

# SNOMED CT Quality Improvement Project

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SNOMED International - 31 October 2019

SNOMED CT Expo 2019  
Kuala Lumpur | Oct 31-Nov 1

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# Background

Over the past two decades, the approach to adding new content has been inconsistent

- Multiple modeling patterns used for similar content
- Incomplete modeling of content resulting in intermediate primitives
- Changes to content to fix identified errors were not applied to existing related content
- Lack of tooling to apply batch changes
- Editorial guidance sometimes missing or incomplete

# Our Goals

The aim is to improve internal structural consistency of SNOMED CT content through:

- **Adherence** to the Machine Readable Concept Model (MRCM)
- **Adherence** to editorial policy as well as updates to guidance
- **Application** of a consistent modeling philosophy to current and new content
- **Reduction** of the number of intermediate primitives, maximizing the number of sufficiently defined concepts
- **Application** of defined templates to content to reduce the introduction of new modeling errors
- **Leveraging** the use of automated processes to batch refine content

# The QI Process

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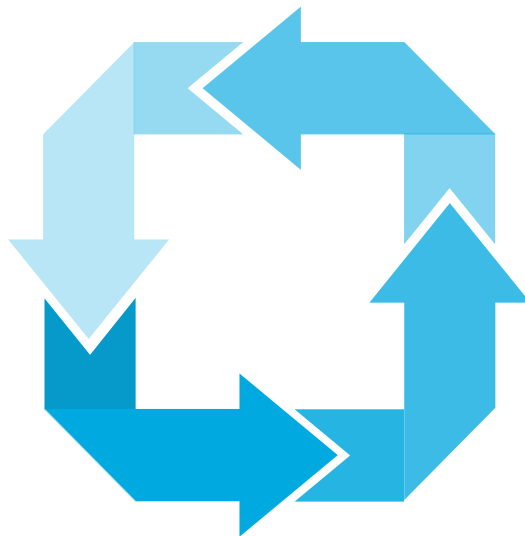
# Quality Improvement Process

## Quality initiative launched February 2018 with a proof of concept pilot

- Clinical finding hierarchy chosen for the initial focus
  - Hierarchy subdivided into multiple sub-hierarchies for manageability
  - A four stage process applied to each sub-hierarchy

