SNOMED CT for Clinical Imaging Procedures in UK

Yongsheng Gao - Terminologist, IHTSDO
(formerly Advanced clinical terminologist, NHS, UK)

Ian Arrowsmith - Head of Clinical Terminology, NHS, UK

Maria Braithwaite - Terminologist, IHTSDO
(formerly Clinical terminologist, NHS, UK)

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Background

- National Interim Clinical Imaging Procedure (NICIP) codes developed in response to rapid deployment of ‘off-the-shelf’ PACS/RIS systems in the NHS circa 2003.
- Simple code scheme designed to accommodate system constraints.
- Relationship to SNOMED CT ‘built in’ from start.
- Virtually 100% adoption across NHS.
NICIP – SNOMED CT

• NICIP – user interface terminology for PACS/RIS
  ➢ 6 character short code.
  ➢ 40 character description of procedure using approved abbreviations.

• SNOMED CT for DI - reference terminology
  ➢ NICIP - SNOMED CT have one to one maps excluding laterality.
  ➢ Many properties of NICIP codes are implied using agreed Editorial Principles.
  ➢ NICIP and SNOMED CT synchronized at each national terminology release every 6 months.
  ➢ Clinical governance provided by national group with representation from across clinical imaging community.
  ➢ National SNOMED CT imaging subset.
SNOMED CT to OPCS4 maps

- OPCS4 – UK national classification for procedures
- Maps from SNOMED CT to OPCS4
  - Maps maintained in UK national release centre.
  - Optional code combinations.
- Improved maps for DI procedures
  - Fixed set of OPCS4 codes.
  - Eliminated optional combinations.
  - Maps are automatically generated and reviewed by coder.
  - OPCS4 maps are updated at each release but not yet a formally approved product.
Diagnostic Imaging Dataset (DID)

- A mandated central collection of diagnostic imaging procedures carried out by NHS.
- Data submitted monthly from local radiology information systems.
- Submissions accepted in NICIP or SNOMED CT format.
- Data validated against most recent release(s).
- The DID captures information, such as:
  - Referral source and patient type.
  - Details of the imaging procedures.
  - Demographic information.
  - Times for each diagnostic imaging events, from request procedures through to reporting.
National waiting times census

- National Health Service initiative to determine what categories of procedure have longer waiting list times than others in relation to national targets.
- Categories are not all ‘logical’.
- NICIP relationship with SNOMED CT allows categories to be automatically assigned and returns automated.
Editorial principles

- **Scope**: procedures only, defined imaging modalities.
- **Functional domain specific principles**.
- **Administrative aspects of procedures are excluded**.
- **Protocols designed for**:
  - Contrast usage.
  - Imaging guided interventional procedures.
  - Multiple imaging modalities.
Description patterns and modelling

- **Term patterns:**
  - Computed tomography of X (procedure)
  - Magnetic resonance imaging of X (procedure)
  - Ultrasonography of X (procedure)
  - X-ray of X (procedure)

- **Modelling:**
  - Method = Imaging action, e.g. Computed tomography - action
  - Procedure site – Direct = body structure
Utilise SNOMED CT hierarchy

Monthly waiting times census:

- M101 Magnetic resonance imaging (excludes Cardiac MRI and MRI guided procedures)
  - **Includes** hierarchy << 113091000 | Magnetic resonance imaging (procedure)
  - **Excludes** hierarchy << 258177008 | Magnetic resonance imaging guidance (procedure)
  - **Excludes** hierarchy << 241620005 | Magnetic resonance imaging of heart (procedure)
MRI (excludes MRI guided procedures & cardiac MRI)
DID groupers for body structures

- 69536005 | Head structure |
- 45048000 | Neck structure |
- 51185008 | Thoracic structure |
  - 76752008 | Breast structure |
- 113345001 | Abdominal structure |
- 12921003 | Pelvic structure |
- 66019005 | Limb structure |
  - 53120007 | Upper limb structure |
  - 61685007 | Lower limb structure |
DID groupers for body systems

- **113257007** | structure of cardiovascular system |
  - 11527006 | arterial system structure |
  - 119553000 | venous system structure |
  - 80891009 | heart structure |

