Concept Inactivation

Proposed Amendments

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Table of Contents

1. Introduction

SNOMED CT is an international standard terminology Therefore, maintenance of the terminology must be seen to adhere to standards which are open and transparent with a clear audit trail for each change made. This is particularly important where a SNOMED CT concept is inactivated and replaced with one or more concepts linked by historical associations or in exceptional cases, where no replacement is deemed necessary.

The Concept Inactivation Working Group conducted a review of historical concept inactivations from 2002 to 2020 to establish whether the current suite of inactivation reasons and historical associations were sufficient to cover all of the inactivation scenarios that have occurred over time. In addition, an assessment, using sampled data, was made of the consistency with which inactivation reasons had been applied, noting the level of between reviewer variation to establish a measure of how easy or difficult it was to apply the inactivation guidelines as they evolved over time.

Lessons learned from the review have been used to inform proposals for enhancements to existing inactivation reasons, historical associations and associated guidance. The impact of concept inactivation and provision of appropriate historical associations on analysis of EPR data and data healing have also been considered.

The conclusions of the review are presented in this paper as proposals for change to:

- Clarify the criteria for use of existing inactivation reasons and historical associations.
- Propose new inactivation reasons to fill existing identified gaps.
- Propose new historical associations to fill existing identified gaps.
- Define the purpose of each historical association and explain how authors should apply them and users interpret the impact on their data.
- Provide additional guidance for authors/editors.
- Recommend actions that should be taken when the concept to be inactivated has itself been the target of previous historical associations.

The document provides a section on each existing and proposed new inactivation reason, where appropriate detailing the issues that have arisen from its use to date, under what circumstances it should now be used, and the proposed historical associations that might be applied to address specific scenarios.

Based on feedback from the EAG and members of the community of practice this document will be updated and form the basis for a technical requirements document that will inform the tooling enhancements needed to implement these proposals.

There will be a requirement to address the issue of whether or not existing historical inactivations and their associations should be updated based on the new inactivation policy and guidance, but this will be the subject of a separate paper.

2. Duplicate Concept

The inactivation reason **"Duplicate Component"** with association type **"SAME_AS"** explicitly states that the inactivated concept (A) semantically represents exactly the meaning of the remaining active concept (B). Implicitly it also means that (A) **SAME_AS** (B) always, by definition implies (B) **SAME_AS** (A).

The statement of including the requirement to ensure any analysis expressed in terms of (A) returns the same subtypes as would have been present had the concept (B) been substituted into the query logic, and vice versa.

2.1 History and Current Usage:

Not surprisingly, prior to their merger CTV3 and SNOMED RT each had many instances of concepts that were semantically equivalent to a counterpart in the other scheme. Many of these semantically equivalent pairs were identified during the process of merger. Both were allocated unique SNOMED CT identifiers and then, for each pair of duplicates, one was immediately inactivated with a **"SAME_AS"** association to the remaining active concept. Therefore the inactive SNOMED CT concept was intended to be never used for capture of new EPR data going forward, but existed as the means by which legacy data from CTV3 and SNOMED RT could be mapped through to an appropriate unique active SNOMED CT concept.

A diminishing number of historical duplicates introduced at the time of the merger continue to be identified. Meanwhile, in some instances, *new* duplicates have been inadvertently added and subsequently identified. An example being:

735744000 Fracture of spine due to birth injury (disorder) - added in January 2018

However,

64728002 Fracture of spine due to birth trauma (disorder) - had existed since 2002

This accidental new duplicate was identified soon after, with the result that the July 2018 release declared the newer concept as inactive (duplicate), and with the **"SAME_AS"** association:

*735744000 **SAME_AS** 64728002*

It should be noted that the **"SAME_AS"** association was originally restricted for use only when the inactivation reason was "duplicate" but this was extended to the inactivation reason of "Limited" in 2010, when the concept status of being "Limited" was also changed from being another flavour "current, active" to being an inactive status. There were 5889 such SAME_AS relationships from a **"LIMITED"** concept in the July 2020 International Edition (though many, many more exist in some national extensions):

200467009 Complications of the puerperium NOS (disorder)
SAME_AS 156274003 Complications of the puerperium NOS (disorder)
SAME_AS 156290003 Complications of the puerperium NOS (disorder)
SAME_AS 156277005 Complications of the puerperium NOS (disorder)
SAME_AS 200359000 Complications of the puerperium NOS (disorder)
SAME_AS 200363007 Complications of the puerperium NOS (disorder)
WAS_A 80113008 Complication of the puerperium (disorder)

The most recent new **"SAME_AS"** associations declared on a Limited Concept within the International Edition was a set of six different concepts added in January 2015 (e.g. on 141350007 O/E - lymphadenopathy NOS (finding)). About half of the current total of 5889 were added mainly in January 2010 and the other half mainly in July 2002 at an earlier point in time when the relevant concepts were already inactive but at that time "duplicate" rather than the "limited" status they were later revised to, for example:

123055008 Dwarfism, NEC (disorder)
***SAME_AS** 190583009 Dwarfism NEC*
***WAS_A** 237836003 Short stature disorder*

2.2 Known Issues

As one might expect, the implementation of this inactivation reason has been highly consistent with the review exercise identifying an error rate of less than 4%. Error examples still present in current (January 2021) International Edition data being:

312186009 L-Phenylalanine (substance)
***SAME_AS** 63004003 Phenylalanine (substance)*

360115008 Gastrostomy tube (physical object)
***SAME_AS** 303699009 Gastrointestinal tube (physical object)*

151246009 Non-operative procedures (procedure)
***SAME_AS** 71388002 Procedure (procedure)*

The key to achieving an appropriate inactivation is establishing semantic equivalence between the concept to be inactivated and its proposed replacement. Therefore, it is important that any such inactivation should be convincingly evidenced and if there is any doubt the 2 concepts should remain active and available.

2.3 Proposals for Change

The inactivation reason of **"Duplicate"** with **"Association type"** of **"SAME_AS"** will continue to be needed in its current form but would benefit from a strengthening of the guidance. The tooling would benefit from the ability to record the reference to the evidential basis used to confirm that the two concepts are duplicates through the addition of a text field.

2.4 Guidance

The following guidance is given to support consistency in implementation:

- Ensure that the synonyms on the inactive concept are represented within the active duplicate concept.
- To reduce the impact on users/vendors, consider keeping the concept with the oldest effective date as this is likely to have had the most usage. Where the existing FSN for the older concept does not comply with current naming conventions, it may be possible to assign a newer and compliant FSN "in place" i.e. without inactivating the concept. However, if the newer concept already carries

the ideal, compliant FSN then it will not be possible to also assign that same FSN to the older concept, and so there may be no other option than to inactivate the older concept in favor of the newer, with its better FSN.

- Where both concepts have subtypes ensure, where appropriate, that they are all present as subtypes of the active concept.
- Where the FSN is the same but the semantic tags differ between the 2 concepts, then IF the pair of semantic tags are within the following limited set of permitted pairs then an inactivation reason of **"Duplicate"** may still be used:
    - disorder and finding.
    - procedure and regime/therapy.
    - finding and situation.
    - procedure and situation.
    - (possibly, imminently, procedure and observable).

  All other potential pairs of semantic tags are excluded: it is considered *de facto* impossible for something that is fundamentally classed as, for example, an (event) to *ever* be a semantic duplicate of something else that is fundamentally classed as, say, a (finding).

2.5 Combinatorial Logic

Whenever an already stated **"SAME_AS"** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

(A) **SAME_AS** (B) and (B) **SAME_AS** (C) implies (A) **SAME_AS** (C)

(A) **SAME_AS** (B) and (B) **REPLACED_BY** (C) implies (A) **REPLACED_BY** (C)

(A^{IntEd}) **SAME_AS** (B^{IntEd}) and (B^{IntEd}) **MOVED_TO** (C^{NRC}) implies (A^{IntEd}) **MOVED_TO** (C^{NRC})[1]

(A) **SAME_AS** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (C OR D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C OR D)

(A) **SAME_AS** (B) and (B) **WAS_A** (C AND D) implies (A) **WAS_A** (C AND D)

Note:

[1]Once **MOVED_TO** the NRC we (SNOMED International) have no knowledge of what has happened to B^{IntEd}

3. Ambiguous Concept

The inactivation reason **"Ambiguous Concept"** with association type **"POSSIBLY_EQUIVALENT_TO"** explicitly states that the concept to be inactivated is inherently ambiguous but that each of the potential meanings represent clinically meaningful concepts each of which is semantically identical to one of the **"POSSIBLY_EQUIVALENT_TO"** target concepts, whether currently present or could be created in SNOMED CT.