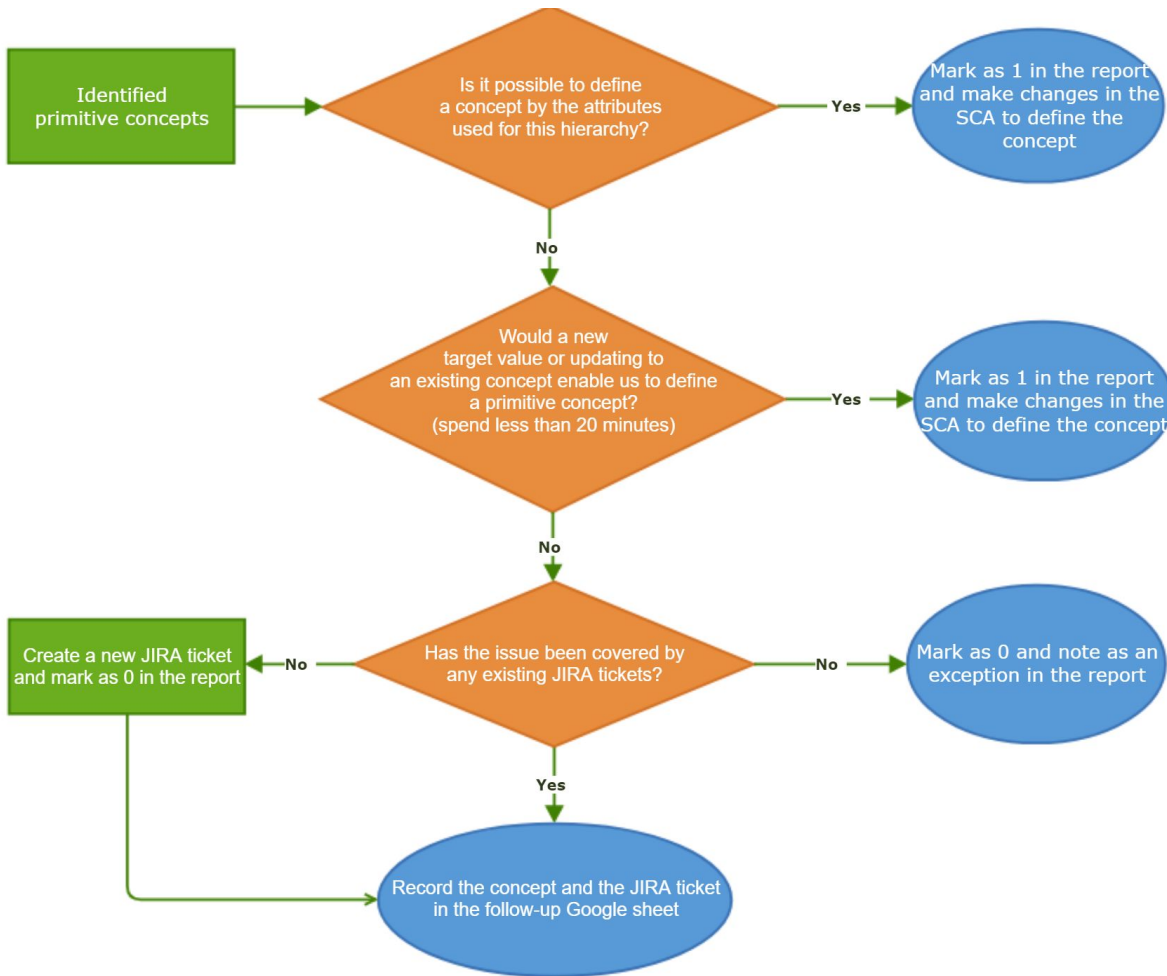
A. Identify and where possible, sufficiently define all intermediate primitives

B. Based on identified patterns, create one or more standard modeling templates



D. Normalize the content by transforming to the “proximal primitive parent” pattern

C. Identify and revise content within the hierarchy that does not conform to the template



# Quality improvement process

Workflow for addressing intermediate primitives

What is the screenshot showing?

Hematoma template - descriptions & concept model

Term	description type	Language/acceptability	Language/acceptability	Case significance
[Periods of life][Morphology] of [Body structure] due to [disorder] (disorder)	FSN	us:P	gb:P	ci
[Periods of life][Morphology] of [Body structure] due to [disorder]	SYN	us:P	gb:P	ci

Concept model:

Attribute Cardinality	Attribute	Value	Role Group Cardinality
1..1	116680003  Is a (attribute)	64572001  Disease (disorder)	N/A
0..1	42752001  Due to (attribute)	< 64572001  Disease (disorder)	
1..1	116676008  Associated morphology (attribute)	[Morphology] << 35566002  Hematoma (morphologic abnormality)	1..1
0..1	363698007  Finding site (attribute)	[Body structure] < 123037004  Body structure (body structure)	
0..1	246454002  Occurrence (attribute)	< 282032007  Periods of life (qualifier value)	

What is the screenshot showing?

