GOBIERNO DE ESPAÑA

MINISTERIO DE SANIDAD, SERVICIOS SOCIALES E IGUALDAD

SNOMED CT Expo 2016

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Te Papa Museum

Wellington, New Zealand

Mapping SNOMED CT to ICD-10-PCS

Ontology approach

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Wellington, Friday 28/10/2016 11:00

Stream C - SNOMED CT Development

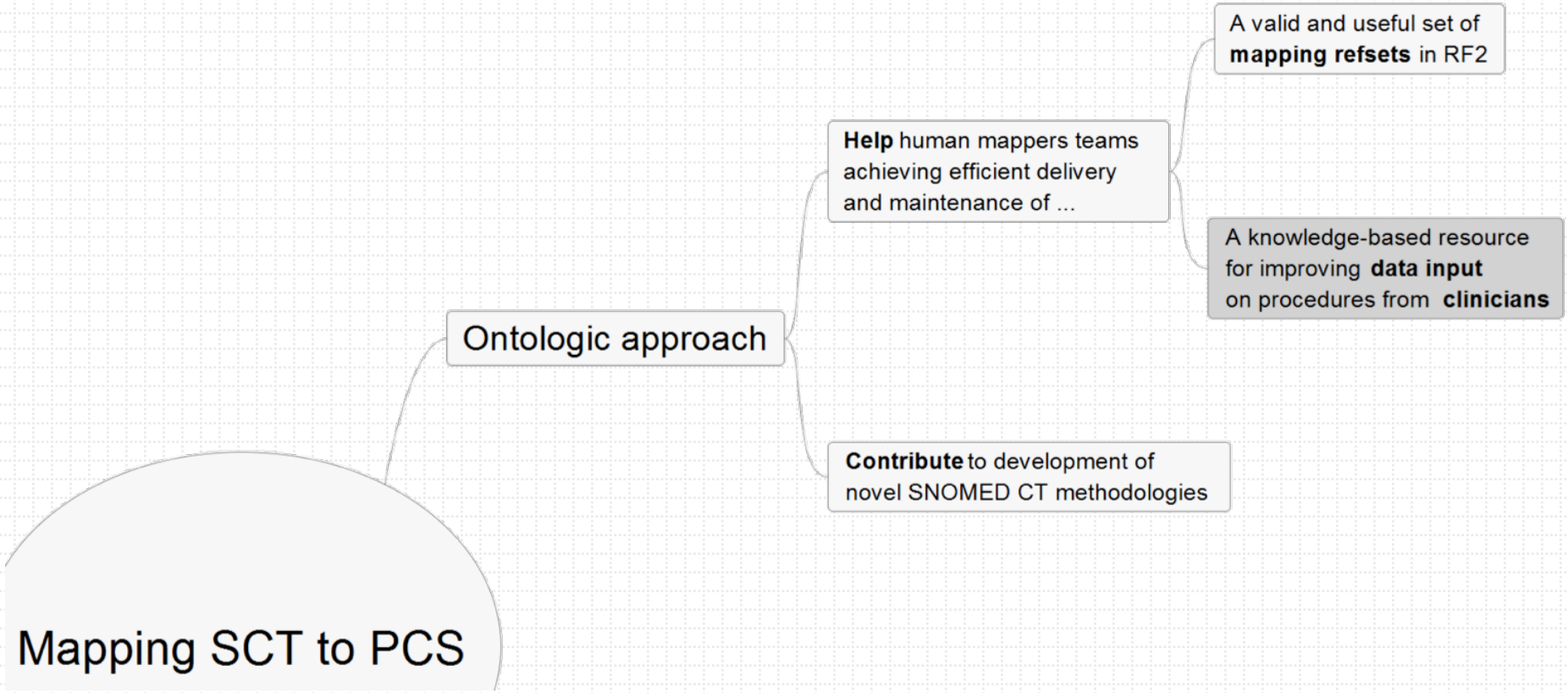
Subdirección General de Información Sanitaria e Innovación