Despite this "simple" definition, the inactivation reason "**Ambiguous**" is arguably the most difficult and therefore, the source of the most inconsistent usage.

In summary, for any pair of concepts {A,B} if A **POSSIBLY_EQUIVALENT_TO** (B) then (A) must necessarily have more than one possible interpretation but, of these alternate interpretations, one exists that is semantically identical to the meaning covered by (B).

3.1 History and Current Usage

It is clear from the review that the implementation of the inactivation reason of **"Ambiguous"** has been both inconsistent and changed/evolved over time. In terms of current and historical usage **"Ambiguous"** has been used in the following scenarios:

- Inherent ambiguity within the concept's FSN term
- The FSN is ambiguous but there is only one clinically useful interpretation
- Explicit disjunction or conjunction within the FSN, especially when it represents a classification concept that contains "AND" or "AND/OR" within its term.
- Non-synonymy between the meaning of the concept's FSN and synonyms
- Semantic divergence between the meaning of the concept's FSN and the implied meaning of the same concept's modeling (its intensional definition)
- Semantic divergence between the meaning of the concept's FSN and the implied meaning of the same concept's sub- and supertypes (its extensional definition)
- The FSN does not represent a currently known clinical concept (aka - I have no idea what it means/meaning unknown!)
- The meaning of the code is linguistically entirely unambiguous but, were it to be used to describe a real patient instance, this would *de facto* be an insufficiently precise clinical statement in that EPR. The concept itself is NOT ambiguous.

For all of these scenarios, the association type applied has been **"POSSIBLY_EQUIVALENT_TO"** (previously **"MAYBE_A"**) and the tooling supports one or more target **"POSSIBLY_EQUIVALENT_TO"** options with the ability to state 'use first target'.

The review gave some concerning results that indicated that 70% or above of the inactivations were potentially in error and that the inter-reviewer disagreement was often 40% or above. However, the review was based upon the reviewer's knowledge and

perception of the current rules for this inactivation. If the author perceives that it is permissible to allocate a single target but the reviewer does not, then not surprisingly both the error rate and between reviewer disagreement will be observed to be high.

3.2 Known Issues

Given the broad range of scenarios to which the inactivation reason of **"Ambiguous"** has now become associated, it is not surprising that this 'dilution' of specificity has led to confusion for authors, implementers, and users alike.

The following issues have been identified during the review and as a result of author/editor feedback:

- Editorial guidance on how to resolve concepts that manifest ambiguity between the FSN and attached synonyms has at times been in conflict.
- Judgments made about whether an ambiguous FSN represents 2 or more truly clinically meaningful/useful concepts may require domain-specific knowledge not available to the editor.
- The implicit implication for vendors, implementers and users of **"POSSIBLY_EQUIVALENT_TO"** is that there is a choice to be made regarding possible targets. If only one possible target exists how should that be interpreted?
- The implication of a single **"POSSIBLY_EQUIVALENT_TO"** for data healing and analysis of historical data is that there may be other concepts that are either not present, are present and not listed, or could be created within SCT to improve the consistency/accuracy of data analysis and extraction.
- The commonest error was a failure to provide the full suite of **"POSSIBLY_EQUIVALENT_TO"** targets for a truly ambiguous concept.

3.3 Proposals for Change

Given the inconsistency identified by the review and between reviewer disagreement, the proposal is to significantly restrict the use of **"POSSIBLY_EQUIVALENT_TO"** with a definition as suggested below:

"POSSIBLY_EQUIVALENT_TO" associations state that for all possible EPR instances previously coded to the inactivated code each one can be re-coded to one or other of the listed association concepts. The "POSSIBLY_EQUIVALENT_TO" identified target concepts, without exception, must be equal to the sum of the targets should neither add or lose any granularity in the semantics not already expressed by the original concept. No combination of any other active concepts either does - or could ever - exist that would more precisely capture what was expressed by a clinician originally selecting the inactivated code.

Stated in a different way, each ambiguous concept is assumed to have a number of alternate interpretations, each of which is unambiguous. Each member of the set of alternate interpretations must be identified, and each must be mapped by a POSSIBLY_EQUIVALENT_TO association to an exactly equivalent active concept, and not to one that is either broader or narrower in meaning than the relevant interpretation.

On the basis of this definition of use, the proposed solution to the scenarios identified above are detailed below:

1. Where the FSN is inherently ambiguous and the ambiguity can be fully represented by 2 or more different clinical concepts, inactivate the concept with the reason of **"Ambiguous"** and declare association type of **"POSSIBLY_EQUIVALENT_TO"** to each of the target concepts, creating new concepts where they do not exist.
2. Where there is ambiguity between the meaning of the FSN and the implied meaning of one or more synonyms, the non-synonymous synonyms should be inactivated as **"Not semantically equivalent component"** and the association type of **"REFERS_TO"** *(see - **REFERS_TO** on page 12)*
3. Where the meaning implied by the modeling is in conflict with the meaning of the FSN, and the concept is a leaf concept, update the modeling - (*note: this approach may need to be reviewed as implementers, decision support applications, and analytics increasingly use ECL as their primary means of specifying their queries.)*
4. Where the sub- and/or supertypes suggest that a concept has been misplaced within the hierarchy this implies *either* that the modeling is at odds with the meaning of the FSN (so, as per (3) above) *or-* if the concept is primitive and not modelled at all - then it has been manually misclassified. In either case therefore:
    a. If the concept has no subtypes, correct the modeling
    b. If the concept has subtypes, inactivate as **"Ambiguous"** and use an association type of **"POSSIBLY_EQUIVALENT_TO"** if there are 2 targets, or **"REPLACED_BY"** if there is only a single target - *(see guidance below)*
5. Where the concept is clearly ambiguous but not all of the meanings can be represented as clinically meaningful concepts within the scope of SNOMED CT, use **"REPLACED_BY"** for the clinically meaningful concept and add from a drop down list a statement of the form "Not all of the ambiguity can or should be represented" and then add further explanation in the text box.
6. Classification concepts that are either a conjunction or a combined conjunction and disjunction, usually of the form: X WITH Y or X AND Y or X AND/OR Y. Resolution of these constructs relies on establishing a clear understanding of what is meant by "AND" or "WITH":
    a. Where "AND" is a substitute for "AND/OR": This is a clear example of ambiguity and should be resolved as for (c) below. *(There are few of these remaining and they can be identified where the subtype concepts include each element of the conjunction separately)*
    b. Where the "AND" (or "WITH") represents clinical statement composition - a record of when independent clinical phenomena are co-occurrent in a particular patient - that is deemed to be no longer appropriate to record in the patient's notes by means of single codes. Represent each of the individual elements of the conjunction by separate clinical concepts using an association type of **"EQUIVALENT_TO".** This signifies to the implementer and end-user that the single concept **MUST** be represented within the clinical notes by **ALL** of the **"EQUIVALENT_TO"** targets.

c. Where "AND/OR" represents the conflation of "AND" and "OR". This scenario (A AND/OR B) requires 3 targets, one for each of A, B, and (A AND B) using an association type of **"POSSIBLY_EQUIVALENT_TO"** to each of the targets.

7. Only if it has been established that the FSN does not represent either an outdated clinical concept or an obvious error, should the concept be labeled as "Meaning unknown" - A new reason for inactivation has been proposed for this situation with no association to a replacement concept. *(see page 23)*

8. There may be occasions where the concept is a complex clinical statement such as:

   209904002 |Hind brain laceration with open intracranial wound, with 1-24 hours loss of consciousness (disorder)|

   87796008 |Gastrojejunal ulcer with hemorrhage and with perforation but without obstruction (disorder)|

   ...Or resolution appears to require a mixture of **"REPLACED_BY" and "POSSIBLY_EQUIVALENT_TO"** these are likely to be classification constructs which require a bespoke solution and are not covered by the approaches described above - *(see guidance below)*.