Hematoma template - definition status, applicable hierarchy & template language

#### Definition status:

9000000000000073002 |Defined|

#### Applies To:

<< 385494008 |Hematoma (disorder)|

#### Template language:

```
64572001 |Disease (disorder)| : [[~0..1]] 42752001 |Due to (attribute)| = [[+id(< 64572001 |Disease (disorder)| ) @dueto ]], {[[~1..1]] 116676008 |Associated morphology (attribute)| = [[+id(<< 35566002 |Hematoma (morphologic abnormality)| ) @hematoma ]], [[~0..1]] 363698007 |Finding site (attribute)| = [[+id(< 123037004 |Body structure (body structure)| )]], [[~0..1]] 246454002 |Occurrence (attribute)| = [[+id(< 282032007 |Periods of life (qualifier value)| ) @occurrence]] }
```

#### Link to the misaligned concept report

Complex - [https://docs.google.com/spreadsheets/d/1y28A5\\_qD8ukAnbekxizkZy\\_xe6gGYDhOsLgVNHbD6Q0/edit#gid=0](https://docs.google.com/spreadsheets/d/1y28A5_qD8ukAnbekxizkZy_xe6gGYDhOsLgVNHbD6Q0/edit#gid=0)

#### Rules for description generation:

1. Apply General rules for generating descriptions for templates;
2. Apply Enhancements for the Template Language;

#### JIRA ticket:

🔍 Q1-189 - 131148009|Bleeding| - Template **COMPLETED**

📌 TBBA-386 - Template [new]: Hematoma of [body structure] due to [disease] (disorder) **BACKLOG**



MisalignedConcepts 385494008 |Hematoma| 20191003\_205229\_prod\_c...

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

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A	B	C	D	E
SCTID	FSN	SemTag		
282065004	Hematoma of ileum (disorder)	(disorder)		
5223003	Hematoma of spermatic cord (disorder)	(disorder)		
88050005	Hematoma of pinna (disorder)	(disorder)		
11829861000119100	Hematoma of right lower leg (disorder)	(disorder)		
447096000	Hematoma of abdominal wall (disorder)	(disorder)		
308154003	Hematoma of rectus sheath (disorder)	(disorder)		
264558008	Pelvic hematoma (disorder)	(disorder)		
232377002	Nasal septal hematoma (disorder)	(disorder)		
429059007	Hematoma of occipital scalp (disorder)	(disorder)		
262858002	Appendix hematoma (disorder)	(disorder)		
11768681000119108	Subungual hematoma of middle finger of left hand (disorder)	(disorder)		
281464006	Subchondral hematoma (disorder)	(disorder)		

+ Metadata Excluded Concepts Aligned Concepts Explore

What is the screenshot showing?

Misaligned concepts report - aligned concepts list



# Quality Improvement Examples

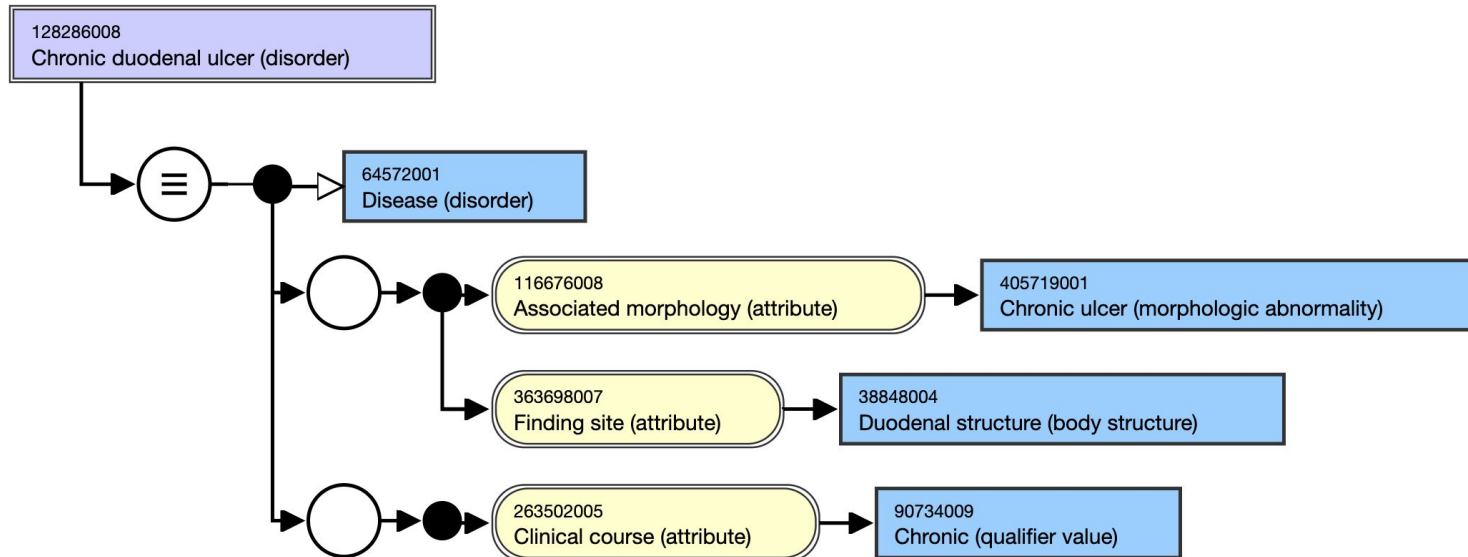
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# Chronic duodenal ulcer








