

**DEPARTMENT OF VETERANS AFFAIRS**

**Office of Informatics and Analytics**

**Office of Knowledge Based Systems (KBS)**

**Informatics Architecture Support Services**

**Contract No. VA701-16-C-0157**

**Obligation No. 776-C60159**

**CLIN: 1017**

***SUPPORTING DOCUMENT***

**Task 5.5 Identify SOLOR Content that Requires Special Handling**

***Version 1.0***

**Date:** **January 31, 2019**

Table of Contents

[1. Purpose 3](#_Toc536620869)

[2. Symmetrical Modeling Definition 3](#_Toc536620870)

[3. Approach to Identify Content 5](#_Toc536620871)

[4. Rules for Evaluating Membership in RefSets 8](#_Toc536620872)

[5. Rules for placing concepts in the RefSets 8](#_Toc536620873)

[6. Other Symmetry Issues 9](#_Toc536620874)

[7. Grades, Scales and Scores 9](#_Toc536620875)

Table of Figures

[Figure 1: Content Modeled Inappropriately – Concept with multiple Clinical Course attributes 5](#_Toc535932753)

[Figure 2. Example of Inverse Concepts modeled with radical differences – Closed supcapital fracture of left femur is correctly modeled with a single role group while the Open concept is incorrectly modeled with multiple 6](#_Toc535932754)

[Figure 3. FSN contains "Acute", but does not have a Clinical Course = Acute 7](#_Toc535932755)

[Figure 4: Grade concept with an Interprets = Procedure 9](#_Toc535932756)

[Figure 5: Grade concept with an Interprets = Observable Entity 9](#_Toc535932757)

[Figure 6: Grade Concept with both a Procedure and Observable used for the Interprets Attribute 10](#_Toc535932758)

[Figure 7: Grade with no Interprets Attribute 10](#_Toc535932759)

[Figure 8. Proposed Model for Grades, Scales, and Score Concepts 11](#_Toc535932760)

[Figure 9. Example of Systolic heart failure stage modeled with the new concept model 11](#_Toc535932761)

# Purpose

The purpose of the RefSets produced in the four-month extension to Option Year 1 was to identify concepts in SNOMED that are and are not symmetrical.

# Symmetrical Modeling Definition

We consider modeling of concepts “symmetrical”

1. If concepts which are opposites of each other (inverse concepts)
   * exist in SNOMED and
   * reside in the correct hierarchy under the correct parent concept

Example Inverse Concepts

Example

299331007 |Knee joint varus deformity (finding)| has two children, which are opposites. Both are present and under the correct parent concept:

64925008 |Acquired genu varum (disorder)|

79168008 |Congenital genu varum (disorder)|

**Note**: Inverse concepts do not necessarily have to reside under the same parent to be considered symmetrically modeled.

Example Child concepts residing under different (but correct) parents:

Example

230763008 |Traumatic cerebral edema (disorder)| and 330011000119102 |Non-traumatic cerebral edema (disorder)| are inverse.

230763008 |Traumatic cerebral edema (disorder)| is a child of 127295002 |Traumatic brain injury (disorder)|

330011000119102 |Non-traumatic cerebral edema (disorder)| is a child of 2032001 |Cerebral edema (disorder)|

We consider modeling of concepts “symmetrical”

1. If concepts are not modeled with more than one of the same attribute, but with different values (e.g. a clinical course that is both acute and chronic)
2. If concepts are parent concepts of a Leaf Node have all the correct Leaf concepts
3. If concepts, which are Grades, Scales, Stages, and Scores, where all concepts existed and were consistently modeled

# Approach to Identify Content

The below approach was used to identify the content to be reviewed to create the RefSets:

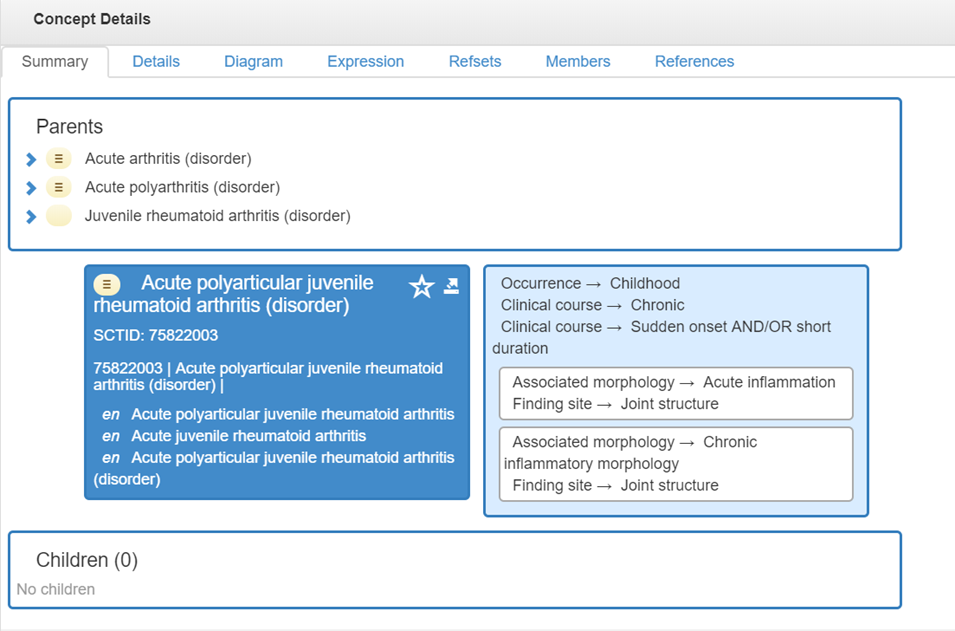
1. Missing Content – Via Inverse Work
   1. Inverse Refset work identified roughly 6,000 concepts that need to be reviewed to confirm missing opposing concepts

Table 1. Example of missing opposing concepts

|  |  |
| --- | --- |
| Conceptid1 | FSN |
| 8587003 | Congenital diverticulum of colon (disorder)  Missing opposite: Acquired diverticulum of colon (disorder) |
| 8656007 | Total traumatic cataract (disorder)  Missing opposite: Partial traumatic cataract (disorder) |
| 9027003 | Normal pulmonary arterial wedge pressure (finding)  Missing opposite: Abnormal pulmonary arterial wedge pressure (finding) |
| 21370008 | Tenotomy of abductor of hip, open (procedure)  Missing opposite: Tenotomy of abductor of hip, closed (procedure) |

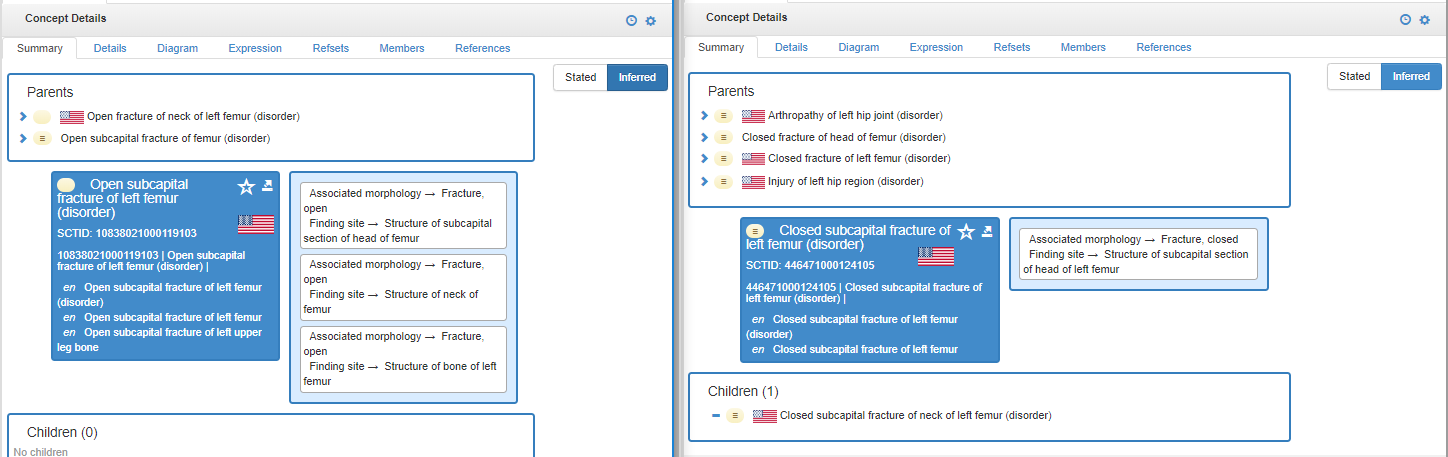
1. Missing Content – Via Leaf Nodes
2. Identify all concepts that are parents of a leaf with only one leaf.
3. Content Modeled Inappropriately:
   1. Concepts that are inferred with more than one of the same Attribute Type
   2. From this set of concepts, remove any Concept that are modeled with more than one of the same Attribute Type and the same Value
   3. Also remove from this set of concepts, any Concept with Attributes that are frequently used with different values, like Finding Site or Associated Morphology
   4. Finally remove from this set of concepts, any Concepts from hierarchies that will not be reviewed (Products, Substances, Qualifier value, Situations, Body structures)