3.4 Guidance

The following additional guidance is given to support consistency in implementation:

- Ensure that the synonyms on the inactive concept are represented within the appropriate active concept(s).
- Where the ambiguous concept includes one or more non-synonymous synonyms that do not apply to any of the target concepts, inactivate these and point them to their appropriate active concept or create a new concept if it does not exist.
- Where an ambiguous concept requires 2 or more targets that are clinically relevant, but SNOMED CT currently does not include the full suite, create the missing concept(s).
- Where the concept has subtypes, ensure that these concepts have been appropriately allocated to each of the target active concepts.
- Where the concept is deemed to be a classification concept such as "AND" or "AND/OR" there will be a drop down list from which the statement "This is a classification concept" should be chosen.
- If the concept is considered to have "unknown clinical meaning" first exclude the possibility that it is not either **"Outdated" or "Erroneous".**
- For complex classification constructs, refer to the Internal Editors meeting for review and agreement on an appropriate resolution.

3.5 Combinatorial Logic:

3.5.1 POSSIBLY_EQUIVALENT_TO

Whenever an already stated **POSSIBLY_EQUIVALENT_TO** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **POSSIBLY_EQUIVALENT_TO** (B OR C) and (B) **SAME_AS** (D) implies A **POSSIBLY_EQUIVALENT_TO** (C OR D)
- (A) **POSSIBLY_EQUIVALENT_TO** (B OR C) and (B) **REPLACED_BY** (D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C OR D)
- (A^{IntEd}) **POSSIBLY_EQUIVALENT_TO** (B^{IntEd} OR C^{IntEd}) and (B^{IntEd}) **MOVED_TO** (D^{NRC}) implies (A^{IntEd}) **POSSIBLY_EQUIVALENT_TO** (C^{IntEd})
- (A) **POSSIBLY_EQUIVALENT_TO** (B OR C) and (B) **POSSIBLY_EQUIVALENT_TO** (D OR E) implies **A POSSIBLY_EQUIVALENT_TO** (C OR D OR E)
- (A) **POSSIBLY_EQUIVALENT_TO** (B OR C) and (B) **WAS_A** (D AND E) implies ((A) **POSSIBLY_EQUIVALENT_TO** (C) OR (A) **WAS_A** (D AND E))

3.5.2 EQUIVALENT_TO*new*

The historical association **"EQUIVALENT_TO"** explicitly states when a conjunction using "WITH" or "AND" is inactivated each of the individual elements of the conjunction are replaced by separate clinical concepts using an association type of **"EQUIVALENT_TO".** This signifies to the implementer and end-user that the single concept **MUST** be represented within the clinical notes by **ALL** of the **"EQUIVALENT_TO"** targets.

Whenever an already stated **"EQUIVALENT_TO"** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **EQUIVALENT_TO** (B AND C) and (B) **SAME_AS** (D) implies A **EQUIVALENT_TO** (C AND D)
- (A) **EQUIVALENT_TO** (B AND C) and (B) **REPLACED_BY** (D) implies (A) **EQUIVALENT_TO** (C AND D)
- (A^{IntEd}) **EQUIVALENT_TO** (B^{IntEd} AND C^{IntEd} AND D^{IntEd}) and (B^{IntEd}) **MOVED_TO** (E^{NRC}) implies (A^{IntEd}) **EQUIVALENT_TO** (B^{IntEd} AND C^{IntEd} AND D^{IntEd}) *even though* B^{IntEd} is now inactive; anything else would block the NRC from achieving a full data repair.
- (A) **EQUIVALENT_TO** (B AND C) and (B) **POSSIBLY_EQUIVALENT_TO** (D OR E) implies **A EQUIVALENT_TO** (C AND (D OR E))
- (A) **EQUIVALENT_TO** (B AND C) and (B) **WAS_A** (D AND E) implies (A) **WAS_A** (B AND D AND E) and (A) **EQUIVALENT_TO** (B AND C) *even though* B is now inactive

3.5.2 REPLACED_BY

Whenever an already stated **"REPLACED_BY"** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **REPLACED_BY** (B) and (B) **SAME_AS** (C) implies (A) **REPLACED_BY** (C)

- (A) **REPLACED_BY** (B) and (B) **REPLACED_BY** (C) implies (A) **REPLACED_BY** (C)
- (A^{IntEd}) **REPLACED_BY** (B^{IntEd}) and (B^{IntEd}) **MOVED_TO** (C^{NRC}) implies (A^{IntEd}) **MOVED_TO** (C^{NRC})
- (A) **REPLACED_BY** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (C, D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C, D)
- (A) **REPLACED_BY** (B) and (B) **WAS_A** (C AND D) implies (A) **WAS_A** (C AND D)

3.5.3 REFERS_TO

The **"REFERS_TO"** association is used specifically to manage non-synonymy.

Where a description on a particular concept is not, in fact, a true synonym of the Fully Specified Name for that same concept, then:

- only the offending description should be inactivated, and not also the entire concept (unless its Fully Specified Name is itself ambiguous).
- the reason for the description being inactivated should be recorded as **"Not semantically equivalent component"**
- a single **"REFERS_TO"** association should be added between each inactivated description and exactly one concept whose Fully Specified Name correctly corresponds to the meaning of that description.
- In the rare case where a non-synonymous description is also itself ambiguous, it should still carry only a single **"REFERS_TO"** but this will point to a single inactive (ambiguous) concept that accurately captures that ambiguity, and that inactive concept should then itself have appropriate **"POSSIBLY_EQUIVALENT_TO"** associations. A new inactive (ambiguous) concept may need to be created specifically for this purpose and therefore will be inactive from the outset.

For example, given:

112113009 Steroid hormone (substance)

Synonym: 190108010 Steroid

...the synonym was inactivated and a **"REFERS_TO"** 116566001 Steroid (substance) added.

Note: the **"REFERS TO"** concept association reference set is therefore unique amongst association reference sets: all entries in its referencedComponentId column must be an identifier for a SNOMED description rather than for a SNOMED concept, as is the case for all other association reference sets. It's linkedComponentIds, however, are all still identifiers for concepts.

4. Non-Conformance to Editorial Policy

The inactivation reason "Non-conformance to Editorial Policy" explicitly states that the inactivated concept does not comply with a specific Editorial Guideline valid at the point of inactivation.

From time to time editorial policy may change, either to revise what is considered to be even within scope for the international edition of SNOMED CT, or to support changes in modelling practice and thereby bring greater consistency to existing content. In the latter scenario, the necessary refactoring or remodelling of content can change the meaning of existing SNOMED CT concept FSN's or the implied meaning of their logical definitions.

When concepts fall entirely out of SNOMED's scope, or remain within scope but become subject to such a change of meaning, the legacy concept should be inactivated for this reason. Where appropriate a new replacement active concept should be created if one does not already exist.

4.1 History and Current Usage:

Existing editorial guidance is unclear on the exact criteria for use of this inactivation reason. Further, selecting this reason for inactivation currently *de facto* prohibits authors from declaring any potential replacement concept targets - especially for "now out of scope" content. This lack of any replacement has caused issues for both authors/editors and the community of practice. Of course, where no replacement is explicitly stated by means of an historical association, it is still possible to use the implicit **"WAS_A"** association(s) in order to support limited data healing and data extraction routines. However, it is recognised that not all users have access to the technical resources necessary to implement this approach.

Where a replacement concept has been considered to be necessary authors/editors have instead therefore been forced to choose to use an alternative inactivation reason that permits an appropriate link to a replacement concept. The end result is confusing for the end-users and vendors who are then presented with an incorrect reason for the inactivation and potentially extends the use of the association type chosen beyond its intended definition.

Such situations can lead to some interesting and inconsistent historical decisions:

312979000 Acquired blindness, one eye (disorder) (non-conformant 20180731)

WAS A (implicit; no explicit historical associations)

232149003 Acquired blindness (disorder) (now itself ambiguous)

POSSIBLY_EQUIVALENT_TO

105597003 Blindness AND/OR vision impairment level (disorder)

However, *22950006 |Blindness of one eye (disorder)|* existed at that time but has subsequently been inactivated (20210131):

22950006 |Blindness of one eye (disorder)| (Ambiguous 20210131)

POSSIBLY_EQUIVALENT_TO - 274571007 |Blind left eye (disorder)|

POSSIBLY_EQUIVALENT_TO - 274572000 |Blind right eye (disorder)|

Both of which existed in 2002.

