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
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

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

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

Workflow for addressing intermediate primitives

1. Identified primitive concepts
   - Is it possible to define a concept by the attributes used for this hierarchy?
     - Yes: Mark as 1 in the report and make changes in the SCA to define the concept
     - No: Would a new target value or updating to an existing concept enable us to define a primitive concept? (spend less than 20 minutes)
       - Yes: Mark as 1 in the report and make changes in the SCA to define the concept
       - No: Create a new JIRA ticket and mark as 0 in the report
2. Has the issue been covered by any existing JIRA tickets?
   - Yes: Record the concept and the JIRA ticket in the follow-up Google sheet
   - No: Mark as 0 and note as an exception in the report
What is the screenshot showing?

Hematoma template - descriptions & concept model
What is the screenshot showing?

Hematoma template - definition status, applicable hierarchy & template language
What is the screenshot showing?

**Misaligned concepts report - aligned concepts list**

<table>
<thead>
<tr>
<th>SCTID</th>
<th>FSN</th>
<th>SemTag</th>
</tr>
</thead>
<tbody>
<tr>
<td>282065004</td>
<td>Hematoma of ileum (disorder)</td>
<td></td>
</tr>
<tr>
<td>5223003</td>
<td>Hematoma of spermatic cord (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>88050005</td>
<td>Hematoma of pinna (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>11829861000119100</td>
<td>Hematoma of right lower leg (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>447096000</td>
<td>Hematoma of abdominal wall (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>308154003</td>
<td>Hematoma of rectus sheath (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>264558008</td>
<td>Pelvic hematoma (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>232377002</td>
<td>Nasal septal hematoma (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>429059007</td>
<td>Hematoma of occipital scalp (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>262658002</td>
<td>Appendix hematoma (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>11768681000119108</td>
<td>Subungual hematoma of middle finger of left hand (disorder)</td>
<td>(disorder)</td>
</tr>
<tr>
<td>281464006</td>
<td>Subchondral hematoma (disorder)</td>
<td>(disorder)</td>
</tr>
</tbody>
</table>
Quality Improvement Examples
Chronic duodenal ulcer

Clinical course attribute added
Chronic duodenal ulcer

Structural Improvement

Before - Inferred taxonomy view Jan 2019 release

- 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)

After - Inferred taxonomy view July 2019 release

- 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)
What is the screenshot showing?

Toxoplasma myositis - missing parent due to missing pathological process attribute
What is the screenshot showing?

Toxoplasma myositis - correctly modeled
Template Authoring

The way forward
What is the screenshot showing?

Template - Infection caused by [virus]
What is the screenshot showing?

Authoring Platform Template - Infection caused by [virus] populated
Part Two

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:

<table>
<thead>
<tr>
<th>Content Scope</th>
<th>Jan 2019 Count</th>
<th>October 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of active concepts</strong></td>
<td>349,513</td>
<td>352,498</td>
</tr>
<tr>
<td><strong>Out of scope</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(No model or non-clinical concepts, metadata, etc)</td>
<td>150,738</td>
<td>147,906</td>
</tr>
<tr>
<td><strong>In Scope</strong> (&quot;should&quot; conform to a template)</td>
<td>198,775</td>
<td>204,592</td>
</tr>
<tr>
<td><strong>Percent in scope</strong></td>
<td>56.9%</td>
<td>58.0%</td>
</tr>
</tbody>
</table>
Quality improvement process scope - phase 1

Initial focus on Clinical findings

67641
Simple Clinical findings in scope

GROUP BY
46.9%

67641
Simple Clinical findings in scope

IN PROGRESS
8.5%
NEOPLASM
6.8%

COMPLETED
37.7%

33168
First Cut Clinical Findings

IN PROGRESS
18.4%

COMPLETED
81.6%
QI Project Impact

Structural improvements are quantified by a number of measurable indicators:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of role group crossovers</td>
<td>3382</td>
<td>3245</td>
<td>3119</td>
<td>2576</td>
<td>3043</td>
</tr>
<tr>
<td></td>
<td>(-4.1%)</td>
<td>(-3.9%)</td>
<td>(-17.4%)</td>
<td>(+18.1%)</td>
<td></td>
</tr>
<tr>
<td>Role group inconsistencies</td>
<td>2342</td>
<td>2220</td>
<td>1363</td>
<td>845</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(-5.2%)</td>
<td>(-38.6%)</td>
<td>(-38%)</td>
<td>(-100%)</td>
<td></td>
</tr>
<tr>
<td>IP count Inferred</td>
<td>5675</td>
<td>5564</td>
<td>5810</td>
<td>5946</td>
<td>6133</td>
</tr>
<tr>
<td></td>
<td>(-2.0%)</td>
<td>(+4.4%)</td>
<td>(+2.3%)</td>
<td>(+3.1%)</td>
<td></td>
</tr>
<tr>
<td>IP count Stated</td>
<td>5109</td>
<td>4908</td>
<td>5010</td>
<td>4297</td>
<td>4410</td>
</tr>
<tr>
<td></td>
<td>(-3.9%)</td>
<td>(2.1%)</td>
<td>(-14.2%)</td>
<td>(2.6%)</td>
<td></td>
</tr>
<tr>
<td>Percent sufficiently defined</td>
<td>24.9</td>
<td>28.2</td>
<td>30.4</td>
<td>31.7</td>
<td>32.3</td>
</tr>
</tbody>
</table>
QI Templates and Conformance

Templates are in various stages of development and implementation

<table>
<thead>
<tr>
<th>Template status</th>
<th>March 2019</th>
<th>Oct 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under development</td>
<td>30</td>
<td>23</td>
</tr>
<tr>
<td>Ready for implementation</td>
<td>35</td>
<td>52</td>
</tr>
<tr>
<td>In production</td>
<td>22</td>
<td>22</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Template status</th>
<th>March 2019</th>
<th>Oct 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eligible concepts</td>
<td>198,775</td>
<td>204,414</td>
</tr>
<tr>
<td>Conforming concepts</td>
<td>19,705</td>
<td>51,956</td>
</tr>
<tr>
<td>Percent conformance</td>
<td>9.91%</td>
<td>25.42%</td>
</tr>
</tbody>
</table>
Phase 2
Allocate based on attributes