Dirección General de Salud Pública, Calidad e Innovación

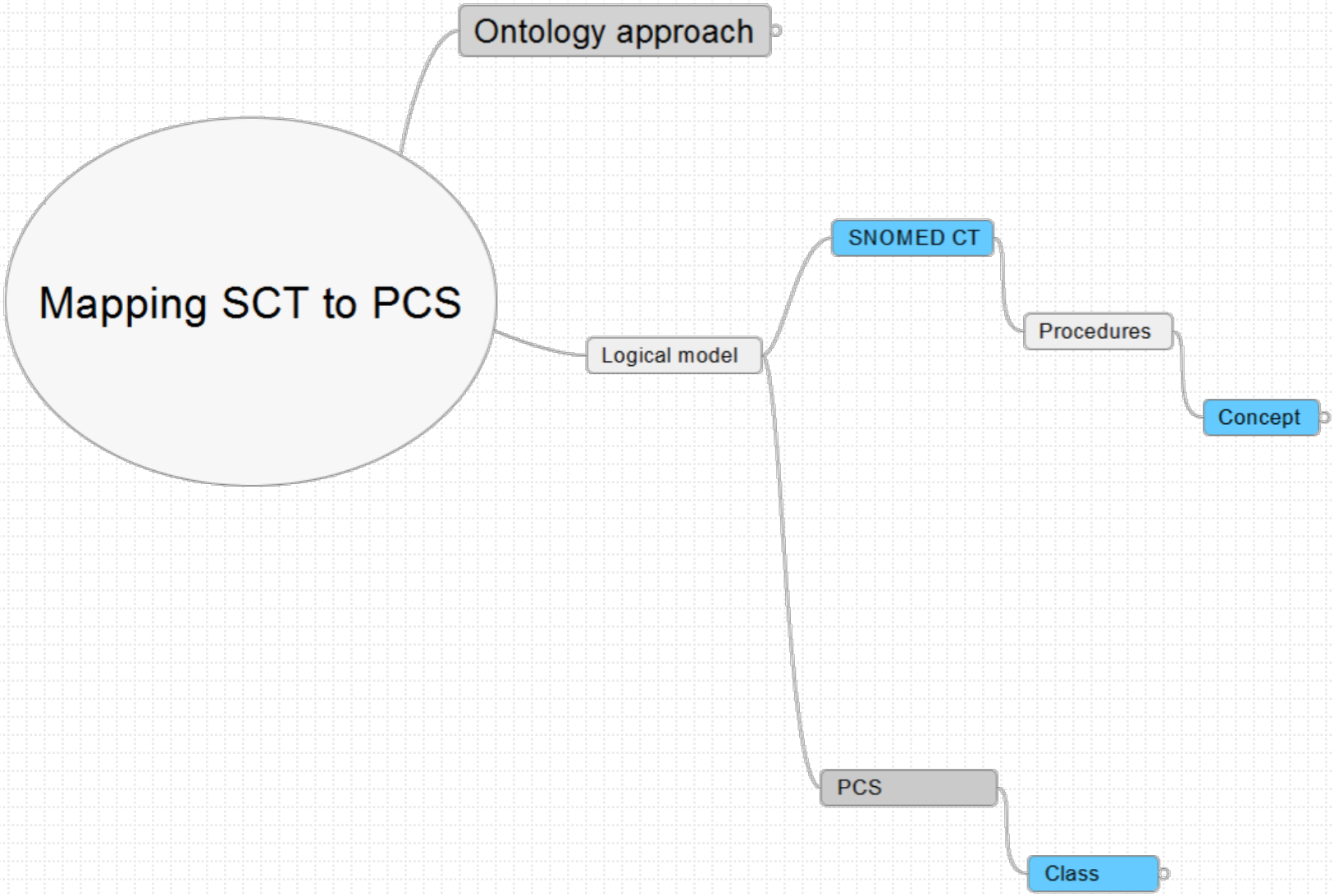
Shared objectives and methods

- To describe **one identified alternative** approach for facilitating mappings of SNOMED CT procedure concepts into ICD-10-CM PCS (Procedure Classification System).
- This specific **method** is based on analyzing **logical model attributes** of each resource to identify valid *candidate* maps for each concept.
  - Sufficient recall (retrieve all candidates)
  - Sufficient precision (limit false candidates)

