Oncology in SNOMED CT

Olivier Bodenreider
Lister Hill National Center for Biomedical Communications
Bethesda, Maryland - USA
Disclaimer

“The views and opinions expressed do not necessarily state or reflect those of the U.S. Government, and they may not be used for advertising or product endorsement purposes”
SNOMED CT and oncology

- **SNOP (~1965)**
  - Systematized Nomenclature of Pathology

- **SNOMED International (~1990)**
  - Morphology and topology harmonized with the International Classification of Diseases for Oncology (ICD-O)

- **SNOMED CT (~2000)**
  - General clinical terminology
Breast cancer in SNOMED CT
Breast cancer in SNOMED CT
Main types of cancer-related entities

“situation”

associated finding

No family history: breast carcinoma

associated morphology

Carcinoma of breast

Malignant epithelial neoplasm – category
Types of cancer-related entities

- Sarcoma lower inner quadrant of female breast
- T3: Breast tumor >5 cm in greatest dimension
- CAP Cancer Checklist; Breast: Excision Less Than...
- Suspected breast cancer
- BRCA1 mutation carrier detection test
- Breast cancer type 1 susceptibility protein
- Tumor-node-metastasis (TNM) breast tumor staging
- Distance of tumor from closest surgical margin (breast)
- Mental adjustment to cancer scale
- Nottingham histologic grading system
## Coverage (pre-coordinated)

<table>
<thead>
<tr>
<th>Category</th>
<th>Top-level concept</th>
<th># descendants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disorder</td>
<td>Malignant neoplastic disease</td>
<td>3449</td>
</tr>
<tr>
<td>Finding</td>
<td>Tumor finding</td>
<td>1562</td>
</tr>
<tr>
<td>Record artifact</td>
<td>Pathology report</td>
<td>71</td>
</tr>
<tr>
<td>Situation</td>
<td>- Family history of neoplasm</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>- History of neoplasm</td>
<td>91</td>
</tr>
</tbody>
</table>

1.75% of SNOMED CT concepts are directly related to cancer
Coverage (post-coordinated)

- Compositional grammar
  - Based on the SNOMED CT “concept model”

- “Refinement” of existing concepts
  - Specific morphology
    - Primary vs. secondary
  - Specific anatomical structure
    - Laterality

- E.g., Family history of breast carcinoma in the mother
Coverage (relations)
Use cases

- Clinical documentation
- Clinical research
  - Secondary use of data / observational research
- Cohort selection
  - For clinical quality measures ("Meaningful Use")
  - For clinical research
- Clinical decision support
<table>
<thead>
<tr>
<th><strong>eMeasure Title</strong></th>
<th>Breast Cancer: Hormonal Therapy for Stage IC-IIIC Estrogen Receptor/Progesterone Receptor (ER/PR) Positive Breast Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>eMeasure Identifier (Measure Authoring Tool)</strong></td>
<td>140</td>
</tr>
<tr>
<td><strong>eMeasure Version number</strong></td>
<td>4.0.000</td>
</tr>
<tr>
<td><strong>NQF Number</strong></td>
<td>0387</td>
</tr>
<tr>
<td><strong>GUID</strong></td>
<td>ac639794-cb3f-4f4f-8fa6-680300d5ed4e</td>
</tr>
<tr>
<td><strong>Measurement Period</strong></td>
<td>January 1, 20XX through December 31, 20XX</td>
</tr>
<tr>
<td><strong>Measure Steward</strong></td>
<td>American Medical Association-convened Physician Consortium for Performance Improvement(R) (AMA-PCPI)</td>
</tr>
<tr>
<td><strong>Measure Developer</strong></td>
<td>American Medical Association-convened Physician Consortium for Performance Improvement(R) (AMA-PCPI)</td>
</tr>
<tr>
<td><strong>Endorsed By</strong></td>
<td>National Quality Forum</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Percentage of female patients aged 18 years and older with Stage IC through IIIC, ER or PR positive breast cancer who were prescribed tamoxifen or aromatase inhibitor (AI) during the 12-month reporting period</td>
</tr>
</tbody>
</table>

**Metadata**

- **Name:** Breast Cancer ER or PR Positive
- **Type:** Extensional
- **Steward:** American Medical Association-convened Physician Consortium for Performance Improvement(R)

**OID:** 2.16.840.1.113883.3.526.2.1387

**Definition ID:** 20150430

**Program:** CMS, MU2 Update 2015-05-01 using this value set

**Value Set Members** Expansion ID: 20121025

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>416053008</td>
<td>Estrogen receptor positive tumor (disorder)</td>
<td>SNOMEDCT</td>
<td>2014-09</td>
<td>2.16.840.1.113883.6.96</td>
</tr>
<tr>
<td>416561008</td>
<td>Progesterone receptor positive tumor (disorder)</td>
<td>SNOMEDCT</td>
<td>2014-09</td>
<td>2.16.840.1.113883.6.96</td>
</tr>
<tr>
<td>417181009</td>
<td>Hormone receptor positive malignant neoplasm of breast (disorder)</td>
<td>SNOMEDCT</td>
<td>2014-09</td>
<td>2.16.840.1.113883.6.96</td>
</tr>
<tr>
<td>417742002</td>
<td>Hormone receptor positive tumor (disorder)</td>
<td>SNOMEDCT</td>
<td>2014-09</td>
<td>2.16.840.1.113883.6.96</td>
</tr>
</tbody>
</table>
SNOMED CT in the U.S.

- International release developed by IHTSDO
  - 27 member countries, including U.S.
- NLM is the U.S. National Release Center
  - Distribute international release (UMLS license)
    - Released in January and July
  - Develop the U.S. extension / U.S. edition
    - Released in March and September
  - Take requests for changes or new concepts / terms
    - U.S. SNOMED CT Content Request System (USCRS)
    - E.g., cancer staging concepts added for clinical quality measures
Challenges

◆ Keep it simple (or hide complexity)
  - Reproducible representation (ontology developer)
  - Reproducible annotation (ontology user)

◆ Interoperability between biological and clinical data
  - Clinical data is Big Data
  - Necessary for translational research