Similarly, in 2020, the following were all inactivated as “non conformant with editorial policy”:

398779009 Acetaminophen + orphenadrine citrate (product)
350242003 Alcoholic disinfectant (product)
375729000 Meperidine hydrochloride 75mg/mL solution (product)
25057004 Mercurial diuretic (product)
346597008 Oral hypoglycemic (product)

413502006 Amidine disinfectant (substance)
277953004 Dental fluoride gel (substance)
87452007 Light metal compound (substance)
372874007 Mucous membrane antifungal agent (substance)
372875008 Skin antibiotic (substance)

...whereas these were all inactivated as “ambiguous” so that the author could assert a POSSIBLY_EQUIVALENT_TO association to an active replacement concept:

398869001 Aspirin + caffeine + orphenadrine citrate (product)
108523005 Agent for migraine (product)
374764004 Cidofovir 75mg/mL injection (product)

11621003 Organic metallic compound (substance)
85160003 Mucous membrane anti-inflammatory agent (substance)
72785003 Nasal antibiotic (substance)

Situations in which this inactivation reason is best suited include bulk changes where editorial policy has resulted in significant changes to FSNs that result in a change of meaning; medicinal product and substance hierarchies being obvious examples.

4.2 Known Issues:

As discussed above the key issues are:

- It is currently unclear which elements of a "change" to editorial policy might result in the need to inactivate a concept.
- It is currently unclear whether non-conformance to editorial policy applies to the FSN alone or might include the logical definition.
- There is currently no facility to record which editorial policy resulted in a requirement to inactivate the concept.
- It is not permitted to allocate a historical association and so management of the inactivation at a local level is at best difficult.

4.3 Proposals for change:

Proposals for improvement:

- Where a change is made to Editorial Policy consideration must be given to whether the impact on existing content will result in the need to inactivate the concept and/or provide a historical association. Where inactivation is deemed necessary:

    - Provide guidance on the specific changes to each component affected.
    - Provide guidance on how to choose or create a new replacement.
- Provide a drop-down list that can be populated with a reference to the editorial policy that has resulted in the need for inactivation and add links as follows:
    - Change in editorial policy for drugs/substances- add a link to the Editorial Guide section or General Content (GC) or Editorial Panel (EDPANEL) Ticket.
    - Change in editorial policy for clinical findings - add a link to the Editorial Guide section or General Content (GC) or Editorial Panel (EDPANEL) Ticket.
    - Non-conformance to current editorial guidance - add a link to the Editorial Guide section.
    - ***Note:*** *the links would need to be a persistent and reliable reference to editorial policies, including to old policies that may later be abandoned.*
- Permit (and support within tooling) the use of the **"REPLACED_BY"** association type for the "non-conformant" reason for inactivation.
- Support the use of a new **"ALTERNATIVE"** flavour of historical association where the change is due to a change of scope e.g. where the review of devices content considers the existing detail out of scope for the SNOMED International release.
- Support the use of **"No replacement required"** in the drop down list with an additional text field to give the reason.
- Consider explicitly including changes to the editorial policy where that change impacts the logical definition and hence the implicit meaning of the concept.

4.4 Guidance:

The following guidance is given to support consistency in implementation:

- Establish whether the change to the FSN does actually imply a change of meaning, where it does not, inactivate and replace the FSN.
- The inactivation of classification based content is specifically excluded from this inactivation reason, use instead **"Obsolete Classification concept".**
- The inactivation of "statement composition" type content, typically using "AND" or "WITH" to represent when two or more interesting phenomena are concurrently present in the same patient, is excluded from this inactivation reason. Use instead **"Ambiguous Concept".**
- Inactivation of the 'AND/OR' content should be done using 'Ambiguous concept', this includes 'AND' where the 'AND' implies 'AND/OR'.
- Where the inactivation results from a change to Editorial Policy and requires a "REPLACED_BY" or "ALTERNATIVE" association, the Editorial Guide should state which should be used.

4.5 Combinatorial Logic:

4.5.1 REPLACED_BY:

Whenever an already stated **REPLACED_BY** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **REPLACED_BY** (B) and (B) **SAME_AS** (C) implies (A) **REPLACED_BY** (C)
- (A) **REPLACED_BY** (B) and (B) **REPLACED_BY** (C) implies (A) **REPLACED_BY** (C)
- (A^{IntEd}) **REPLACED_BY** (B^{IntEd}) and (B^{IntEd}) **MOVED_TO** (C^{NRC}) implies (A^{IntEd}) **MOVED_TO** (C^{NRC})[1]
- (A) **REPLACED_BY** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (C, D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C, D)
- (A) **REPLACED_BY** (B) and (B) **WAS_A** (C AND D) implies (A) **WAS_A** (C AND D)

4.5.2 ALTERNATIVE *new*

The identified **"ALTERNATIVE"** substitute(s) are offered as semantically "sufficiently similar" to the original inactive concept, for certain unspecified use cases.

"ALTERNATIVE" substitutes may or may not be semantically equivalent to the inactivated concept.

Whenever an already stated **ALTERNATIVE** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

(A) **ALTERNATIVE** (B) *and* (B) **SAME_AS** (C) *implies* (A) **ALTERNATIVE** (C)

(A) **ALTERNATIVE** (B) *and* (B) **REPLACED_BY** (C) *implies* (A) **REPLACED_BY** (C)

(A^{IntEd}) **ALTERNATIVE** (B^{IntEd}) *and* (B^{IntEd}) **MOVED_TO** (C^{NRC}) *implies* (A^{IntEd}) **MOVED_TO** (C^{NRC})

(A) **ALTERNATIVE** (B) *and* (B) **POSSIBLY_EQUIVALENT_TO** (C, D) *implies* (A) **ALTERNATIVE** (C, D)

(A) **ALTERNATIVE** (B) *and* (B) **WAS_A** (C AND D) *implies* (A) **WAS_A** (C AND D)

Note:

[1]Once MOVED_TO the NRC we (SNOMED International) have no knowledge of what has happened to B^{IntEd}

5. Erroneous Concept

The inactivation reason **"Erroneous Component"** explicitly states that the inactivated concept (A) has an FSN which contains an error that when corrected potentially changes the semantic meaning of the concept and that in the judgment of the author/editor the true *original* meaning is now represented by the **"REPLACED_BY"** concept (B).

5.1 History and Current Usage:

Despite the fairly tight definition and in part due to some historical changes to the Editorial Guide, the use of this concept inactivation reason has at times extended to include:

- Word order changes that do not result in a change in meaning
- Changes in punctuation
- Minor spelling mistakes that do not result in a change of meaning

Therefore, this inactivation reason has also been used to include (usually minor) technical typographical and grammar errors. However, current guidance recommends that the FSN can be changed whilst retaining the concept ID provided such corrections do not in truth change the meaning. Therefore, in the context of inactivating concepts, this inactivation reason now explicitly excludes such minor technical corrections.

Of all inactivation reasons, "Erroneous" has been used the least with a count of only 2150 up until and including the 2021 January release. The errors most likely to arise and be assigned to this inactivation reason are those involving disorders associated with incorrect *anatomy e.g sprain v strain of muscle v tendon, significant spelling mistakes in the descriptions of organisms, and incomplete or erroneous descriptions of drugs.*

Some examples:

391052007 Hip dual energy X-ray absorptiometry scan (procedure)

REPLACED BY

429529009 Dual energy X-ray photon absorptiometry scan of hip (procedure)

387831006 Isoproterenol hydrochloride 1:50,000mg injection (product)

REPLACED_BY

400309007 Isoproterenol hydrochloride 1:50,000mg(0.2mg/mL) injection solution 1mL ampule (product)

In truth, the latter example could either be a genuine error or simply a change in editorial policy.

5.2 Known Issues:

The issues relating to the use of **"Erroneous Component"** for typographical and grammar errors have been addressed through clarity in the Editorial Guidance on how and when an FSN can be inactivated without the need for concept inactivation.

A lack of clarity in the definition and guidance on how this inactivation reason should be used has resulted in an understandable overlap between this and the use of **"Non-conformance to Editorial Policy"**. Editorial policy evolves over time and seeks to bring consistency and clarity in naming conventions and modeling in specific domains. As a result, FSNs are changed to bring clarity to the meaning of concepts but without a change in meaning.

It may be difficult to distinguish between a concept that has an error as opposed to one which is ambiguous and some errors may give rise to a level of ambiguity.

5.3 Proposals for change:

The primary change to the use of **"Erroneous Component"** is to reinforce the clear distinction between "true clinical" errors and simple typographical and grammar errors that do not require concept inactivation.

Further clarity regarding the reason for the error will be supported by the addition of a text field that authors can use to give more detail regarding the error and a suitable reference, if available.

In addition, **"Erroneous Component"** should not be used to support the inactivation of a concept that is the subject of a change in Editorial Policy.