Figure 1: Content Modeled Inappropriately – Concept with multiple Clinical Course attributes



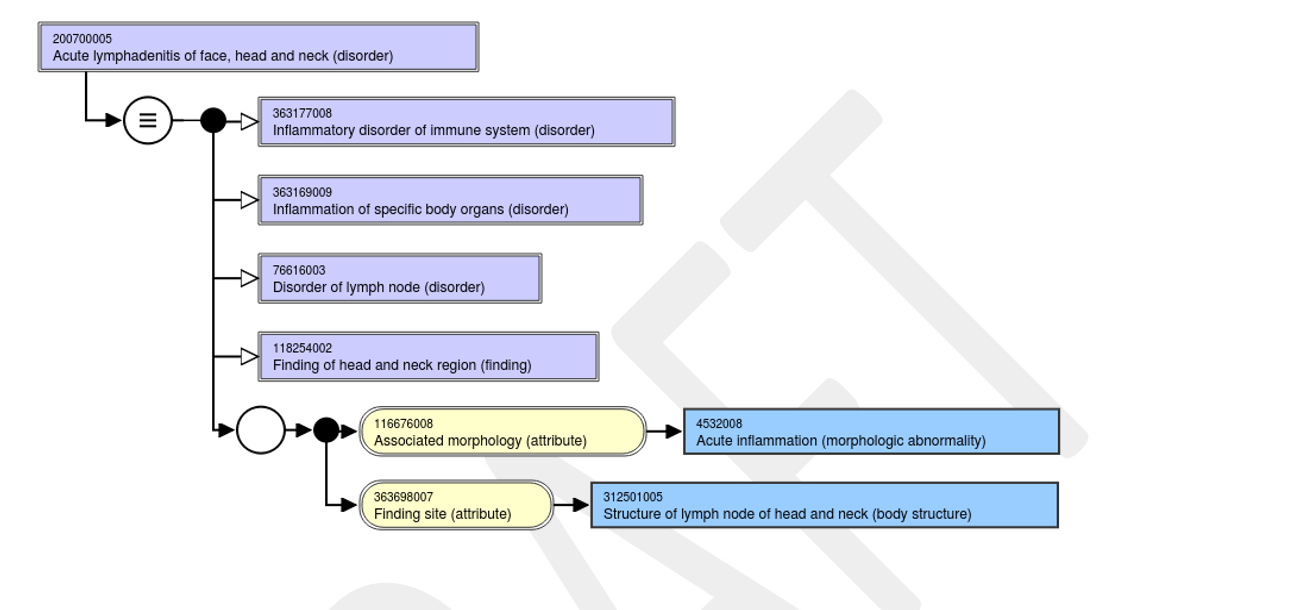
1. Concept Modeled Inappropriately – Inverse
   1. Using concepts that are paired as inverse of each other, we identify those concepts that are modeled differently based on querying the number of defining relationship differences. Not all of the identified modeling differences are symmetrical modeling issues but can be an indicator of them.

Figure 2. Example of Inverse Concepts modeled with radical differences – Closed subcapital fracture of left femur is correctly modeled with a single role group while the Open concept is incorrectly modeled with multiple



1. Identify concepts that contain a common phrase without the appropriate corresponding role. This does not necessarily cause a symmetry issue as the concept may still be placed in the correct hierarchy, but can be used as a query to find a symmetry issue. If the concepts are in the appropriate hierarchy, they would be considered to be symmetrical even though they are under modeled.
   1. Find all concepts that have common phrases like “Acute”, “Chronic”, “Acquired”, “Congenital” that do not have the corresponding attribute.

