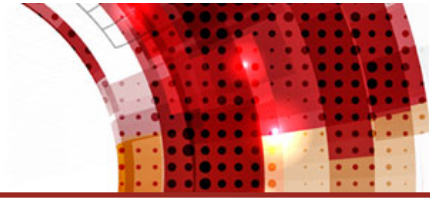


Towards a Global Imaging Procedure Code Mapping Resource (IPCMR)

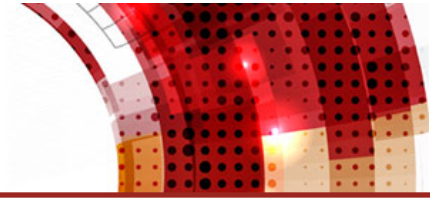
David A. Clunie

PixelMed Publishing, LLC

http://www.ipcmr.org/

SIIM2015

Disclosures

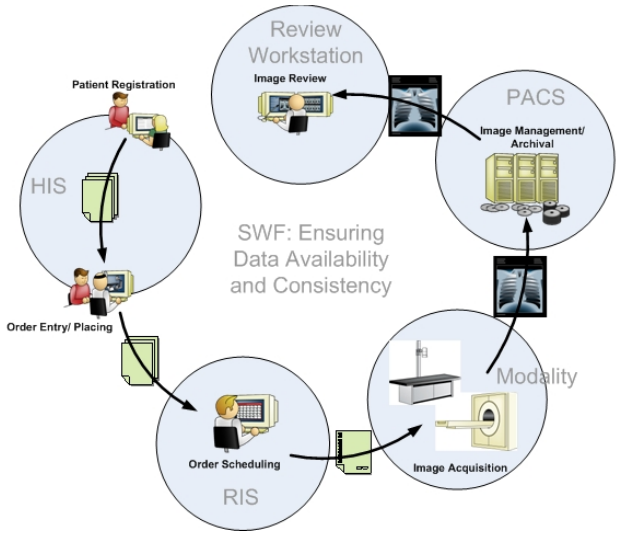


- Owner, PixelMed Publishing, LLC (Consulting)
- Editor, DICOM Standard (NEMA contractor)

- Nothing relevant to this subject

Orders/Requests Drive Imaging

- Clinician conceives of need for & places order
  - may be modulated by “appropriateness”
- Radiologist “protocols”
  - may or may not be mediated by a “code”
- Technologist/machine “performs”
  - manual or “automated protocol setting”
- PACS displays
  - procedure-specific hanging protocols
- Report dictated
  - procedure-specific templates
- Quality and performance measured
  - procedure-specific radiation dose tabulated
- Coded for billing
  - black art driven by non-clinical resource/political/commercial factors



Orders/Requests Drive Imaging

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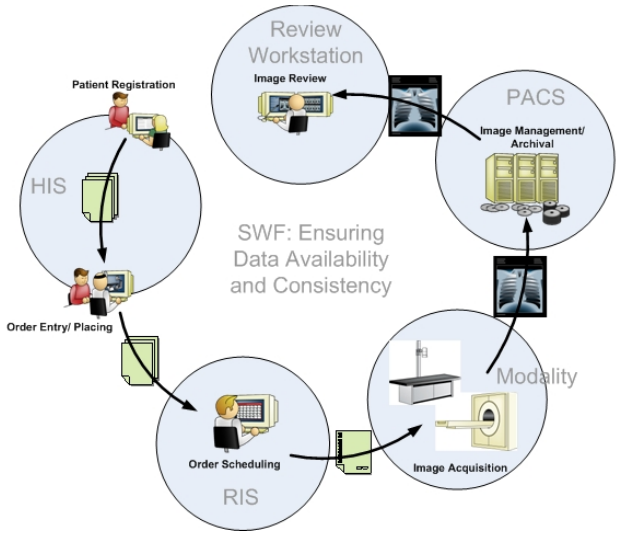
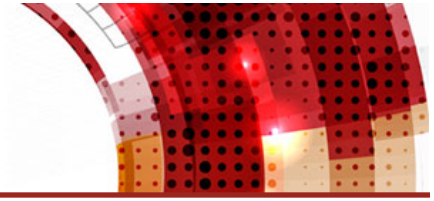
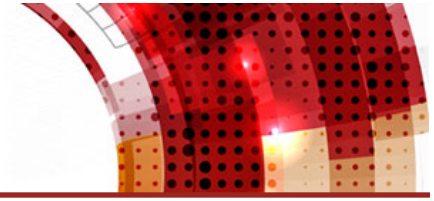