5.4 Guidance:

The following guidance is given to support consistency in implementation:

- Establish whether the changes that need to be made to correct the FSN do indeed make a potential change to the meaning of the concept. If they do not, inactivate and replace the FSN but not also the entire concept.
- Where the error gives rise to potential ambiguity, use the inactivation reason of **"Ambiguous Concept"**
- In some instances the decision to use 'Erroneous' or 'Non-conformance to editorial policy' is not straight forward. Take for example the issue relating to CT angiography in which we now understand that ALL CT angiograms necessarily use contrast. Technically, this represents an error in the FSN which changes meaning. Therefore, the correct approach would be to inactivate all concepts which do not state the use of contrast and replace them with one that does include contrast. However, this would result in significant churn of concepts and a simple replacement of FSN was agreed with the EAG and Community of practice. Therefore, consider internal discussion if there is any doubt as to the most appropriate solution.

5.5 Combinatorial Logic:

Whenever an already stated **REPLACED_BY** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **REPLACED_BY** (B) and (B) **SAME_AS** (C) implies (A) **REPLACED_BY** (C)

- (A) **REPLACED_BY** (B) and (B) **REPLACED_BY** (C) implies (A) **REPLACED_BY** (C)
- (A^{IntEd}) **REPLACED_BY** (B^{IntEd}) and (B^{IntEd}) **MOVED_TO** (C^{NRC}) implies (A^{IntEd}) **MOVED_TO** (C^{NRC})[1]
- (A) **REPLACED_BY** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (C, D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C, D)
- (A) **REPLACED_BY** (B) and (B) **WAS_A** (C AND D) implies (A) **WAS_A** (C AND D)

Note:

[1]Once MOVED_TO the NRC we (SNOMED International) have no knowledge of what has happened to B^{IntEd}

6. Outdated Concept

The inactivation reason **"Outdated Concept"** explicitly states that the inactivated concept (A) is an outdated concept that is no longer considered to be clinically acceptable or semantically interoperable internationally. It is possible that the *original* meaning of the outdated concept could be **"REPLACED_BY"** concept (B) that is semantically similar to or more general than the inactivated concept for the purposes of data healing and analysis of historical data. However, in some circumstances there will be no suitable replacement concept and therefore no historical association is provided.

6.1 History and Current Usage:

Over time our knowledge of diseases and disease processes evolves and this often results in reclassification and re-naming of the affected clinical domain. A classical example of this is diabetes mellitus and its subtypes which have undergone a number of renaming and classification exercises. Diabetes was originally classified only by age of onset ("adult" vs "juvenile" diabetes), then by how it was treated ("insulin-dependant" vs "non insulin dependant") and currently by 'Type' and/or specific monogenic defects.

Many inactivations properly belonging within this domain have instead historically been represented as either **"Duplicate"** or **"Ambiguous"**. The use of either of these inactivation reasons gives rise to incorrect assumptions about the semantic equivalence between the inactivated concept and its replacement. The use of **"Outdated Concept"** with a **"REPLACED_BY"** makes clear that the active replacement is not semantically equivalent to the inactive concept but rather represents a clinically acceptable current representation of the inactivated concept.

The domains in which this inactivation reason is most widely used are drugs and organisms in which there is quite a high turnover of naming conventions and reclassifications e.g.

114457004 |Klebsiella ornithinolytica (organism)|

REPLACED_BY

416832000 |Raoultella ornithinolytica (organism)|

This reclassification resulted from phylogenetic analysis.

Procedures also fall into and out of fashion where it might be appropriate not to provide a target replacement e.g.

58337008 |Transorbital leukotomy (procedure)|

Also known as "Ice pick lobotomy", as this was the instrument used, last performed by Dr Freeman in 1967. Surprisingly, this is still an active concept in SNOMED.

195989002 | Pituitary snuff-takers' disease (disorder) |

...an iatrogenic extrinsic allergic alveolitis caused by inhaling the dried, ground pituitary glands of human cadavers as the only known treatment for diabetes insipidus, until the 1970s when it became possible to synthesise antidiuretic hormone. The product required to cause the condition has therefore been neither available nor required, globally, for some 50 years; cases of allergic response to inhaled synthetic desmopressin have since been reported against this term but this is more correctly terminological drift since no

"pituitary snuff" was involved. The code remains still present and current in SNOMED and the term itself in the index of ICD10.

6.2 Known Issues:

Careful research is needed to clearly differentiate between a true duplicate, where there is semantic equivalence between the two concepts, and where there is a true evolution in the understanding of the concept, and therefore, an evolution in the meaning, that warrants a more appropriate **"REPLACED_BY"** target concept that is of equal or more general specificity.

There may be occasions where a single outdated concept has, as a result of new evidence, been reclassified into two or more new concepts. However, the **"POSSIBLY_EQUIVALENT_TO"** association type is not appropriate for use in this scenario because **"POSSIBLY_EQUIVALENT_TO"** is restricted to the situation in which the union of meanings provided by the set of potential equivalents is semantically equivalent to the *still valid* original meanings encapsulated by the inactivated concept. In the case of an outdated concept, that original meaning may have been unambiguous in its day but is no longer considered valid.

It is also possible that outdated clinical concepts simply fall into disuse without any appropriate replacement, and therefore no historical association should be provided.

6.3 Proposals for change:

The primary changes for the "Outdated" reason for inactivation relate to the requirement to support:

- The use of the new association type **"POSSIBLY_REPLACED_BY"**
- The use of **"POSSIBLY_REPLACED_BY"** where the inactivated concept has been replaced by 2 or more concepts, only one of which will be appropriate.
- Where appropriate to enable the author/editor to state that no historical association is required along with a text box to provide additional information.

6.4 Guidance:

The following guidance is given to support consistency in implementation:

- Establish the evidence to confirm that the concept is outdated rather than a synonym to an existing 'duplicate' concept.
- Where the concept has been identified as outdated because of a change in the understanding of the clinical concept, or where updated clinical thinking is that the clinical phenomena previously coded to the single concept should now be distributed across more than one possible replacement, apply the **"POSSIBLY_REPLACED_BY"** association type.
- Simple renaming of drugs or organisms where the meaning is unchanged should be dealt with by updating the FSN only using **'Outdated component'** as the association type on the inactivated FSN description.

- Where the concept is no longer recognized as clinically useful, mark the inactivated concept as 'No suitable replacement concept identified' and add a textual comment.

6.5 Combinatorial Logic:

6.5.1 REPLACED_BY

Whenever an already stated **REPLACED_BY** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **REPLACED_BY** (B) and (B) **SAME_AS** (C) implies (A) **REPLACED_BY** (C)
- (A) **REPLACED_BY** (B) and (B) **REPLACED_BY** (C) implies (A) **REPLACED_BY** (C)
- (A^{IntEd}) **REPLACED_BY** (B^{IntEd}) and (B^{IntEd}) **MOVED_TO** (C^{NRC}) implies (A^{IntEd}) **MOVED_TO** (C^{NRC})[1]
- (A) **REPLACED_BY** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (C, D) implies (A) **POSSIBLY_EQUIVALENT_TO** (C, D)
- (A) **REPLACED_BY** (B) and (B) **WAS_A** (C AND D) implies (A) **WAS_A** (C AND D)

6.5.2 POSSIBLY_REPLACED_BY*new*

The purpose of the **"POSSIBLY_REPLACED_BY"** association type is to indicate BOTH that none of the suggested target replacement concepts are semantically equivalent to any meaning implied by the inactivated concept (ie neither **SAME_AS** nor **POSSIBLY_EQUIVALENT_TO** can apply) AND that more than one potential replacement exists, only one of which will be appropriate.

The stated **"POSSIBLY_REPLACED_BY"** targets represent all of the alternatives identified as a result of the reclassification process, one of which, although not semantically *exactly* the same as the inactivated concept, is considered to be clinically acceptable for each individual patient previously coded to the inactive concept.

