "increased" = "above reference range" and "decreased" = "above reference range". It was also stated that through rearrangement of the qualifies relating to the reference range proper subsumption could be achieved whereby increased and decreased analyte levels would become subtypes of "Abnormal" (outside reference range) findings.

While many concepts were remodeled based on these decisions the Fully Specified Name and often the Preferred Term remained unchanged. Subsequently, new content in this area has often but not exclusively utilized reference range descriptions. There is

some concern that where FSNs are not explicit (e.g. do not use the “reference range” descriptions), a small number of end users who are unaware of the decisions made in 2010 may misinterpret the meaning of some of these concepts.

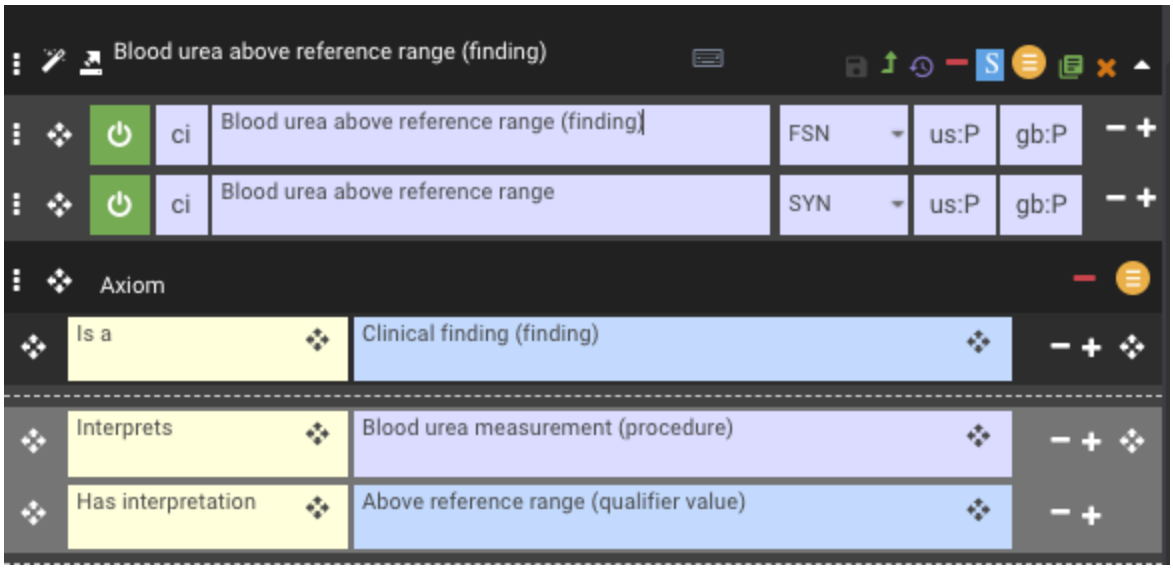
The remainder of this briefing note is an attempt to document the consensus of the EAG arrived at over a number of meetings on how content within the hierarchy 118245000 |Measurement finding (finding)|relating to analyte levels can be updated and made explicit.

Existing SNOMED CT laboratory findings content:

There are currently 1397 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:



Of the 1397 concepts, 776 are modeled using subtypes of 442705008 |Reference range interpretation value (qualifier value)|. Of the remaining 621 concepts, approximately 50% relate to concepts for which the use of "reference range" is not appropriate e.g. concepts representing a detected or not detected finding.

July 2022 International Release.

Proposal for updating existing content:

The concept represents a finding that is above or below the reference range

In line with the decision made in 2010 all content that represents a finding that is above or below the reference range will be modeled using 363714003 |Interprets (attribute)| - an appropriate procedure/observable and 363713009 |Has interpretation (attribute)|- either 281302008 |Above reference range (qualifier value)| or 281300000 |Below reference range (qualifier value)|.

The FSN/PT will be updated to fully represent the modeling e.g. 166892002 |Random blood sugar raised (finding)|will be updated to 166892002 |Random blood sugar above reference range (finding)|. Existing descriptions will be kept as synonyms e.g."Random blood sugar raised".

It is possible that a small number of end users may have interpreted "increased" and "decreased" to indicate that a given result is either above or below the previous result. While it was acknowledged that it may be clinically useful to record findings that are relative to previous results or to indicate a trend it was felt that at this point in time such findings were out of scope for SNOMED CT. If local NRCs wish to represent this class of concepts it is advised that they use the following qualifier values: 442387004 |Increased relative to previous (qualifier value)| or 442474009 |Decreased relative to previous (qualifier value)|with 363713009 |Has interpretation (attribute)|.

The concept represents an interpretation of "within reference range":

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

The FSN/PT will be updated to fully represent the modeling e.g. 166890005 |Random blood sugar normal (finding)| will be updated to 166890005 |Random blood sugar within reference range (finding)|. The use of "normal" to mean "within reference

range" is widely accepted clinically and therefore, a description containing the word "normal" will be retained.

Because the FSN/PT does not state that "normal" represents "within reference range" there is a small possibility that some of these concepts have 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.

There is agreement that the notion of "normal" is context dependent and it is expected that laboratories will provide a statement of the reference ranges applicable for the patient accounting for age, gender, ethnicity, and existing known conditions. For this reason, it was not deemed necessary to make any additional changes or recommendations to this proposal.

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 findings, it should be interpreted as meaning either above or below the reference range.

There has been feedback on this class of concept to indicate 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.

The discussion in 2010 included a review of the use of "abnormal" measurement findings. The decision at that time was to allow the use of "abnormal", meaning "outside reference range" because it is possible to sufficiently define these concepts, and thus all above and below reference range concepts would automatically classify as subtypes of the appropriate abnormal finding.

The FSN/PT will be updated to fully represent the modeling e.g. 442545002 |Random blood glucose abnormal (finding)| will be updated to 442545002 |Random blood glucose outside reference range (finding)|. The concept will retain a synonym of "x abnormal".

These changes will be made to existing content but further additions of "abnormal" measurement findings will only be added by request.

Concepts that represent a "borderline" level.

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 and thus may require clinical intervention.

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.

The FSN/PT will be updated to fully represent the modeling e.g. 442313006 |Serum folate borderline low (finding)|will be updated to 442313006 |Serum folate borderline below reference range (finding)| and 442213008 |Serum folate borderline high (finding)| will be updated to 442213008 |Serum folate borderline above reference range (finding)|. Existing FSNs will be retained as synonyms.

It should be noted that concepts that use either 442777001 |Borderline high (qualifier value)| or 442779003 |Borderline low (qualifier value)| correctly do 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 were added and they are being 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 only be used to model finding concepts used to monitor the levels of medications used in the treatment of clinical disorders. The findings related to levels of other drug substances will be the subject of a later briefing note following consultation with the requirements of those who manage substance use disorders.

New content has previously been created to represent above, below and within the therapeutic range for:

- Phenobarbitone
- Serum Carbamazepine
- Serum digoxin
- Serum lithium
- Serum phenytoin

- Serum sodium valproate

All new requests will follow this pattern.

Action:

Members of the EAG are asked to review this document before the meeting on 24th August and either agree to the proposed changes or bring concerns to the meeting for discussion.

Approvals	Date	Name
Chief Terminologist		
Director of Content and Mapping		

Paul Amos 2022-08-16