Clinical course attribute added



# Chronic duodenal ulcer

## Structural Improvement

- ▼  Duodenal ulcer disease (disorder)
- ▼  **Chronic duodenal ulcer (disorder)**
  - ▶  Chronic duodenal ulcer with hemorrhage (disorder)
  - ▶  Chronic duodenal ulcer with obstruction (disorder)
  - ▶  Chronic duodenal ulcer with perforation (disorder)
  - ▶  Chronic duodenal ulcer without hemorrhage AND without perforation (disorder)
  -  Chronic peptic ulcer of duodenum (disorder)

- ▲  Chronic peptic ulcer (disorder)
- ▲  Ulcer of duodenum (disorder)
- ▼  **Chronic duodenal ulcer (disorder)**
  - ▶  Chronic duodenal ulcer with hemorrhage (disorder)
  - ▶  Chronic duodenal ulcer with obstruction (disorder)
  - ▶  Chronic duodenal ulcer with perforation (disorder)
  - ▶  Chronic duodenal ulcer without hemorrhage AND without perforation (disorder)

Before - Inferred taxonomy view Jan 2019 release

After - Inferred taxonomy view July 2019 release

Toxoplasma myositis (disorder)

AF Stated Inferred

zoom | - 100% +

1092821000119106  
Toxoplasma myositis (disorder)

26889001  
Myositis (disorder)

246075003  
Causative agent (attribute)

61849005  
Toxoplasma (organism)

116676008  
Associated morphology (attribute)

23583003  
Inflammation (morphologic abnormality)

363698007  
Finding site (attribute)

127954009  
Skeletal muscle structure (body structure)

Toxoplasma myositis (disorder)

ci	Toxoplasma myositis (disorder)	FSN	us:P	zz:N	+
ci	Toxoplasma myositis	SYN	us:P	zz:N	+
0	Is a (attribute)	Disease (disorder)			
1	Finding site (attribute)	Skeletal muscle structure (body structure)			
1	Associated morphology (attribute)	Inflammation (morphologic abnormality)			
1	Causative agent (attribute)	Toxoplasma (organism)			

Missing pathological process

What is the screenshot showing?

Toxoplasma myositis - missing parent due to missing pathological process attribute

Toxoplasma myositis (disorder)

AF Stated Inferred

zoom | - 100% +

```
graph TD; A[1092821000119106 Toxoplasma myositis (disorder)] --> B[722549009 Infection caused by Toxoplasma (disorder)]; A --> C[240112000 Protozoal myositis (disorder)]; B --> D[363098007 Finding site (attribute)]; B --> E[248075003 Causative agent (attribute)]; D --> F[127954009 Skeletal muscle structure (body structure)]; E --> G[61949005 Toxoplasma (organism)]; H[116676008 Associated morphology (attribute)] --> I[409774005 Inflammatory morphology (morphologic abnormality)]; J[370135005 Pathological process (attribute)] --> K[442614005 Parasitic process (qualifier value)];
```