Retrieval Use Case Examples



- Alerts about prior studies
  - during ordering, protocolling, performing
- Retrieval of relevant priors
  - from long term archive (slow/offsite)
  - for reporting
  - for clinical users comparison
- Retrieval of relevant reports
- Different codes used inside versus outside organization
  - central or federated archives
  - old (unmigrated/unmodified) studies after merger
  - “foreign” studies imported via media or network
- Use case impact on requirements for codes/concepts
  - what was ordered/requested versus what was performed
  - how detailed the description of what was performed needs to be

State of the Art vs Incentives



- State of the art:
  - every site creates own procedure list
  - every site creates own acquisition protocols
  - every site creates own hanging protocols
  - every site creates own report templates
  - all indexed by local site's codes (or something)

- Incentives to change internal practice (standardize):
  - re-use opportunity (does not seem to have driven change)
  - consolidation of enterprises (mergers/acquisitions)
  - consolidation of systems (unifying EMR installation)
  - one vendor, one set of universal codes?

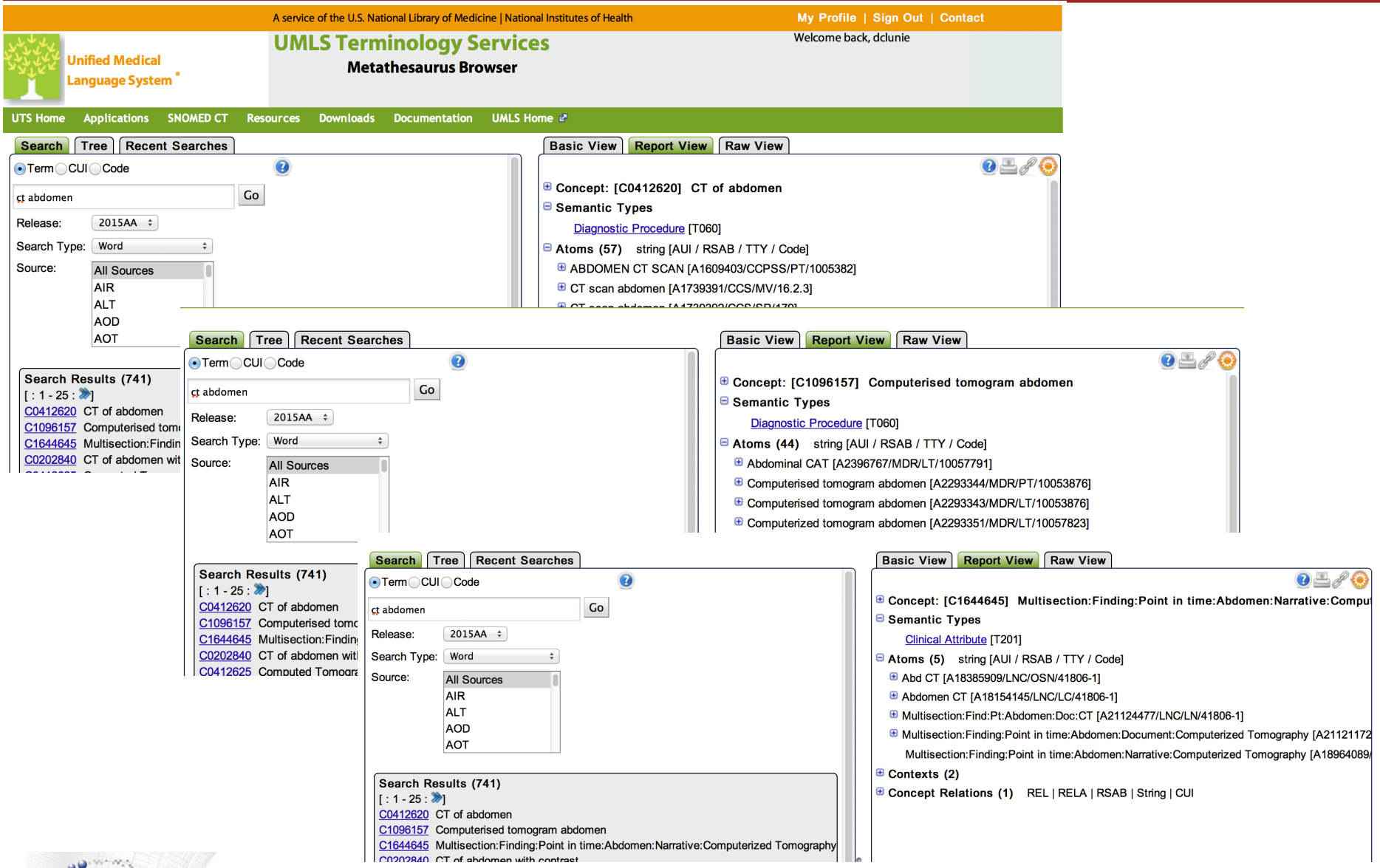
Which Standard? One Standard?