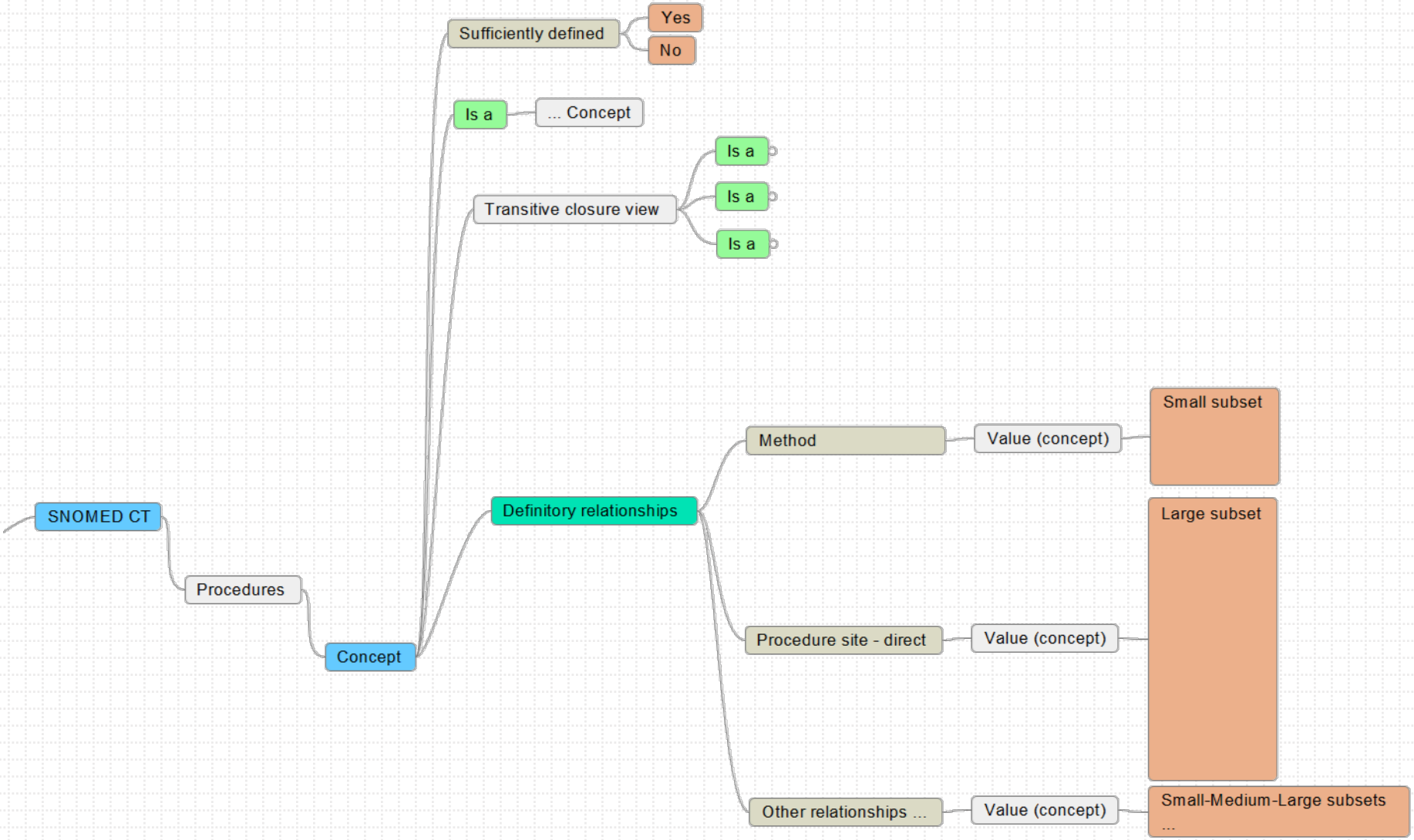
Objectives of this specific approach



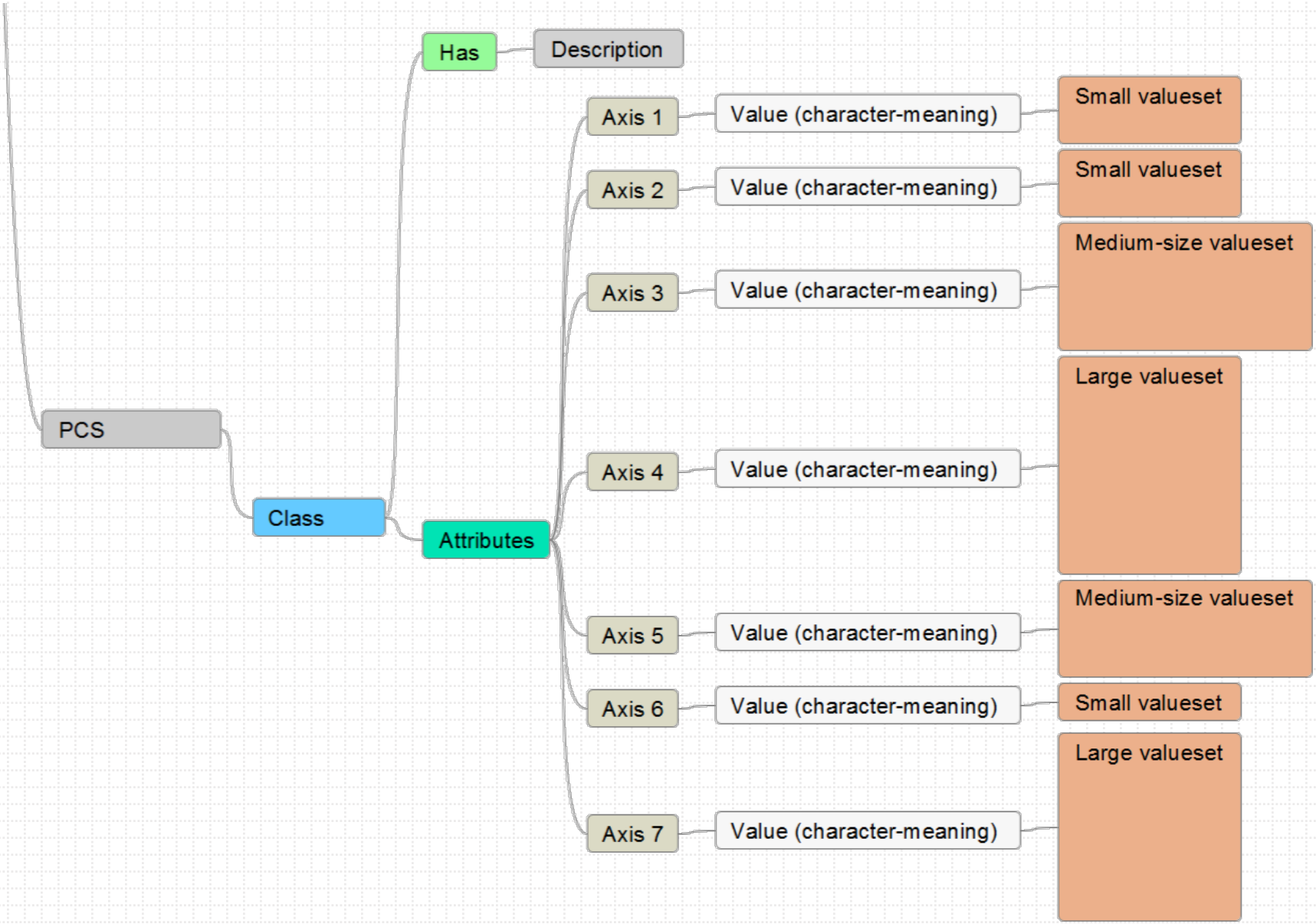