Figure 3. FSN contains "Acute", but does not have a Clinical Course = Acute



1. Grades, Stages, Scales, and Scores
   1. Review concepts, that represent Grades, Stages, Scales, and Scores to ensure all are present in the Finding and Disorder hierarchies.

# Rules for Evaluating Membership in RefSets

For this project, we will deliver four RefSets that will categorize our efforts as follows:

1. **Symmetric Concepts**
   * A simple RefSet of child concepts that were reviewed and deemed to be in the correct hierarchy and under the correct parent.
2. **Non-symmetric Concepts**
   * A simple RefSet of **child concepts** that were reviewed and deemed to be placed in the wrong hierarchy (under an incorrect parent).
3. **Symmetric Concepts Children Present**
   * A simple RefSet of **parent concepts** that had correct symmetric children
4. **Non-symmetric Concepts, Non-existent Children**
   * An Annotation RefSet with **parent concepts** that are missing symmetric children that should exist and any comments on what needs to be done to make them symmetric.

**Note: Overlap can exist between RefSets 1 and 3 as well as between 2 and 4.**

**RefSets 1 and 2 are mutually exclusive.**

**RefSets 3 and 4 are mutually exclusive.**

# Rules for placing concepts in the RefSets

**Note**: For this “symmetric modeling” review, we only consider concepts “incorrectly modeled” if the incorrect modeling pertains to symmetry. If concepts have other – unrelated – modeling issues, they are not referenced as “incorrectly modeled”.

* Inverse concepts
  + If an inverse concept has an existing opposite concept and it is in the appropriate hierarchy, it was considered Symmetric Correct Modeling and placed in the “Symmetric Correct Modeling” RefSet.
  + If an inverse concept has an existing opposite concept and it is in the wrong hierarchy, it was considered Symmetric Incorrect Modeling and placed in the “Symmetric Incorrect Modeling” RefSet.
* Parents of leaf concepts (concepts with only one child):
  + If the child is in the correct hierarchy and if the child modeled correctly, it was considered Symmetric Correct Modeling and placed in the “Symmetric Correct Modeling” RefSet.

**Note:** “correct modeling” only applies to the correct inferred view for this concept as it pertains to symmetry. ***If a concept has other modeling problems, it is not marked as “incorrectly modeled”.***

* Some keywords that could indicate the need for symmetry are not always reliable, for example:
  + *Traumatic vs. non-traumatic* - concepts without a stated “traumatic” in the FSN are considered non-traumatic by default.
  + *With vs. without* - not every concept that has a “with” or “without” needs its opposite, e.g. Diagnostic arthroscopy of elbow with synovial biopsy (procedure) does not need a “…without biopsy”.

# Other Symmetry Issues

In the course of our review, we identified another symmetry issue, which was out of scope for this deliverable, but could possibly be proposed to the IHTSDO as an area of content to be reviewed and edited to achieve consistency.

* Clinical Course vs. Associated Morphology

Throughout SNOMED, inconsistent modeling using attributes “clinical course” and “associated morphology” exists.

Example:

19429009 |Chronic ulcer of skin (disorder)| is modeled using 116676008 |Associated morphology (attribute)| = 405719001 |Chronic ulcer (morphologic abnormality)|

111422001 |Chronic abscess of breast (disorder)| is modeled using both the |Associated morphology (attribute)| = 79203009 |Chronic abscess (morphologic abnormality)| and the 263502005 |Clinical course (attribute)| = 90734009 |Chronic (qualifier value)|

# Grades, Scales and Scores

This following analysis of the inconsistent use of Procedures and/or Observables as the value of the “Interprets” Attribute is exploratory and not part of the RefSet creation.

The Findings and Disorders reviewed were found to use a Procedure 42 times vs. an Observable Entity 352 times. In 41 cases, both a Procedure and Observable Entity were used for the Interprets attribute. 400 of the concepts had no Interprets Attribute at all.