- *"The nice thing about standards is that you have so many to choose from"* – Andrew Tanenbaum
- Equally applicable to "standards" for coding schemes, or even just controlled terminology
- Why are standard schemes not already used locally?
  - poor fit to local practice
  - poor coverage of local diversity
  - folks just insist on inappropriately use billing codes
  - historical isolation with inertia and little incentive to change (code "ghettos")
- Does new enterprise/system (esp., EMR CPOE) drive change?
  - does the vendor have their own proprietary "standard"?
  - counterincentive of business model for professional services customization
- Perhaps we should just give up on selecting one standard
  - instead map all the standards, rather than expend futile effort on evangelism
  - lead many horses to different forms of compatible water (?)
  - still may require inbound/outbound coercion to/from local coding scheme

Mapping: What about the UMLS?

- National Library of Medicine (NLM) Unified Medical Language System (UMLS) “metathesaurus”
  - evolving since 1986
  - more than 1 million biomedical concepts, over 100 sources
- Imaging procedures in UMLS
  - some sources of imaging procedure codes
  - some sources not yet included (e.g., RadLex)
  - driven by lexical equivalence (issue for LOINC)
  - not yet good coverage or mapping for imaging
- Improve UMLS
  - if gaps can be filled by imaging domain experts
  - requires a systematic and credible approach

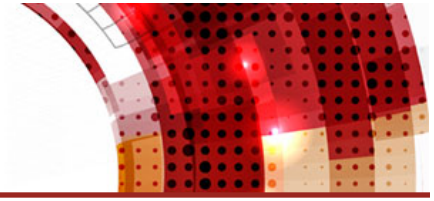
UMLS – 1 procedure, 3 concepts



Imaging: A Specialized Terminology

- Imaging procedure domain is restricted
- E.g. in UMLS, “BPD” may also be
  - Bronchopulmonary Dysplasia
  - Borderline Personality Disorder
- In imaging (procedure) context
  - Biparietal Diameter
- Unless pre-coordinated as “reason”?
- Hypothetical
  - not actually encountered in IPCMR source schemes (yet) (subsumed under gestational age stuff)

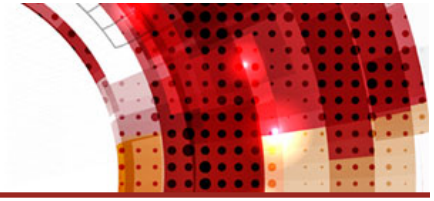
Goal of Pilot Project



- Build a prototype of a “content mapping resource”
  - a list of “equivalent” concepts
  - a list of same concept in different sources
- Include as many relevant sources as available (even drafts)
  - preferably international in scope
  - SNOMED INT, GB, CA, LOINC, RadLex, JJ1017, Ontario DI, UK NICIP, ICD10PCS, ICD9CM, HCPCS, ACR Common, RANZCR BSF
- Compare lexical and semantic approaches
  - lexical – parsing strings for patterns/matches
  - semantic – “model” behind source to identify equivalent attributes
- Assess feasibility of using for production
- Identify opportunities to improve sources
  - correct errors, remove duplicates, identify ambiguities
- Consider contributing results to include in UMLS