Toxoplasma myositis (disorder)

ci	Toxoplasma myositis (disorder)	FSN	us:P	gb:P	+
ci	Toxoplasma myositis	SYN	us:P	gb:P	+

Axiom

Is a	Disease (disorder)	+	-	+
Finding site	Skeletal muscle structure (body structure)	+	-	+
Associated morphology	Inflammatory morphology (morphologic abnormality)	+	-	+
Pathological process	Parasitic process (qualifier value)	+	-	+
Causative agent	Toxoplasma (organism)	+	-	+

+1 Add Group

What is the screenshot showing?

Toxoplasma myositis - correctly modeled

# Template Authoring

The way forward

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What is the screenshot showing?

Template - Infection caused by [virus]

Term	description type	Language/acceptability	Language/acceptability	Case significance
[Course] [Occurrence] [morphology] of [body structure] caused by [virus] (disorder)	FSN	us:P	gb:P	ci
[Course] [Occurrence] [morphology] of [body structure] caused by [virus]	SYN	us:P	gb:P	ci

Concept model:

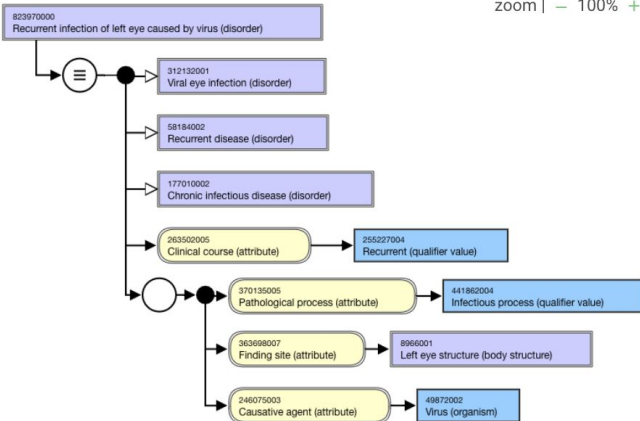
Attribute cardinality	Attribute	Value	Role group cardinality
1..1	116680003  Is a (attribute)	64572001  Disease (disorder)	N/A
0..1	263502005  Clinical course (attribute)	[Course] < 288524001  Courses (qualifier value)	N/A
0..1	246454002  Occurrence (attribute)	[Occurrence] < 282032007  Periods of life (qualifier value)	1..1
1..1	370135005  Pathological process (attribute)	441862004  Infectious process (qualifier value)	
0..1	363698007  Finding site (attribute)	[body structure] < 442083009  Anatomical or acquired body structure (body structure)	
1..1	246075003  Causative agent (attribute)	[Virus] << 49872002  Virus (organism)	
0..1	116676008  Associated morphology (attribute)	<< 49755003  Morphologically abnormal structure (morphologic abnormality)	



Recurrent infection of left eye caused by virus (disorder)

Stated Inferred AF

zoom | - 100% +



Recurrent infection of left eye caused by virus (disorder)

FSN us:P gb:P SYN us:P gb:P

ci	Recurrent infection of left eye caused by virus (disorder)	FSN	us:P	gb:P	- +
ci	Recurrent infection of left eye caused by virus	SYN	us:P	gb:P	- +
0	Is a (attribute)	Disease (disorder)			
0	Clinical course (attribute)	Recurrent (qualifier value)			-
1	Causative agent (attribute)	Virus (organism)			
1	Pathological process (attribute)	Infectious process (qualifier value)			
1	Finding site (attribute)	Left eye structure (body structure)			

What is the screenshot showing?