Materials and methods



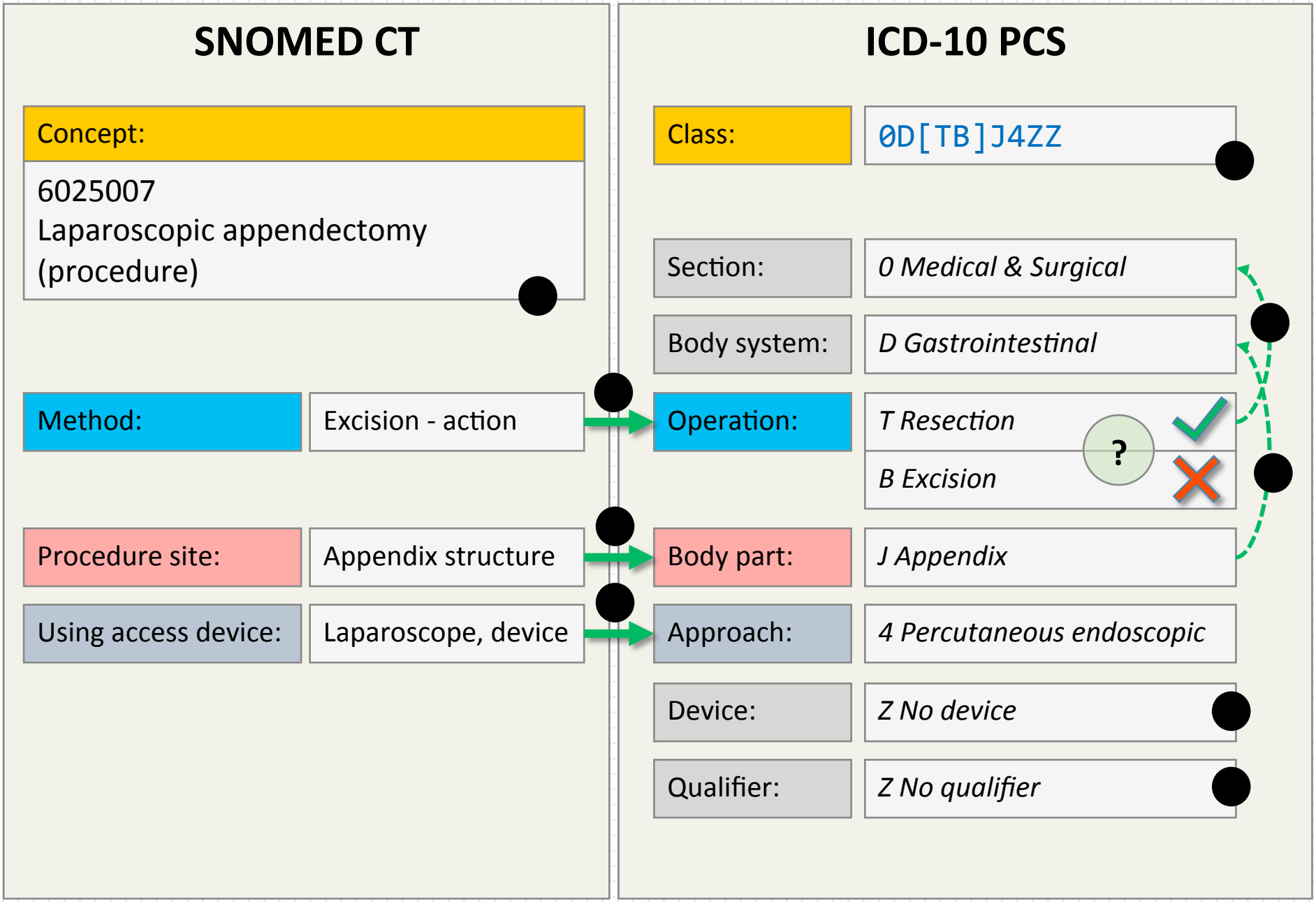
Materials: map source



Materials: map target