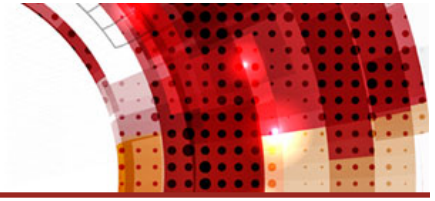
Imaging Procedure Code Mapping Resource (IPCMR)

Web Page – IPCMR Concepts



IPCMR Code	IPCMR Definition	IPCMR Description	Source Description	SNOMED	NICIP	ACRCommon	ONTARIODI	LN	ICD10P
2844-6527	Modality:CT	ct (2 chars)	ct of regions	303678006 77477000			100501	25045-6	BW2
8917-8883	Modality:CT Access:Percutaneous Context:Therapeutic Guidance:Drainage	ct percutaneous therapeutic drainage (36 chars)	ct guided percutaneous therapeutic drainage	277584008					
6661-9857	Modality:CT AgeGroup:Pediatric	ct pediatric (12 chars)	a computed tomography radiology orderable pediatric imaging procedure focused on the						
8608-7388	Modality:CT AgeGroup:Pediatric Angio:Angiography IVContrast:W	ct pediatric angiography w iv (29 chars)	a computed tomography radiology orderable pediatric angiography procedure focused on the with iv contrast						
5838-8956	Modality:CT AgeGroup:Pediatric Extent:Limited IVContrast:W	ct pediatric limited w iv (25 chars)	ct, area of interest, w iv contrast, [peds]			376			
3689-1527	Modality:CT AgeGroup:Pediatric Extent:Limited IVContrast:WO	ct pediatric limited wo iv (26 chars)	ct, area of interest, wo iv contrast, [peds]			735			
7055-2810	Modality:CT AgeGroup:Pediatric Extent:Limited IVContrast:WO+W	ct pediatric limited wo+w iv (28 chars)	ct, area of interest, wo/w iv contrast, [peds]			732			
7477-2419	Modality:CT Analysis:3D	ct 3d (5 chars)	computerized tomography, 3 dimensional reconstruction	22400007				25040-7 41804-6	
1818-5655	Modality:CT Analysis:3D Context:Preoperative	ct 3d preoperative (18 chars)	a computed tomography radiology orderable 3d imaging processing procedure focused on the for the purpose of pre op						
2684-2799	Modality:CT Analysis:3D Context:Screening	ct 3d screening (15 chars)	Analysis:3D Context:Screening Modality:CT						
5717-1802	Modality:CT Analysis:3D Workstation:Independent:W	ct 3d w independent workstation (31 chars)	a computed tomography radiology orderable 3d imaging processing with independent workstation procedure focused on the						
2622-6811	Modality:CT Analysis:3D Workstation:Independent:WO	ct 3d wo independent workstation (32 chars)	a computed tomography radiology orderable 3d imaging processing without independent workstation procedure focused on the						
6009-9981	Modality:CT Anatomy:ABDOMEN	ct abdomen (10 chars)	computed tomography of abdomen	169070004	CABDO	374	100212	41806-1	BW20Z
2051-6471	Modality:CT Anatomy:ABDOMEN Access:Percutaneous Device:Tube Guidance:Change Guidance:Drainage	ct abdomen percutaneous tube change drainage (44 chars)	ct guidance for replacement of percutaneous drainage tube in abdomen					52790-3	
0336-0168	Modality:CT Anatomy:ABDOMEN Extent:Limited	ct abdomen limited (18 chars)	abdomen ct limited					36086-7	
1432-3325	Modality:CT Anatomy:ABDOMEN Extent:Limited IVContrast:W	ct abdomen limited w iv (23 chars)	abdomen ct limited w contrast iv					36095-8	
3622-8048	Modality:CT Anatomy:ABDOMEN Extent:Limited IVContrast:WO	ct abdomen limited wo iv (24 chars)	abdomen ct limited wo contrast					36103-0	
4226-1085	Modality:CT Anatomy:ABDOMEN Extent:Limited IVContrast:WO+W	ct abdomen limited wo+w iv (26 chars)	abdomen ct limited w and wo contrast iv					36102-2	
4684-1187	Modality:CT Anatomy:ABDOMEN Guidance	ct abdomen guidance (19 chars)	a computed tomography radiology orderable guidance procedure focused on the abdomen						
9302-7776	Modality:CT Anatomy:ABDOMEN Guidance:Aspirate	ct abdomen aspirate (19 chars)	computed tomography and aspiration of abdomen	2578450013 420230009	CABDON		103421		
2234-6735	Modality:CT Anatomy:ABDOMEN Guidance:Aspirate:Needle:Fine	ct abdomen aspirate needle fine (31 chars)	ct guidance for fine needle aspiration of abdomen					30602-7	
5594-9042	Modality:CT Anatomy:ABDOMEN Guidance:Biopsy	ct abdomen biopsy (17 chars)	computed tomography and biopsy of abdomen	419940006	CABDOB		100202	30601-9	
5562-9889	Modality:CT Anatomy:ABDOMEN Guidance:Biopsy Guidance:Biopsy:Needle	ct abdomen biopsy biopsy needle (31 chars)	Anatomy:ABDOMEN Guidance:Biopsy Guidance:Biopsy:Needle Modality:CT						
3436-7232	Modality:CT Anatomy:ABDOMEN Guidance:Biopsy IVContrast:WO	ct abdomen biopsy wo iv (23 chars)	ct guidance for biopsy of abdomen-- wo contrast					69083-4	
6114-5490	Modality:CT Anatomy:ABDOMEN Guidance:Biopsy:Needle	ct abdomen biopsy needle (24 chars)	ct guidance for needle biopsy of abdomen					42288-1	
1690-7535	Modality:CT Anatomy:ABDOMEN Guidance:Biopsy:Needle Position:Supine	ct abdomen biopsy needle supine (31 chars)	x-ray computed tomography observation needle biopsy abdomen supine position						
4372-2570	Modality:CT Anatomy:ABDOMEN Guidance:Drainage	ct abdomen drainage (19 chars)	computed tomography and drainage of abdomen	418199004	CABDOD		100203	35913-3	
8377-0005	Modality:CT Anatomy:ABDOMEN IVContrast:ReducedVolume	ct abdomen reducedvolume iv (27 chars)	abdomen ct w reduced contrast volume iv					46330-7	
9253-6644	Modality:CT Anatomy:ABDOMEN IVContrast:W	ct abdomen w iv (15 chars)	computerized tomography of abdomen with contrast	32962002	CABDOC	116	100208	30599-5	