Whenever an already stated **POSSIBLY_REPLACED_BY** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

- (A) **POSSIBLY_REPLACED_BY** (B OR C) and (B) **SAME_AS** (D) implies (A) **POSSIBLY_REPLACED_BY** (C OR D)
- (A) **POSSIBLY_REPLACED_BY** (B OR C) and (B) **REPLACED_BY** (D) implies (A) **POSSIBLY_REPLACED_BY** (C OR D)
- (A^{IntEd}) **POSSIBLY_REPLACED_BY** (B^{IntEd} OR C^{IntEd}) and (B^{IntEd}) **MOVED_TO** (D^{NRC}) implies (A^{IntEd}) **POSSIBLY_REPLACED_BY** (C^{IntEd})
- (A) **POSSIBLY_REPLACED_BY** (B OR C) and (B) **POSSIBLY_REPLACED_BY** (D OR E) implies (A) **POSSIBLY_REPLACED_BY** (C OR D OR E)
- (A) **POSSIBLY_REPLACED_BY** (B OR C) and (B) **POSSIBLY_EQUIVALENT_TO** (D OR E) implies (A) **POSSIBLY_REPLACED_BY** (C OR D OR E)

- (A) **POSSIBLY_REPLACED_BY** (B OR C) and (B) **WAS_A** (D AND E) implies ((A) **POSSIBLY_REPLACED_BY** (C) OR (A) **WAS_A** (D AND E))

[1]Once MOVED_TO the NRC we (SNOMED International) have no knowledge of what has happened to B^{IntEd}

7. Concept Moved Elsewhere

The inactivation reason **"Component Moved Elsewhere"** with association type **"MOVED_TO"** and **"MOVED_FROM"** combine to form a mechanism by which SNOMED records when jurisdictional control of a concept passes between extensions, or between the international core and an extension, in either direction (i.e. from CORE to Extension or vice versa, or between extensions maintained within the same release centre).

The merger between SNOMED RT and CTV3 resulted in some content that did not appear to have an agreed meaning (or utility) internationally but which may still have had meaning within individual regions/jurisdictions. This is often true of concepts that relate to healthcare organizational structures and management processes or treatment regimens etc. In this situation, the content would be inactivated in the International Edition of SNOMED and be "moved to" another extension.

All such transfers of control, therefore, have conceptually a "donor" and a "recipient" SNOMED extension/release.

7.1 History and Current Usage:

The mechanism by which this inactivation reason has been implemented is dependent upon which release format was in use at the time:

7.1.1Release Format 1:

Under the older RF1 encoding of SNOMED CT release materials, **"MOVED_TO"** and **"MOVED_FROM"** associations were the only mechanism for recording the actual transfer. In addition, the mechanism also required that the recipient change the identifier of the concept as part of that transfer.

A **"MOVED_TO"** association type is recorded within the donor release in order to initiate a bilaterally agreed and expected transfer/donation of a concept to another recipient namespace, locus of editorial control and extension.

At its next release opportunity, the recipient namespace - or more precisely some extension published into it - should instantiate matching, active but different conceptId with associated descriptions and relationships, corresponding to the meaning of the code already inactivated by the donor extension. Simultaneously, the recipient extension also adds a **"MOVED_FROM"** association on the active replacement concept, linking it back to the identifier for the inactive conceptId in the donor extension.

It can be seen that all individual **"MOVED_TO"** associations are therefore intended to be (eventually) always matched by a corresponding **"MOVED_FROM"** association within the recipient's extension and namespace. Thus, **"MOVED_TO"** and **"MOVED_FROM"** associations come in pairs; the donor can only record where the component had gone, jurisdictionally. Only the recipient can both acknowledge the transfer and also, uniquely, link the old and new identifiers.

There exists an additional association type "PENDING_MOVE" which was intended to indicate within the International Edition that the concept in question was scheduled to be

“MOVED_TO” another national extension. However, it appears that this has never been used.

7.1.2 Release Format 2:

Recipient extensions can now formally accept and reactivate a **“MOVED_TO”** concept and all its descriptions and modeled relationships without creating any new components within the specific namespace, as was required under RF1. Continued use of the **“MOVED_TO”** association under RF2 implies a level of expected identifier churn that is no longer happening.

Instead of recipient extensions adding new and matching **“MOVED_FROM”** associations (to directly link the inactive conceptId with some newly created equivalent in the new namespace), RF2 permits them instead to simply inactivate the “MOVED_TO” association itself whilst reactivating the original component identifier, in one of their own modules but with a later-dated effectiveTime than the entries in the donor module stating the concept to be inactive and **“MOVED_TO”** somewhere else.

From the subsequent perspective of users of the recipient extension data, therefore, nothing changes about the transferred concept except the moduleId stating who owns it. This transfer pattern is far less disruptive than the original RF1-era mechanism of transfer-with-identifier-churn. A direct consequence is that the **“MOVED_FROM”** relationship will in future never be used, and **“MOVED_TO”** and **“MOVED_FROM”** relationships no longer appear in pairs.

7.2 Known Issues:

The current inactivation mechanism assumes that any concept that has or is proposed to be **“MOVED_TO”** another namespace is a concept that only has ‘meaning’ within that jurisdiction. There is no mechanism to allow authors to provide a link to a suitable alternative for those outside of the jurisdiction to which this concept is to be moved who may have used this concept either intentionally or by accident.

The issue of what mechanism is the most appropriate to use to identify the organization that takes on the responsibility for the **“MOVED_TO”** concept remains unclear. The current options include:

- The recipient’s organization namespaceID
- The recipients moduleID
- A new identifier to represent the authority who carries responsibility for the donated concept
- A combination of namespaceID and moduleID

The continued use of the association type **“MOVED_TO”** implies the presence of a reciprocal **“MOVED_FROM”** and subsequent identifier churn which no longer takes place and does not allow us to clearly identify, in historical inactivations, when this was no longer the case.

7.3 Proposals for change:

The use of this inactivation reason could be improved by:

- Providing the option to allocate one or more “Alternative” concepts that might be sufficiently similar to the inactivated concept:
    - This would normally be a single “Alternative”
    - The use of 2 or more alternatives would indicate that there is some ambiguity in the inactivated concept but this does not imply that the sum of the “Alternatives” is semantically equivalent e.g. this is not **“POSSIBLY_EQUIVALENT_TO”.**
    - Where no ‘alternative’ is chosen this implies that the concept is so specific to the recipient jurisdiction that its use in any other jurisdiction would be deemed inappropriate. A drop-down box stating **“No suitable alternative exists”** with an additional text field to give the reason why no historical association is deemed appropriate.
- Feedback and discussion within CIWG suggest that neither the use of namespaceID nor moduleID alone provides the information necessary to convey where the inactivated concept had been moved to. It is therefore proposed that a **“MOVED_TO”** concept should be accompanied by both the namespaceID and the moduleID
    - The namespaceID indicating the owning authority.
        - The namespaceID should include a PT of the name of the authority.
    - The moduleID indicating which module the recipient has moved the concept to.
        - The moduleID would be provided by the recipient authority
- The association type **“MOVED_TO”** should no longer be used and be replaced by **“DONATED_TO”** to recognise that all components of the concept have passed to the recipient.

7.4 Guidance:

The following guidance is given to support consistency in implementation:

- Moving content from SNOMED International Edition to a local NRC must always be done in consultation with the recipient authority. Consideration should also be given to wider consultation with the community of practice to establish whether the proposed inactivation of the concepts causes significant concern.
- There is a need to establish with the recipient the moduleID of the module to which the donated concept will be added.
- The decision to allocate an “alternative” target concept needs to be done with care taking into consideration the impact on past and future ECL queries.

- Guidance to the community of practice should suggest that the alternatives be reviewed within the context of their potential use by their user base.

7.5 Combinatorial Logic:

7.5.1 DONATED_TO

NB: the combinations of associations listed below are highly unlikely to ever be encountered; to date, no namespace identifiers concept has ever been inactivated.

(A) **DONATED_TO** (B) and (B) **SAME_AS** (D) implies (A) **DONATED_TO** (D)

(A) **DONATED_TO** (B) and (B) **MOVED_TO** (D) implies (A) **MOVED_TO** (D)

(A) **DONATED_TO** (B) and (B) **REPLACED_BY** (D) implies (A) **MOVED_TO** (D)

(A) **DONATED_TO** (B) and (B) **POSSIBLY_EQUIVALENT_TO** (D OR E) implies (A) **MOVED_TO** null

(A) **DONATED_TO** (B) and B **WAS_A** (D OR E) implies (A) **MOVED_TO** null

7.5.2 ALTERNATIVE

Where a concept within SNOMED is **"MOVED_TO"** some other product, an **"ALTERNATIVE"** association can be asserted within the *donor* product in order to identify one or more possible active concept(s) also still active and within the same donor product that may stand in for the moved/inactivated concept.

The identified **"ALTERNATIVE"** substitute(s) are offered as semantically "sufficiently similar" to the original inactive concept, for certain unspecified use cases.