Methods: Laparoscopic Appendectomy



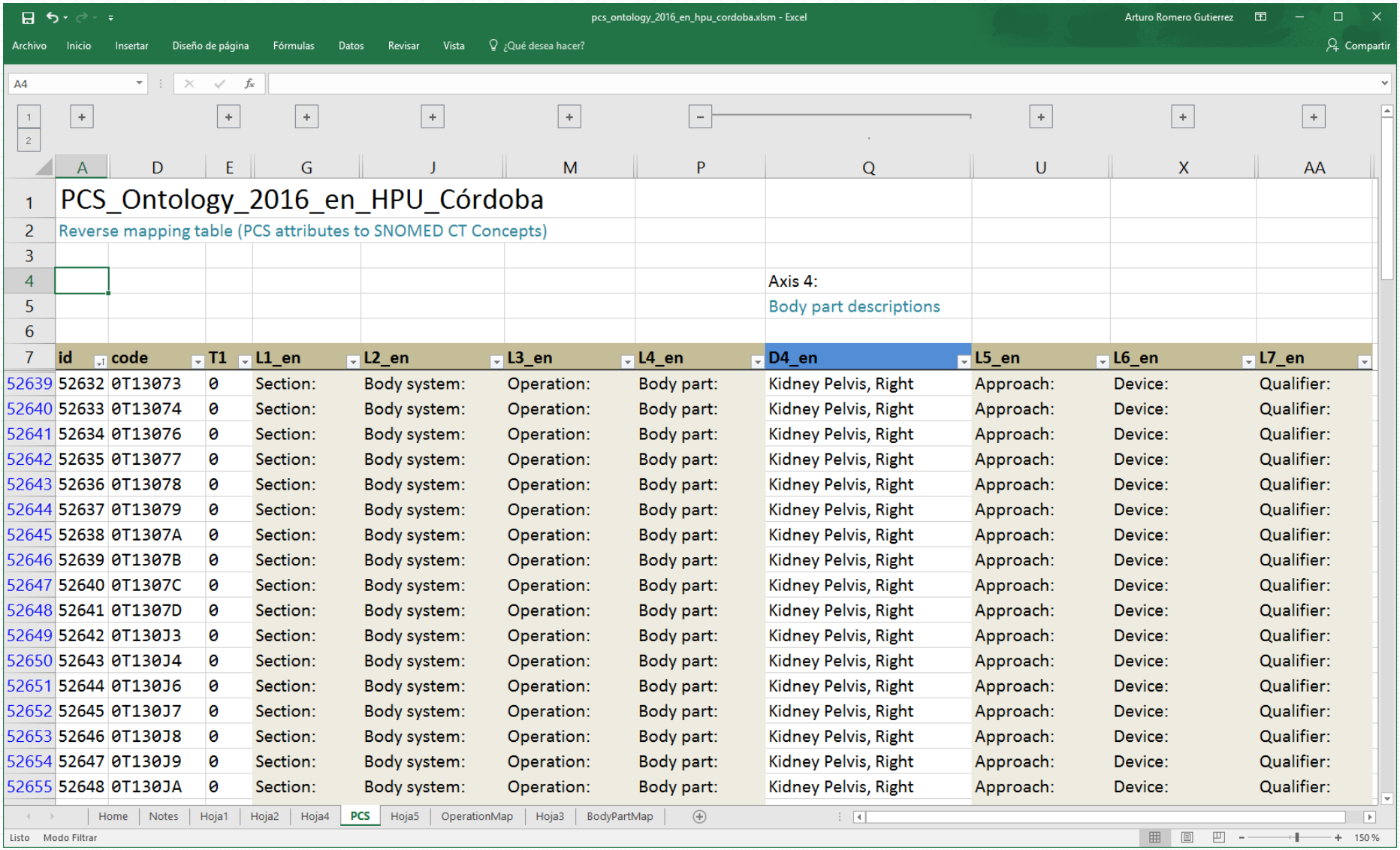
Methods: priority setting (sections & axes)