Web Page – Source Concepts



25040-7	unspecified body region ct 3d (LOINC_2.50) xxx ct.3d (LOINC_2.50)	Analysis:3D Modality:CT (7477-2419)	ct 3d (7477-2419)
25041-5	ct guidance for aspiration or biopsy of unspecified body region-- w contrast iv (LOINC_2.50) xxx ct asp or bx guid w contr iv (LOINC_2.50)	Guidance:Aspirate Guidance:Biopsy IVContrast:W Modality:CT (1999-2594) Guidance:Aspirate,Biopsy IVContrast:W Modality:CT (0101-2413)	ct aspirate biopsy w iv (1999-2594) ct aspirate,biopsy w iv (0101-2413)
25042-3	ct guidance for aspiration or biopsy of unspecified body region (LOINC_2.50) xxx ct asp or bx guid (LOINC_2.50)	Guidance:Aspirate Guidance:Biopsy Modality:CT (8364-2934) Guidance:Aspirate,Biopsy Modality:CT (3706-8011)	ct aspirate biopsy (8364-2934) ct aspirate,biopsy (3706-8011)
25043-1	ct guidance for aspiration of unspecified body region (LOINC_2.50) xxx ct asp guid (LOINC_2.50)	Guidance:Aspirate Modality:CT (2897-6234)	ct aspirate (2897-6234)
25044-9	ct guidance for biopsy of unspecified body region (LOINC_2.50) xxx ct bx guid (LOINC_2.50)	Guidance:Biopsy Modality:CT (1097-3371)	ct biopsy (1097-3371)
25045-6	unspecified body region ct (LOINC_2.50) xxx ct (LOINC_2.50)	Modality:CT (2844-6527)	ct (2844-6527)
25046-4	unspecified body region ct w anesthesia (LOINC_2.50) xxx ct w anesthesia (LOINC_2.50)	Anesthesia:Yes Modality:CT w	
25047-2	unspecified body region ct w conscious sedation (LOINC_2.50) xxx ct w conscious sedation (LOINC_2.50)	Modality:CT conscious sedation w	
25050-6	unspecified body region ct 3d sagittal and coronal disarticulation (LOINC_2.50) xxx ct.3d sagittal+coronal disartic (LOINC_2.50)	Analysis:3D Modality:CT coronal disarticulation sagittal Analysis:3D Modality:CT disartic sagittal+coronal	
25051-4	unspecified body region ct multisectional sagittal (LOINC_2.50) xxx ct multisectional sagittal (LOINC_2.50)	Modality:CT multisectional sagittal	
25052-2	unspecified body region ct sagittal and coronal (LOINC_2.50) xxx ct sagittal+coronal (LOINC_2.50)	Modality:CT coronal sagittal Modality:CT sagittal+coronal	
25053-0	ct guidance for radiosurgery of unspecified body region (LOINC_2.50) xxx ct radiosurg guid (LOINC_2.50)	Guidance Modality:CT radiosurg Guidance Modality:CT radiosurgery	
25054-8	ct guidance for radiosurgery of unspecified body region-- w contrast iv (LOINC_2.50) xxx ct radiosurg guid w contr iv (LOINC_2.50)	Guidance IVContrast:W Modality:CT radiosurg Guidance IVContrast:W Modality:CT radiosurgery	
25055-5	unspecified body region mri additional sequence (LOINC_2.50) xxx mri add'l seq (LOINC_2.50)	Modality:MR additional sequence Modality:MR addl seq	