Authoring Platform Template - Infection caused by [virus] populated

# Part Two

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Technical support

# Quality improvement - Tech Team Support

Initial Analysis

Misaligned Concepts

Group Remodel (iterate)

Normalization

## Reporting Platform

Quality Improvement

Template List

Initial Analysis

Template Compliance

All Templates Compliance Stats

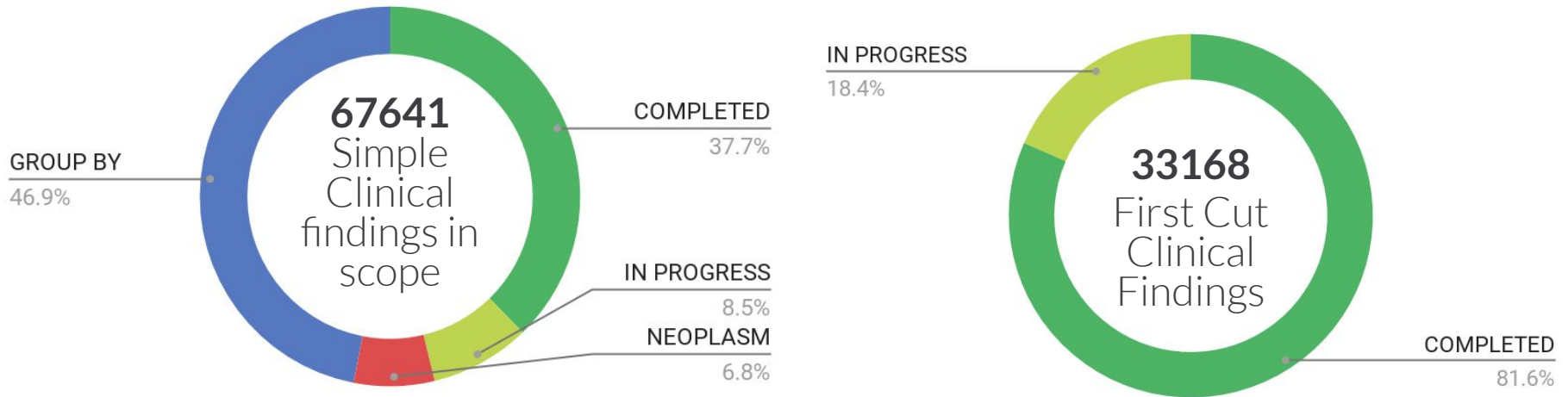
# QI Project Scope

SNOMED CT content in scope for overall quality review:

Content Scope	Jan 2019 Count	October 2019
Total number of active concepts	349,513	352,498
Out of scope (No model or non-clinical concepts, metadata, etc)	150,738	147,906
In Scope ("should" conform to a template)	198,775	204,592
Percent in scope	56.9%	58.0%

# Quality improvement process scope - phase 1

## Initial focus on Clinical findings



# QI Project Impact

Structural improvements are quantified by a number of measurable indicators:

Indicator	Jan 2018	July 2018	Jan 2019	July 2019	23 Oct
Number of role group crossovers	3382	3245 (-4.1%)	3119 (-3.9%)	2576 (-17.4%)	3043 (+18.1%)
Role group inconsistencies	2342	2220 (-5.2%)	1363 (-38.6%)	845 (-38%)	0 (-100%)
IP count Inferred	5675	5564 (-2.0%)	5810 (+4.4%)	5946 (+2.3%)	6133 (+3.1%)
IP count Stated	5109	4908 (-3.9%)	5010 (2.1%)	4297 (-14.2%)	4410 (2.6%)
Percent sufficiently defined	24.9	28.2	30.4	31.7	32.3