- **26107004** | structure of musculoskeletal system |
  - 272673000 | bone structure |
  - 39352004 | joint structure |
  - 280717001 | spinal structure |
Computed tomography of abdominal aorta with contrast

Is a

Abdominal aortography, positive contrast

CT of abdominal aorta

Computerised tomography of abdomen with contrast

Computed tomography imaging - action

Abdominal aorta structure

Contrast media

Priorities

Structure of cardiovascular system (body structure)
- Arterial system structure (body structure)
- Blood vessel structure (body structure)
- Cardiopulmonary circulatory system structure (body structure)
- Cardiovascular organ part (body structure)
- Cardiovascular system subdivision (body structure)
- Endothelium (body structure)
- Entire cardiovascular system (body structure)
- Heart, arteries and veins (body structure)

Regional cardiovascular structure (body structure)
- Cardiovascular structure of trunk (body structure)
  - Intrathoracic cardiovascular structure (body structure)
  - Vascular structure of trunk (body structure)
- Abdominal and pelvic vascular structure (body structure)
  - Abdominal vascular structure (body structure)
    - Structure of abdominal vein (body structure)
    - Structure of artery of abdomen (body structure)
      - Abdominal aorta structure (body structure)
Utilizes SNOMED CT modelling

<table>
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<tr>
<th>Concept ID</th>
<th>Concept FSN</th>
<th>Imaging Modality</th>
<th>Body structure</th>
<th>Sub_Body structure</th>
<th>Body System Structure</th>
<th>Sub_Structure of body system</th>
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<tbody>
<tr>
<td>444968003</td>
<td>Computed tomography of <em>abdominal aorta</em> with contrast (procedure)</td>
<td>Computerized axial tomography (procedure)</td>
<td><em>Abdominal structure</em> (body structure)</td>
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<td><em>Structure of cardiovascular system</em> (body structure)</td>
<td>arterial system structure (body structure)</td>
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<td>Magnetic resonance imaging arthrography of <em>knee</em> (procedure)</td>
<td><em>Magnetic resonance imaging</em> (procedure)</td>
<td>Limb structure (body structure)</td>
<td>lower limb structure (body structure)</td>
<td>Structure of musculoskeletal system (body structure)</td>
<td>joint structure (body structure)</td>
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Use of diagnostic imaging revealed

- The first statistical publication (02/Oct/2013) of linked HES (Hospital Episode Statistics) and DID.
  - Two in five patients (27m) had DI procedures in hospital in 2012-13.
  - Most common procedure was X-ray.
    - A&E patients 91%; outpatients 40%
  - Second most common procedure – Ultrasonography
    - A&E patients 2%; outpatients 29%
Utilize the semantic of SNOMED CT for mapping to procedure classification

- **Procedures with contrast usage**
  - Computed tomography of abdominal aorta with contrast (procedure); Using substance = contrast media.
    - OPCS4   Contrast codes

- **Procedures of multiple body sites**
  - MRI of knee; Laterality=Left and right.
    - OPCS4   Codes for number of body sites

- **Procedures of specific imaging modalities**
  - Ultrasonography of abdomen.
    - OPCS4   Code for duration of a procedure

- **Procedures with complexity and high cost**
  - Cardiac MRI; Procedure site – Direct = heart.
What we have achieved

A suite of products and maps for clinical imaging which supports the end-to-end process from data entry to retrieval and analysis.

SNOMED CT is the ‘engine’ that drives and supports all these processes.
Benefits of using SNOMED CT

• Clear semantics.
• Hierarchical structure.
• Concept model of attributes and values.
• Historical relationships to retired codes.
• Maps to classification systems, e.g. ICD-10 ICD-9, ICD-9-CM, OPCS4.
• Comprehensive coverage of clinical domains.
Contacts and links

- Yongsheng Gao - IHTSDO
  yga@ihtsdo.org
- Ian Arrowsmith - HSCIC, UK
  ian.arrowsmith@hscic.gov.uk
- Maria Braithwaite - IHTSDO
  mbr@ihtsdo.org

- UK national standard representation of clinical imaging procedures
  http://systems.hscic.gov.uk/data/uktc/imaging/
- Diagnostic Imaging Dataset publication
- iView
  https://iview.ic.nhs.uk/DomainInfo/DiagnosticImaging
Questions?