SNOMED Concepts Mapped

- SNOMED International
  - transitive closure of “Is a” children of “Imaging (procedure)” (363679005, P0-0099A) in 2015/01/31 release
- SNOMED UK Extension
  - transitive closure of 2015/04/01 v19.0.0
- SNOMED Canadian Extension
  - transitive closure of 2012/12/21 V1.0
  - plus those in Ontario DI Code mapping

SNOMED Terms Used

- Each SNOMED Concept may have multiple (English) synonyms
  - use en-US (“Computerized”) not en-GB (“Computerised”)
  - only use current terms, not those retired/wrong
- Used the one flagged as “preferred term”
  - e.g., “Computerized axial tomography” (77477000, P5-08000)
- If not available, used “fully specified name” (FSN)
  - e.g., “Computerized axial tomography (procedure)”
- Tried, but stopped using, all other synonyms to avoid introducing ambiguity or loss of specificity
  - e.g. “CAT scan, NOS” (don’t want “not otherwise specified”)
  - e.g., “Computerized tomography without IV contrast” (wrong)

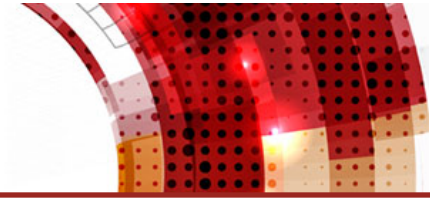
LOINC Concepts Mapped

- LOINC 2.50 2014/12
- All those with CLASS of
  - CARD.US
  - US.ECHO
  - EYE.US
  - GEN.US
  - OB.US
  - RAD
  - US.URO

LOINC Terms Used

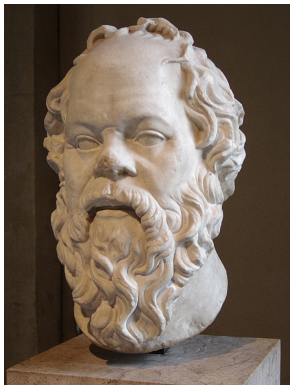
- Short Name
  - e.g. “XXX CT” (25045-6)
- Long Common Name
  - e.g., “Unspecified body region CT”
- Did not use Related Name (constructed)
  - “CAT scan; Computed tomography; Computerized tomography; CT scan; Finding; Findings; Imaging; Misc; Miscellaneous; Other; Point in time; Radiology; Random; Unspecified”

Definitions to Consider



- What are we trying to make from what?
  - terminology
  - controlled terminology
  - interface terminology
  - lexicon
  - thesaurus
  - metathesaurus
  - ontology
  - mapping resource