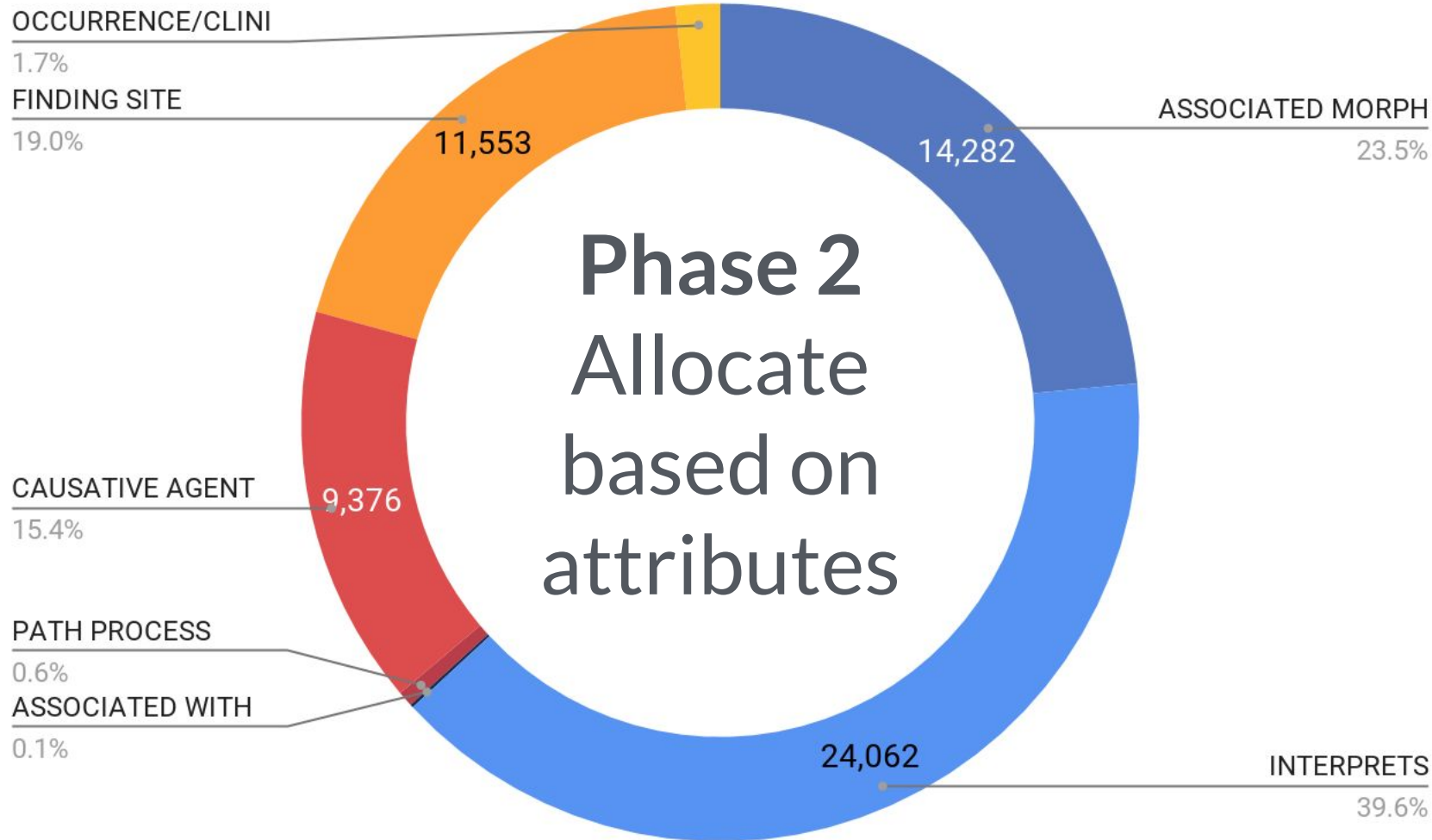
# QI Templates and Conformance

Templates are in various stages of development and implementation

Template status	March 2019	Oct 2019
Under development	30	23
Ready for implementation	35	52
In production	22	22

Template conformance (including QI Templates not yet shipped to Production)

Template status	March 2019	Oct 2019
Eligible concepts	198,775	204,414
Conforming concepts	19,705	51,956
Percent conformance	9.91%	25.42%





FIN

# Questions?