They may or may not be semantically equivalent to that moved, inactivated concept.

Whenever an already stated **ALTERNATIVE** target itself also becomes inactive - whether at the same release or later - the combinatorial logic of associations should be:

(A) **ALTERNATIVE** (B) *and* (B) **SAME_AS** (C) *implies* (A) **ALTERNATIVE** (C)

(A) **ALTERNATIVE** (B) *and* (B) **REPLACED_BY** (C) *implies* (A) **REPLACED_BY** (C)

(A^{IntEd}) **ALTERNATIVE** (B^{IntEd}) *and* (B^{IntEd}) **MOVED_TO** (C^{NRC}) *implies* (A^{IntEd}) **MOVED_TO** (C^{NRC})

(A) **ALTERNATIVE** (B) *and* (B) **POSSIBLY_EQUIVALENT_TO** (C, D) *implies* (A) **ALTERNATIVE** (C, D)

(A) **ALTERNATIVE** (B) *and* (B) **WAS_A** (C AND D) *implies* (A) **WAS_A** (C AND D)

8. Meaning Unknown*new*

The inactivation reason **"Meaning Unknown"** explicitly states that the meaning of the inactivated concept (A) cannot, in the judgement of the author/editor be determined and therefore no historical association should be provided.

For example:

194964003 Milk spots of pericardium (disorder)

...continues to exist in SNOMED as an active code having been inherited from ICD9 via the READ Codes. Some sources recognise it as a normal morphology, others as an *ab*normal morphology. So, as a disease entity, nobody seems to know what it means or what the case definition is.

8.1 History and Current Usage:

This is a new inactivation reason.

8.2 Known Issues:

It is possible that someone within the community of practice may have knowledge of what the concept means and so it is important that there is an audit trail to facilitate future potential changes.

8.3 Proposals for change:

Add this inactivation reason to the concept inactivation suit without any permitted flavour of historical association.

While no historical association is required the proposal is to provide the use of an annotation of **"No replacement required"** with an additional text field to give further details on why this concept was considered not to represent a known clinical phenomena.

8.4 Guidance:

The following guidance is given to support consistency in implementation:

- Consider consulting domain experts to establish whether the concept to be inactivated is or is not considered to have clinical meaning within their sphere of practice. Use the sub and supertypes to identify the domain to consult

9. Classification Concept*new*

The inactivation reason **"Classification Concept"** explicitly states that the inactivated concept originates from the "closed world" classification paradigm and as such is inappropriate content for use within the clinical record. The inactivated concept (A) *may* be linked to one or more active concepts (B and/or C…) using historical associations as determined by the type of classification concept and associated guidance given below.

As the donor 'terminologies' to SNOMED CT, both SNOMED RT and CTV3 were themselves on the evolutionary pathway from 'classifications' to 'terminologies'. Each had a considerable quantity of content explicitly mirrored from statistical classifications but where that particular content existed explicitly to support the "closed world" view required for statistical reporting. Typical examples include all codes whose terms either begin "*other specified*" or end "*not otherwise specified*" or "*not elsewhere classified*".

Many of these "classification concepts" were inactivated around or shortly after the merger, and many more in 2010 when Limited Status was recast as a flavour of inactive SNOMED concept. However, a number remain still active today and the intention is that they will be inactivated.

9.1 History and Current Usage:

The method of dealing with classification concepts until 2018 was to use the inactivation reason of **"Limited"** and association type of **"WAS_A"**. This association type was the "association of last resort": it should be only used whenever no active concept(s) exist to precisely cover the EXACT same semantics as the inactivated concept.

The purpose of this **WAS_A** association type had therefore been to record the complete set of direct parent supertype(s) that were assigned to the inactivated concept in the last release in which it was still active, within all future SNOMED releases.

A WAS_A association thus enables the inactivated concept to continue to be recognised as a "kind of" both its historical direct parents and all their ancestors recursively, subject to the proviso that the ancestors of an inactivated concept's former parents may change over time across successive releases.

However, the WAS_A association can not guarantee that the inactivated concept will be returned as a subclass of *all* semantically appropriate supertype classes that may exist in later releases. If, prior to its inactivation, the concept did not already possess all semantically valid parents and ancestors, many of these "missed classifications" will necessarily persist forever.

Finally, WAS_A associations do not enable the determination of what concepts in the current release (whether now active, or also inactive) either used to be subtypes of the inactivated concept prior to its inactivation, or might now reasonably be judged to be their semantic subtype even if they were not classified as subtypes prior to the inactivation.

The original requirement for explicit declarations of WAS_A relationships was born out of limitations inherent to SNOMED's RF1 encoding of its release materials. Under the newer RF2 encoding, these limitations no longer apply and so it has been argued that explicitly

stating the last known active parents by means of WAS_A associations is now entirely redundant, as this information can be trivially retrieved programmatically directly from the FULL distribution of the release data.

Therefore current editorial guidance states that the inactivation reason of **"Limited Component"** and association type of **"WAS_A"** should no longer be used from July 2018 and that "When changes are made to a historical relationship for a concept that was previously inactivated using WAS_A, effort will be made to assign a new historical relationship that facilitates traceability of the concept (e.g. **"Duplicate"** or **"Ambiguous"**)."

9.2 Known Issues:

In the closed world of classifications there is an absolute requirement to be able to categorise all instances of the "thing" you are recording to a classification leafnode code, whether or not it is also a subtype of any of the fixed list of more obviously recognisable subtypes of "thing" that happen to exist within that version of the classification. Where the fixed list of available codeable "things" does not include the identifiable "thing", then it must be coded to a special "catch all" leafnode code typically called "Thing otherwise specified" or "Thing not elsewhere classified". If it is known that it's a "thing" but not also any of the more precise subtypes of "thing" for which a leafnode code already exists, then it is labelled as "Thing not otherwise specified". The set of "things" that the coded item was tested against and explicitly found *not* to be a kind of is, therefore, knowable because that list of more specific alternatives is known, and fixed. It is a "closed world" system.

By contrast, the only thing you can know or record from within an open world terminological system such as SNOMED CT is that it is a "thing"; the set of more specific subtypes of "thing" for which a SNOMED CT code happens to already exists is *not* fixed within a version: the system is an "open world".

The use of the **"WAS_A"** association was to identify the inactivated concept's immediate parent(s). However, whether stated manually before July 2018 or only implicitly since, there was no guarantee that the inactivated concept was optimally classified and so it might be missing significant semantically appropriate parents and ancestors.

For example:

196311008 Excessive tooth attrition NOS (disorder) - inactivated January 2010

WAS_A

234977009 Tooth surface loss (disorder) - this remains the same today.

However, there exists today (and it was already present in January 2010) the concept:

53963006 Excessive attrition of teeth (disorder)

..which would have been a much more appropriate replacement to the original inactivated concept *196311008 Excessive tooth attrition NOS (disorder)*

A sampled review of all inactivations and stated historical associations has suggested that many such inactivations could have been provided with a more suitable replacement thus avoiding significant taxonomic omission and false negative reporting that will flow from those errors.

The current advice to apply the association types of **"SAME_AS"** and **"POSSIBLY_EQUIVALENT_TO"** may risk giving users and implementers an incorrect impression of the 'quality' of the replacement which are neither semantically equivalent or expressing the ambiguity present in the original concept.

9.3 Proposals for change:

This is a new inactivation reason and the proposal is that there should be:

- A drop down list specifying the type of classification concept:
    - Concept containing "Not otherwise specified".
    - Concept containing "Not elsewhere classified".
    - Concept containing "Otherwise specified".
    - The facility to add additional classification types:e.g. Concept containing "without".
- The association type should be **"REPLACED_BY"** for the above use cases.
- There should be flexibility to add other association types to address the needs of other classification concepts.
- There should be a link from each member of the drop down list to the appropriate editorial guidance section.
- There should be an optional text box to allow additional comments for individual inactivations.

9.4 Guidance:

The Editorial Guide should contain specific guidance for each of the classification 'types' giving:

- The goal of inactivation
- Any impact that it may have on the future analysis
- Advice on the most appropriate target for the **"REPLACED_BY"** association

In the use cases identified above the logical replacement is likely to be a concept that represents the core meaning without the 'classification tail' which may or may not be the immediate supertype prior to inactivation e.g.