Figure 4: Grade concept with an Interprets = Procedure

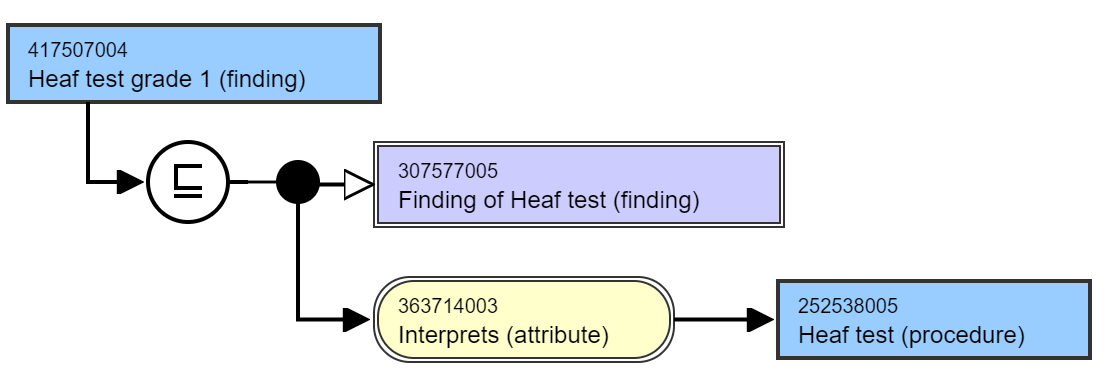


Figure 5: Grade concept with an Interprets = Observable Entity

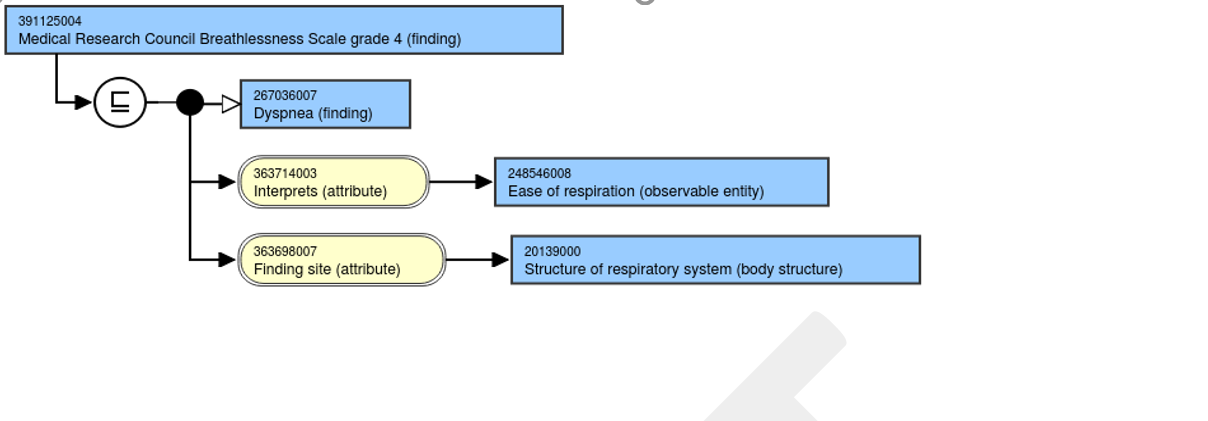


Figure 6: Grade Concept with both a Procedure and Observable used for the Interprets Attribute

