



# SNOMED CT for Clinical Imaging Procedures in UK

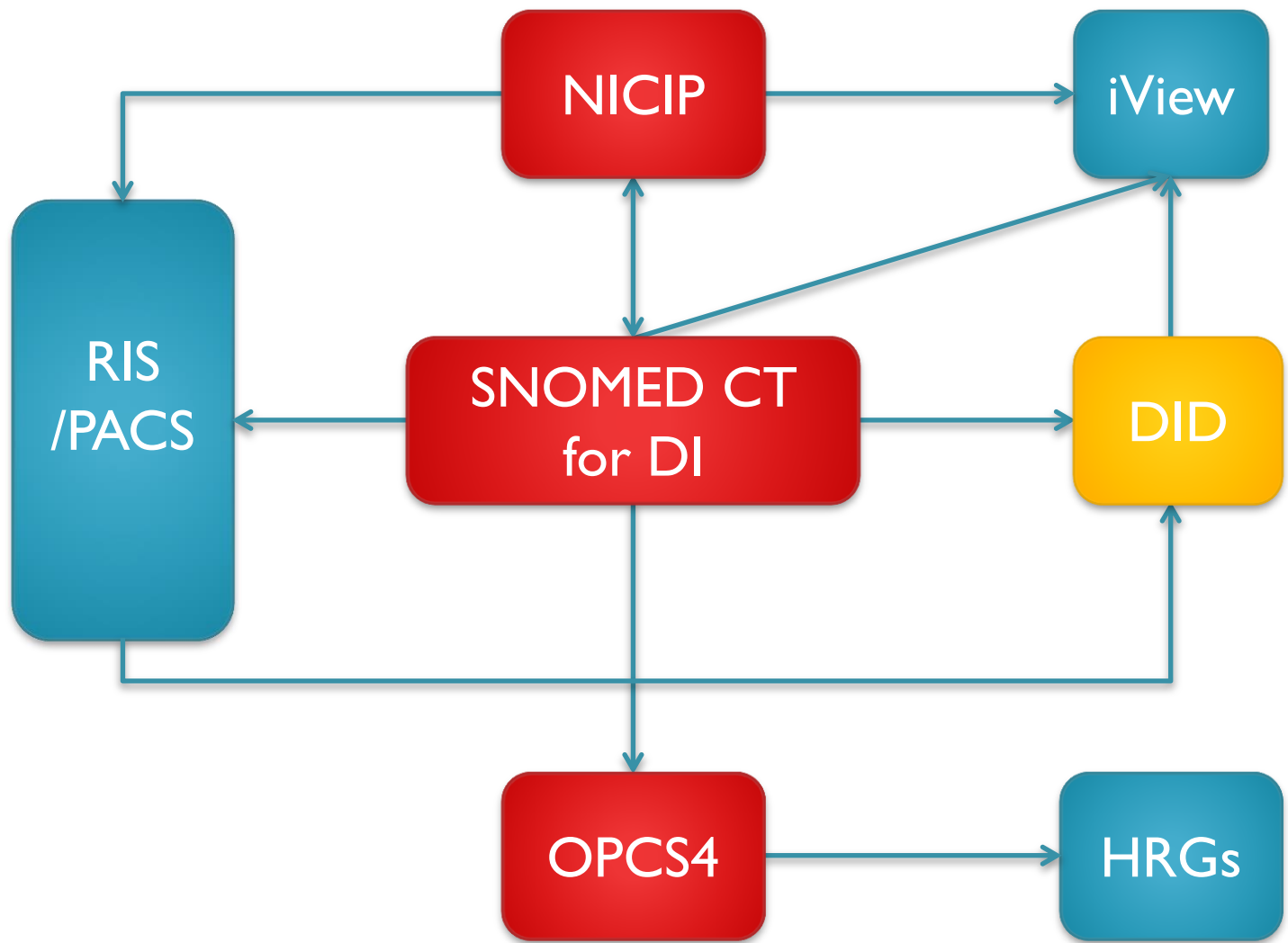
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# Background

- 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)