				Axis						
	nUniqueValues:			1	2	3	4	5	6	7
	Section 0 >>	1233		1	31	31	885	7	81	197
	All sections >>	2197		17	58	106	1.275	187	240	313
Section	**Title**	**nClasses**		**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	Medical and Surgical	61.898	86%	Section	Body system	Operation	Body part	Approach	Device	Qualifier
1	Obstetrics	380	0%	Section	Body system	Operation	Body part	Approach	Device	Qualifier
2	Placement	861	1%	Section	Body system	Operation	Body region	Approach	Device	Qualifier
3	Administration	1.388	2%	Section	Body system	Operation	Body system - Region	Approach	Substance	Qualifier
4	Measurement and Monitoring	339	0%	Section	Body system	Operation	Body system	Approach	Function-Device	Qualifier
5	Extracorporeal Assistance and Performance	41	0%	Section	Body system	Operation	Body system	Duration	Function	Qualifier
6	Extracorporeal Therapies	42	0%	Section	Body system	Operation	Body system	Duration	Qualifier	Qualifier
7	Osteopathic	100	0%	Section	Body system	Operation	Body region	Approach	Method	Qualifier
8	Other Procedures	60	0%	Section	Body system	Operation	Body region	Approach	Method	Qualifier
9	Chiropractic	90	0%	Section	Body system	Operation	Body region	Approach	Method	Qualifier
B	Imaging	2.934	4%	Section	Body system	Type	Body part	Contrast	Qualifier	Qualifier
C	Nuclear Medicine	463	1%	Section	Body system	Type	Body part	Radionuclide	Qualifier	Qualifier
D	Radiation Therapy	1.939	3%	Section	Body system	Modality	Treatment site	Modality qualifier	Isotope	Qualifier
F	Physical Rehabilitation and Diagnostic Audiology	1.380	2%	Section	Section qualifier	Type	Body system - Region	Type qualifier	Equipment	Qualifier
G	Mental Health	30	0%	Section	Body system	Type	Qualifier	Qualifier	Qualifier	Qualifier
H	Substance Abuse Treatment	59	0%	Section	Body system	Type	Qualifier	Qualifier	Qualifier	Qualifier
X	New Technology	52	0%	Section	Body system	Operation	Body part	Approach	Device-Substance-Technology	Qualifier
		71.976								

Results (landmarks reached)

- Refined PCS Ontology: a new representational structure for PCS
- Reverse Mapping: from PCS axis label-value to SCT attribute name-value
- Testing queries (SQL scripts on both SCT and PCS ontologies)

Results: refined PCS Ontology



pcs_ontology_2016_en_hpu_cordoba.xlsm - Excel — Arturo Romero Gutierrez

Archivo Inicio Insertar Diseño de página Fórmulas Datos Revisar Vista ¿Qué desea hacer? Compartir

A4

PCS_Ontology_2016_en_HPU_Córdoba

Reverse mapping table (PCS attributes to SNOMED CT Concepts)

Axis 4:

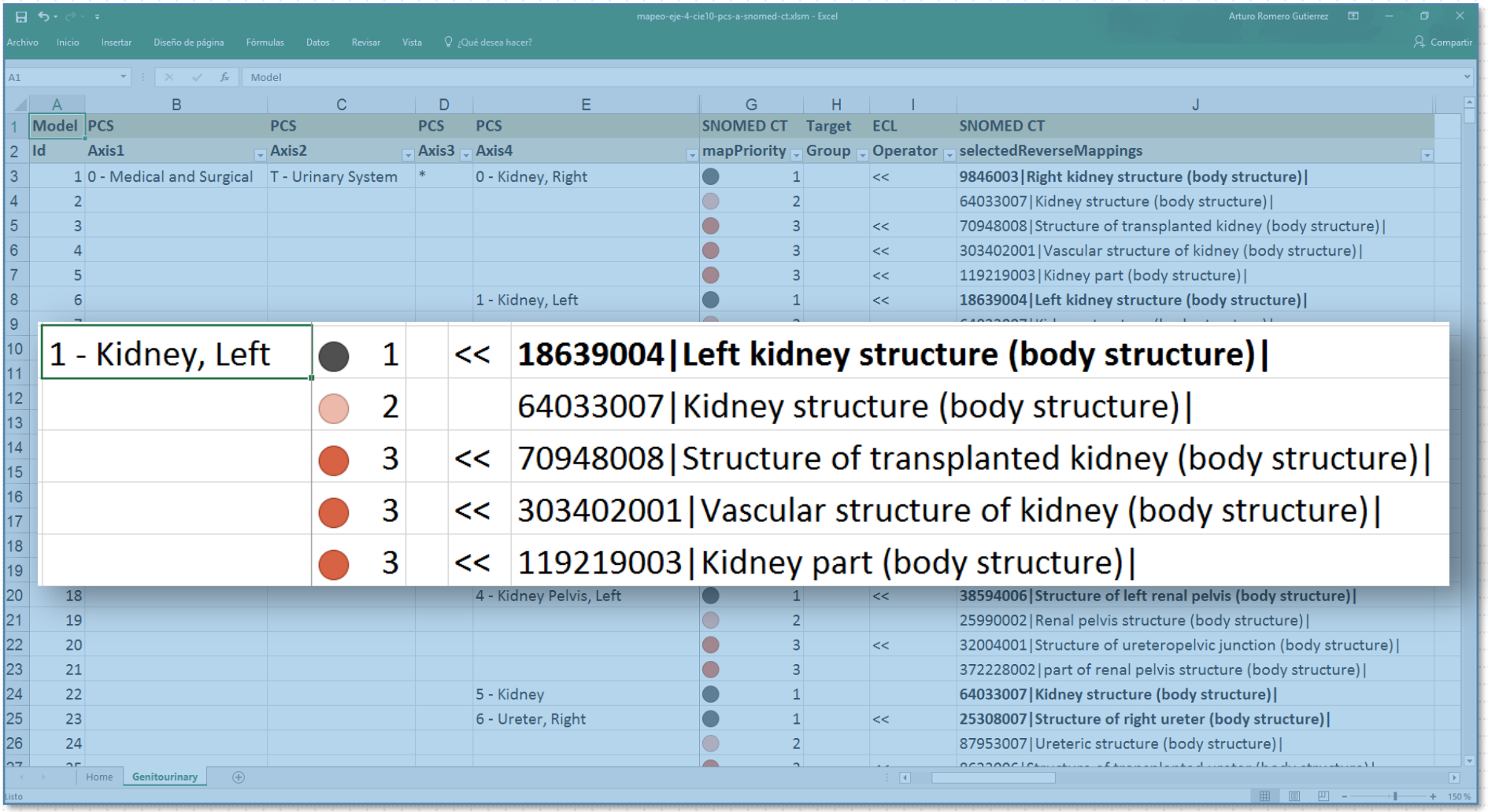
Body part descriptions

	id	code	T1	L1_en	L2_en	L3_en	L4_en	D4_en	L5_en	L6_en	L7_en
52639	52632	0T13073	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52640	52633	0T13074	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52641	52634	0T13076	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52642	52635	0T13077	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52643	52636	0T13078	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52644	52637	0T13079	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52645	52638	0T1307A	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52646	52639	0T1307B	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52647	52640	0T1307C	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52648	52641	0T1307D	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52649	52642	0T130J3	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52650	52643	0T130J4	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52651	52644	0T130J6	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52652	52645	0T130J7	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52653	52646	0T130J8	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52654	52647	0T130J9	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:
52655	52648	0T130JA	0	Section:	Body system:	Operation:	Body part:	Kidney Pelvis, Right	Approach:	Device:	Qualifier:

Home Notes Hoja1 Hoja2 Hoja4 PCS Hoja5 OperationMap Hoja3 BodyPartMap

Listo Modo Filtrar 150 %

Results: reverse mapping (human, 3 systems)



Model	PCS	PCS	PCS	PCS	SNOMED CT	Target	ECL	SNOMED CT
Id	Axis1	Axis2	Axis3	Axis4	mapPriority	Group	Operator	selectedReverseMappings
1	0 - Medical and Surgical	T - Urinary System	*	0 - Kidney, Right	1		<<	**9846003|Right kidney structure (body structure)|**
2					2			64033007|Kidney structure (body structure)|
3					3		<<	70948008|Structure of transplanted kidney (body structure)|
4					3		<<	303402001|Vascular structure of kidney (body structure)|
5					3		<<	119219003|Kidney part (body structure)|
6				1 - Kidney, Left	1		<<	**18639004|Left kidney structure (body structure)|**
18				4 - Kidney Pelvis, Left	1		<<	**38594006|Structure of left renal pelvis (body structure)|**
19					2			25990002|Renal pelvis structure (body structure)|
20					3		<<	32004001|Structure of ureteropelvic junction (body structure)|
21					3			372228002|part of renal pelvis structure (body structure)|
22				5 - Kidney	1			**64033007|Kidney structure (body structure)|**
23				6 - Ureter, Right	1		<<	**25308007|Structure of right ureter (body structure)|**
24					2			87953007|Ureteric structure (body structure)|

1 - Kidney, Left	1	<<	**18639004|Left kidney structure (body structure)|**
	2		64033007|Kidney structure (body structure)|
	3	<<	70948008|Structure of transplanted kidney (body structure)|
	3	<<	303402001|Vascular structure of kidney (body structure)|
	3	<<	119219003|Kidney part (body structure)|

Results: SQL queries for testing candidates

```
SELECT * FROM concepts WHERE id=6025007; /* laparoscopic appendectomy */
SELECT * FROM relationships
  WHERE sourceId = 6025007 and active = 1; /* see SQL within comments*/
```

sourceId	typeId	term	destinationId	term
6025007	116680003	Is a (attribute)	51316009	Laparoscopic procedure (procedure)
6025007	116680003	Is a (attribute)	264274002	Endoscopic operation (procedure)
6025007	116680003	Is a (attribute)	440588003	Endoscopic procedure on appendix (procedure)
6025007	116680003	Is a (attribute)	80146002	Appendectomy (procedure)
6025007	116680003	Is a (attribute)	51316009	Laparoscopic-assisted procedure (procedure)
6025007	260686004	Method (attribute)	129304002	Excision - action (qualifier value)
6025007	405813007	Procedure site - Direct (attribute)	66754008	Appendix structure (body structure)
6025007	425391005	Using access device (attribute)	86174004	Laparoscope, device (physical object)

```
SELECT pcs.code, pcs.descriptor_ref_en FROM pcs_ontology_2016
  WHERE m4 = '66754008|Appendix structure (body structure)'
  AND m3 = '129304002|Excision - action (qualifier value)'
  AND m5 = '86174004|Laparoscope, device (physical object)';
```