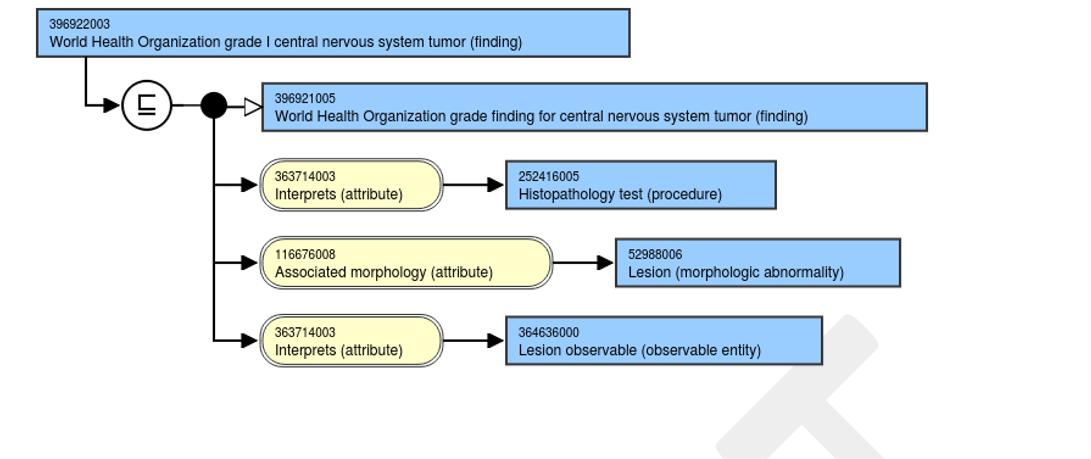
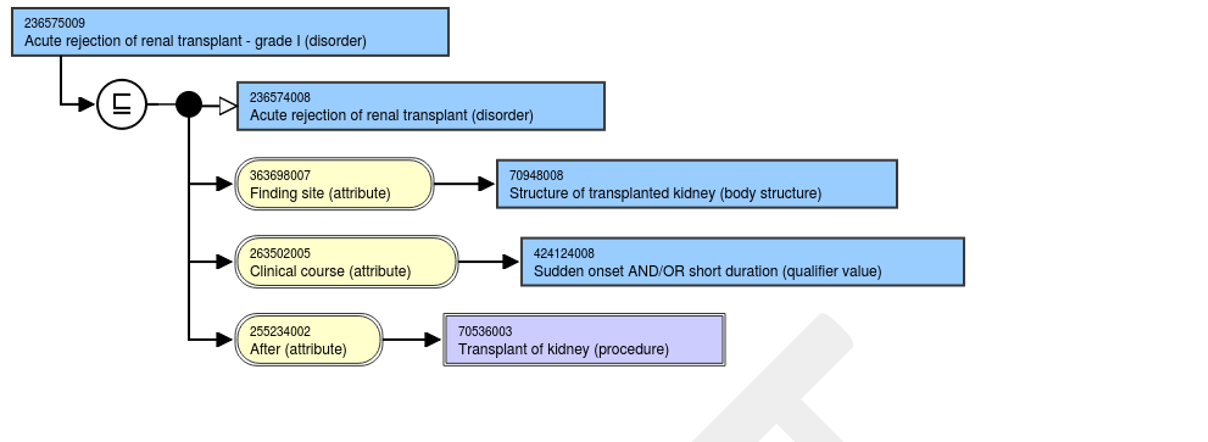


Figure 7: Grade with no Interprets Attribute



Potential changes to Grades, Scales and Scores Concepts

A consistent model needs to be developed and implemented to ensure Grades, Scale and Score concepts are symmetrical. There are many possible options available for creating a consistent concept model for Grades, Scales and Scores but the options outlined below can be accomplished without the addition of new concept model attributes. It will require the addition of 254291000 |Staging and scales (staging scale)| as an allowable value for Interprets. A large number of Observable Entity concepts would either need to be retired or remodeled as subtypes in the Procedure hierarchy.