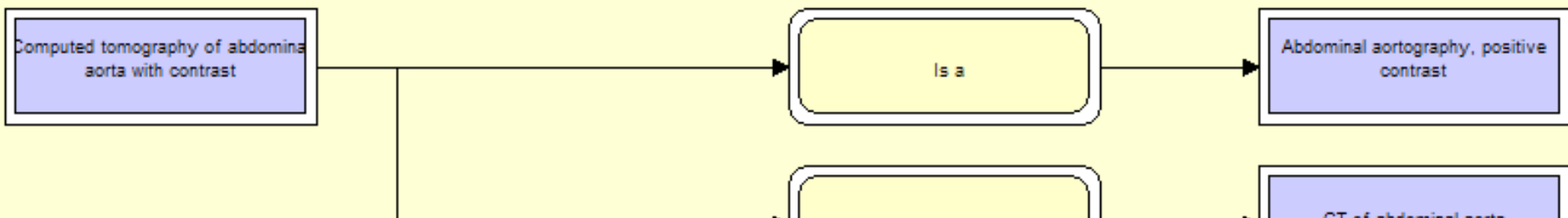


# DID groupers for body structures

- 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 |

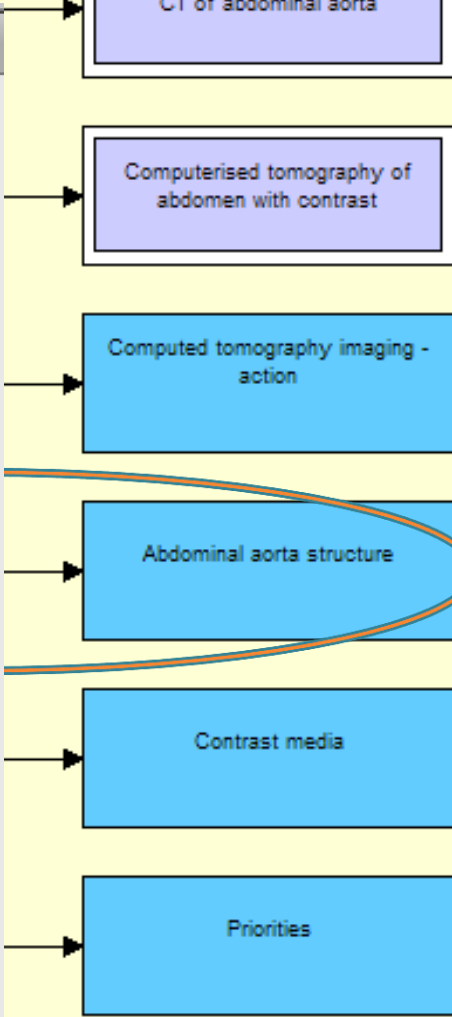
# DID groupers for body systems

- 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 |



**Explorer Window** [X]

- ▼ [+] 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)
              - ▶ [+] Abdominal visceral artery (body structure)



# Utilizes SNOMED CT modelling

Concept ID	Concept FSN	Imaging Modality	Body structure	Sub_Body structure	Body System Structure	Sub_Structure of body system
444968003	Computed tomography of <b>abdominal aorta</b> with contrast (procedure)	Computerized axial tomography (procedure)	<b>Abdominal structure</b> (body structure)		<b>Structure of cardiovascular system</b> (body structure)	<b>arterial system structure</b> (body structure)
241548004	Computed tomography of <b>thoracic aorta</b> (procedure)	Computerized axial tomography (procedure)	<b>Thoracic structure</b> (body structure)		Structure of cardiovascular system (body structure)	arterial system structure (body structure)
241654006	Magnetic resonance imaging arthrography of <b>knee</b> (procedure)	<b>Magnetic resonance imaging</b> (procedure)	Limb structure (body structure)	lower limb structure (body structure)	Structure of musculoskeletal system (body structure)	joint structure (body structure)

- [-] Diagnostic Test Request Date
- [-] Diagnostic Test Request Received Date
- [-] Ethnic Category
- [-] Exam - Early cancer diagnosis
  - [-] Exam - Fetal
- [-] Exam - Modality
  - [-] Exam - Morphology
  - [-] Exam - NICIP
- [-] Exam - Region
  - [-] Exam - SNOMED-CT
- [-] Exam - System
  - [-] Gender
  - [-] Local Area Team

**Filters:** Drop attributes here to filter the data.

**Rows:**

Measures X Region - Subregion: All X

**Columns:**

Modality - Submodality: All X

**Views:**

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Grid Chart

		Computerized axial tomography (procedure) ( 77477000 )	Diagnostic ultrasonography (procedure) ( 16310003 )	Endoscopy (procedure) ( 423827005 )	Fluoroscopy (procedure) ( 44491008 )	Magnetic resonance imaging (procedure) ( 113091000 )	Medical photography (procedure) ( 169283005 )	None	Nuclear medicine procedure (procedure) ( 371572003 )	Plain radiography (procedure) ( 168537006 )	Positron emission tomography (procedure) ( 82918 )
Abdominal structure (body structure) ( 113345001 )	Count	259965	1261095	46535	173590	245940			15635	1526360	
Head structure (body structure) ( 69536005 )	Count	1225155	64060		16850	777720			6400	816735	
Limb structure (body structure) ( 66019005 )	Count	113005	785325		189525	531175			11675	8533525	
Neck structure (body structure) ( 45048000 )	Count	90335	352290		5330	233235			21880	401730	
None	Count	1132750	1319790	2610	392105	410820	6635	345300	193290	1116130	7
Pelvic	Count	230670	3807300	5470	132805	201735			62630	1228090	



# 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

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- UK national standard representation of clinical imaging procedures  
<http://systems.hscic.gov.uk/data/uktc/imaging/>
- Diagnostic Imaging Dataset publication  
<http://www.england.nhs.uk/statistics/diagnostic-imaging-dataset/>
- iView  
<https://iview.ic.nhs.uk/DomainInfo/DiagnosticImaging>



**Questions?**