code	descriptor_ref_en
0DBJ4ZX	Excision of Appendix, Percutaneous Endoscopic Approach, Diagnostic
0DBJ4ZZ	Excision of Appendix, Percutaneous Endoscopic Approach
0DBJ8ZX	Excision of Appendix, Via Natural or Artificial Opening Endoscopic, Diagnostic
0DBJ8ZZ	Excision of Appendix, Via Natural or Artificial Opening Endoscopic
0DTJ4ZZ	Resection of Appendix, Percutaneous Endoscopic Approach
0DTJ8ZZ	Resection of Appendix, Via Natural or Artificial Opening Endoscopic

Regular expression:
/0D[BT]J[48]Z[ZX]/

Results (further developments)

- Guidance service for procedure documentation by clinicians: *fill the gaps* approach (Web interface application for *operating room* deployment, alpha status)
- SNOMED CT Procedures relationships extension for **primitive** concepts (proposal to IHTSDO Content Team, under study)
- Expression Constraint Language (ECL) expressions for intensionally querying SCT implementations (form-based authoring, under study)

Results: Mapping service for prompting clinicians

MapServer | Mapping services for clinicians and coding professionals

From natural language or SNOMED CT concepts to fully informed ICD-10-PCS classes

▸ Help

▸ 1. Settings (optional customization)

▾ 2. Clinical procedure term (required input)

Procedure: Write a search string, select procedure description or use free text ...

SNOMED CT: SCTID ...

▸ Help

▸ 3. Information refining dialog (activate on demand)

▾ 4. PCS codes (service output endpoint)

Code	Descriptor	Ok	Status	Links	Notes	Feedback
*******	...	☐	...	...	...	...
*******	...	☐	...	...	...	...

Operations: Accept Clear

▸ Help

Credits

Developed by: HCDSNS Project Team © MSSSI Spain
Thanks to: SNOMED CT to ICD-10-PCS Mapping Project Working Group, IHTSDO, 2015
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ICD-10-PCS © Centers for Medicare & Medicaid Services USA
Outil d'encodage ICD10BE © FPS Belgium
eCIEmaps © MSSSI Spain

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End of page.

Discussion

- Attributes level mapping is **routinely** used by classifier software
- Transitive closure view enhances **availability** of ontologic relationships
- **Inheritance** is needed to improve definitory relations availability
- Emphasys has been placed on "**Operation**" and "**Body part**" axes
- Coding "Approach" and "Device" axes may require **postcoordination**

Conclusions

- Mapping SNOMED CT to PCS is more **efficient** by **combining** approaches
- Ontologic approach is just **one** of the alternatives under testing
- It requires **reverse** mapping first (PCS axes to SCT attributes)
- Primitive SNOMED CT concepts can be a **challenge**
- Extended SNOMED CT **relationships** improve mapping efficiency
- Extension of relationships can be a short-term **priority**
  - Body part and Root operation priorities
- Simple **queries** on a PCS ontology perform well for the testing stage
- SNOMED CT terms can **mitigate** PCS alphabetic index limitations
- **Laterality** management requires a refined ontology
- Postcoordinated expressions are **desirable** input for ontologic approach

Links

- Programme:
  - https://confluence.ihtsdotools.org/display/FT/SNOMED%2BCT%2BExpo%2B2016
- Abstract:
  - https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=29952418
- Studies:
  - https://www.optum.com/content/dam/optum/resources/articles/Article3_ICD10Monitor_Saving%20_grace_v3.pdf

whakawhetai koe!

aromerog@msssi.es

Subdirección General de Información Sanitaria e Innovación
Dirección General de Salud Pública, Calidad e Innovación

Summary

- **Context: PCS Procedures Classification System**
  - ICD-10-PCS development in **USA**, adoption October 2015
  - Other PCS **adopters** include Belgium, Portugal, Spain, …
  - PCS adoption is based on **regulations**, use is a matter of compliance
  - Procedures **data quality** is critical for precise PCS encoding
- **Challenges: missing information in clinical data sources**
  - Some procedure information elements may be **missing** …
  - … Missing data for coding are a **very costly challenge** in hospitals
- **Opportunities: SNOMED CT for clinical data input**
  - SNOMED CT is being adopted for **clinical data capture**
  - A **map** may facilitate encoding
  - … **Improving primary data capture** does facilitate encoding
- **Strategy: several approaches may render better results**
  - Can we identify **synergies**?
  - Can we develop and sustain transcoding **tools**?
  - Can we **rely** on the **ontologic** content of SNOMED CT **and** PCS?

Audience

- Professionals interested on mapping methodologies from SNOMED CT to healthcare classifications.
- Information analysts and coding professionals interested on transcoding-enabled systems.
- SNOMED CT Content editors interested on identifying priorities for populating relationships.