267997004 |Exostosis of unspecified site (disorder)|

REPLACED_BY

416189003 |Exostosis (disorder)|

The current inactivation is:

267997004 |Exostosis of unspecified site (disorder)|

WAS_A

362965005 |Disorder of body system (disorder)|

10. Summary of Proposed Changes

10.1 Duplicate Concept

The inactivation reason **"Duplicate Component"** with association type **"SAME_AS"** explicitly states that the inactivated concept (A) semantically represents exactly the meaning of the remaining active concept (B). Implicitly it also means that (A) **SAME_AS** (B) always, by definition implies (B) **SAME_AS** (A).

The statement of unambiguous and exact, bidirectional semantic equivalence, (A) SAME_AS (B) explicitly implies that everything ever subsequently said about B is, by definition, also true of A including the requirement to ensure any analysis expressed in terms of A returns the same subtypes as would have been present had the concept B been substituted into the query logic, and vice versa.

The proposal is that there should be ***no other*** situations in which this inactivation reason and historical association should be used.

The tooling should provide the ability to annotate each inactivation with the evidence provided to support duplicate status of the concept

10.2 Ambiguous Concept

The inactivation reason **"Ambiguous Concept"** with association type **"POSSIBLY_EQUIVALENT_TO"** explicitly states that the concept to be inactivated is inherently ambiguous but that all of the potential meanings represent clinically meaningful concepts each of which is semantically identical to one of the **"POSSIBLY_EQUIVALENT_TO"** target concepts, whether currently present or could be created in SNOMED CT.

Using **"POSSIBLY_EQUIVALENT_TO"** indicates to users and vendors that all of the potential meanings have been identified and that they have to make a choice as to which **"POSSIBLY_EQUIVALENT_TO"** target is the most appropriate to their use case.

The proposal is that the **"POSSIBLY_EQUIVALENT_TO"** historical association ***can only be used*** where ***all*** of the potential meanings of the inactivated concept are each represented by a target concept linked to the **"POSSIBLY_EQUIVALENT_TO"** historical association.

There are 2 scenarios in which ambiguity exists within a concept to be inactivated that cannot be addressed by the use of **"POSSIBLY_EQUIVALENT_TO"** historical associations and the proposals are:

1. Where ambiguity exists within the concept but only one meaning can be represented by a clinical concept within the scope of SNOMED CT; apply the **"REPLACED_BY"** historical association as this is stating that in the judgement of the author/editor that this is the most appropriate replacement.
2. Where the concept represents clinical statement composition using "WITH" or "AND", represent each of the individual elements with a single concept using the new historical association **"EQUIVALENT_TO"**. Where an **"EQUIVALENT_TO"** association is used it signifies to the user and vendor that ***ALL*** of the

"EQUIVALENT_TO"associations ***must*** be included in the record to provide semantic equivalence to the inactivated concept.

10.3 Non-Conformance to Editorial Policy

The inactivation reason "Non-conformance to Editorial Policy" explicitly states that the inactivated concept does not comply with a specific Editorial Guideline valid at the point of inactivation.

Currently it is not permitted to allocate an appropriate historical association nor record the editorial policy responsible for the inactivation which makes management of the inactivation very difficult locally.

Therefore the proposal is to:

- Ensure that changes to editorial guidance include guidance on whether a replacement is required and if so which of the options given below is most appropriate.
- Permit the use of the **"REPLACED_BY"** historical association type where that is appropriate.
- Permit the use of a new **"ALTERNATIVE"** flavour of historical association where the change is due to a change of scope e.g. where the review of devices content considers the existing detail out of scope for the SNOMED International release.
- Permit the use of **"No replacement required"** in the drop down list with an additional text field to give the reason why no historical association is deemed appropriate.
- Provide drop down lists to indicate the domain affected and a link to the specific change in editorial policy
- Provide a link to the existing editorial policy where the inactivation is a result of conformance to that policy
- Provide persistent links and reliable links to reference the editorial policies, including to old policies that may later be abandoned.

10.4 Erroneous Concept

The inactivation reason **"Erroneous Component"** explicitly states that the inactivated concept (A) has an FSN which contains an error that when corrected potentially changes the semantic meaning of the concept and that in the judgment of the author/editor the true *original* meaning is now represented by the **"REPLACED_BY"** concept (B).

Improving use of this inactivation reason will be achieved through clarity on the guidance given on the criteria that determines whether a change in FSN results in a change in meaning sufficient to lead to inactivation.

Enhanced tooling will provide annotation to the inactivation to allow the author/editor to provide more detail about the cause of the error that led to inactivation.

10.5 Outdated Concept

The inactivation reason **"Outdated Concept"** explicitly states that the inactivated concept (A) is an outdated concept that is no longer considered to be clinically acceptable or semantically interoperable internationally. It is possible that the *original* meaning of the outdated concept could be **"REPLACED_BY"** concept (B) that is semantically similar to or more general than the inactivated concept for the purposes of data healing and analysis of historical data.

There are occasions where an outdated concept has been reclassified into 2 or more new clinical concepts or where the concept has fallen into disuse and no replacement is necessary. The proposals to address these needs are therefore:

- To permit the use of a new historical association **"POSSIBLY_REPLACED_BY"** to indicate that the outdated concept has been replaced by 2 or more new clinical phenomena which are not considered to be semantically equivalent to the inactivated concept. The end user will need to make a choice as to which is most appropriate.
- Permit the use of **"No replacement required"** in the drop down list with an additional text field to give the reason why no historical association is deemed appropriate.

10.5 Concept Moved Elsewhere

The inactivation reason **"Component Moved Elsewhere"** with association type **"MOVED_TO"** and **"MOVED_FROM"** combine to form a mechanism by which SNOMED records when jurisdictional control of a concept passes between extensions, or between the international core and an extension, in either direction (i.e. from CORE to Extension or vice versa, or between extensions maintained within the same release centre).

The mechanism for implementing **"Concept Moved Elsewhere"** no longer requires that the recipient allocates a new conceptID and so the proposal is that we use a new historical association of **"DONATED_TO"** as this better represents the current mechanism whereby the concept with all of its components is 'donated' to the recipient.

Identifying the recipient has been problematic as neither the namespaceID or the moduleID is sufficient and therefore the proposal is to use both the namespaceID with associated namespace description and the moduleID.

It is possible that jurisdictions other than the recipient may have used the 'donated' content and therefore the historical association **"ALTERNATIVE"** would be offered as semantically "sufficiently similar" to the original inactive concept, for certain unspecified use cases. "ALTERNATIVE" substitutes may or may not be semantically equivalent to the inactivated concept.

There will be instances where there are no appropriate alternatives; the annotation of **"No replacement required"** will be available with an additional text field to give the reason why no historical association is deemed appropriate.

10.6 Meaning Unknown*new*

The inactivation reason **"Meaning Unknown"** explicitly states that the meaning of the inactivated concept cannot, in the judgement of the author/editor be determined and therefore no historical association should be provided.

While no historical association is required the proposal is to provide the use of an annotation of **"No replacement required"** with an additional text field to give further details on why this concept was considered not to represent a known clinical phenomena.

10.7 Obsolete Classification Concept*new*

The inactivation reason **"Obsolete Classification Concept"** explicitly states that the inactivated concept originates from the "closed world" classification paradigm and as such is inappropriate content for use within the clinical record and therefore out of scope for SNOMED CT.

Inactivations of this type used to be achieved through the use of **"Limited Concept"** with a historical association of "**WAS_A"** to identify the inactivated concepts immediate parents. This approach is no longer available and this has resulted in issues with both historical inactivations subject to this inactivation reason and for analysis of EPR data and data healing.

The proposal is to introduce the inactivation reason of **"Obsolete Classification Concept"** with the following additional requirements:

- a drop down list to identify the type of classification concept being inactivated:
    - Concept containing "Not otherwise specified".
    - Concept containing "Not elsewhere classified".
    - Concept containing "Otherwise specified".
- The facility to add additional classification types:e.g. Concept containing "without".
- There should be flexibility to add association types to address the requirements of the classification concepts being inactivated - the above use cases should utilise the **"REPLACED_BY** historical association to the supertype concept that represents the meaning of the concept without the classification tail**.**
- There should be a link from each member of the drop down list to the appropriate editorial guidance section.
- There should be an optional text box to allow additional comments for individual inactivations.

Please provide feedback either directly to Paul Amos (pam@snomed.org) or in the comments boxes on the Confluence Page: https://confluence.ihtsdotools.org/display/editorialag/Concept+Inactivation+Proposed+Amendments