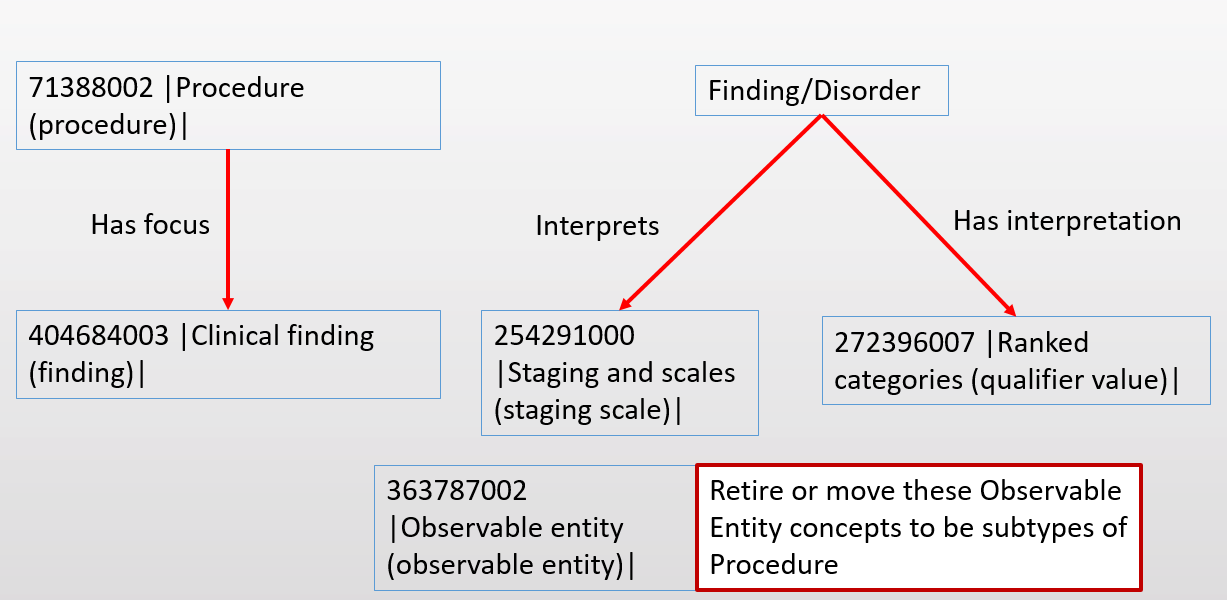


Figure 8. Proposed Model for Grades, Scales, and Score Concepts

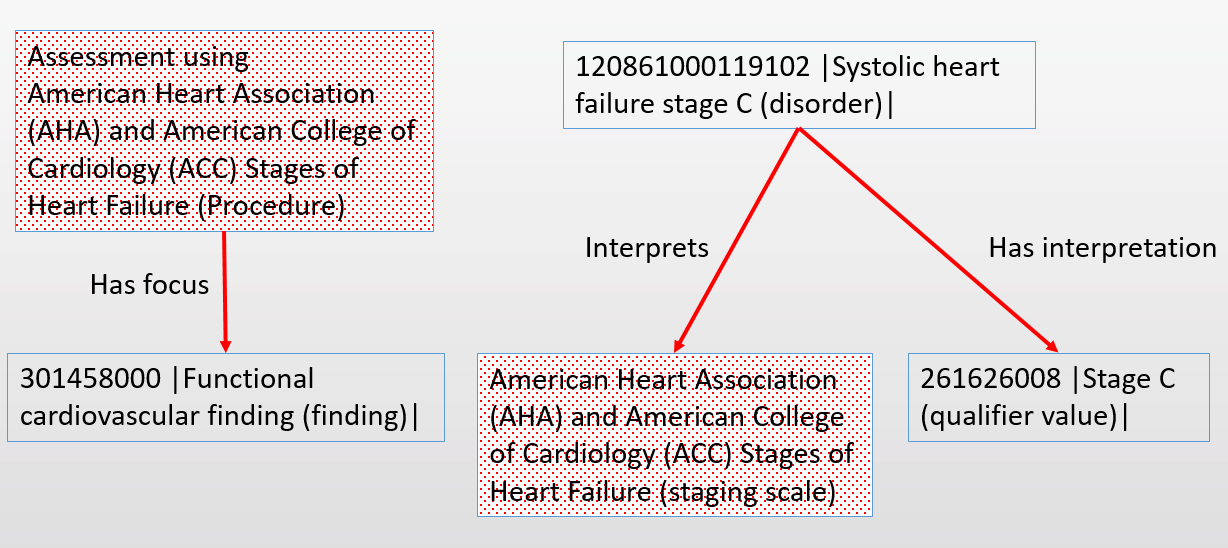


Figure 9. Example of Systolic heart failure stage modeled with the new concept model

In the example above the 120861000119102 |Systolic heart failure stage C (disorder)| concept is modeled using an Interprets to a new concept |American Heart Association (AHA) and American College of Cardiology (ACC) Stages of Heart Failure (staging scale)| and a Has interpretation to the existing concept 261626008 |Stage C (qualifier value)|. Separately, a new Procedure concept would need to be created, |Assessment using American Heart Association (AHA) and American College of Cardiology (ACC) Stages of Heart Failure (Procedure)|. Since these stages focus on the functioning of the cardiovascular system, the new procedure concepts would have a Has focus attribute that would link it to the 301458000 |Functional cardiovascular finding (finding)|.