Equivalence, Synonymity



- Gets philosophical
  - Socrates – “universals”
- Pragmatic – UMLS
  - “terms are identical in meaning if the vast majority of biomedical professionals would find any distinction in meaning between the two terms is inconsequential, that is, a distinction that was not supportable, a distinction without a significant difference” *Powell et al Proc AMIA 2002*
- Formal model based on underlying concepts
- Expedient extraction of common components

Considerations for Mapping

- If goal is only mapping
  - "canonicalized" ("normalized") strings only need to "match"
  - i.e., their "meaning" is irrelevant (extreme: "lexical semantics")
- If concept in source scheme has multiple terms (synonyms)
  - canonicalized version of only one of them needs to "match" those of other schemes
  - as long as not ambiguous (in producing different matches)
- If goal is to extract "meaning" (ontology)
  - canonicalized content needs to have meaning
  - canonical components defined a priori or iteratively improved

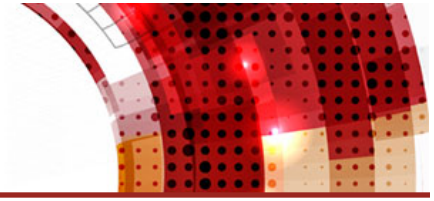
Canonical Representation

- Canonical representation itself
  - sorted unique canonical string components
    - e.g., “Anatomy:ABDOMEN Modality:CT”
  - attributes + values (e.g., UML, XML, database, etc.)
    - e.g., <Concept Anatomy=“ABDOMEN” Modality=“CT”/>
- Lexical mapping
  - extraction/conversion of string to term
  - exact match (not ranking, since fully automated)
- Semantic mapping
  - converting attribute values in source model to (different) attributes and values in IPCMR canonical representation
  - only RadLex so far (and old, pre-RadLex/LOINC version)
  - future candidates: LOINC, SNOMED, JJ1017, ACRCommon

Canonicalization Choices

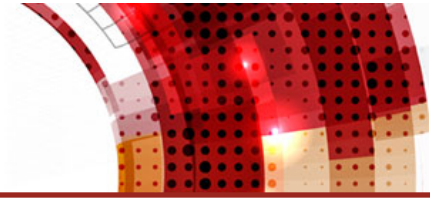
- Not quite a “model” yet, but …
- E.g. “discography” possibilities:
  - ModalityType:Discography (unqualified modifier)
  - Object:IntervertebralDisc IDiscContrast:W
  - may be RF (assume), CT, MR (with Gd)
  - ??RG (ICD10PCS)
  - are all mentions of disc discography?
- c.f., “myelography”
  - Myelography:Yes
  - IThecalContrast:W

Lexical Mapping Approach



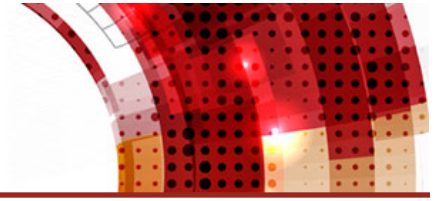
- Large body of literature:
  - generic
  - UMLS – biomedical
  - LOINC – lab tests & imaging procedures (report titles)
- Such techniques as
  - remove case sensitivity
  - make plurals singular
  - expand abbreviations
  - remove conjunctions
  - sort words alphabetically
  - automated stemming (not used; done manually)
  - predefined list of equivalent words
  - predefined list of equivalent multiword patterns (word order)
  - regular expressions

Ambiguities



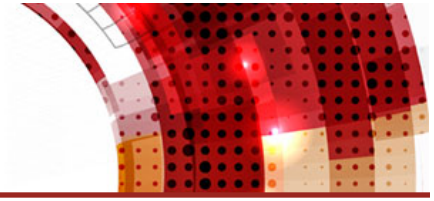
- Source concepts may have
  - different current synonyms
  - different synonyms in different versions
  - conflict between lexical and semantically generated canonicalizations
- Canonicalization may
  - fail to disambiguate distinct concepts (i.e., “lump” rather than “split”)
  - fail to recognize implied distinctions (lack “context”)
  - be internally inconsistent or in error (especially problematic for abbreviations)

Ambiguities



- Same Source Concept maps to different IPCMR concept
  - "Ultrasonography" (SNOMED 16310003)
  - "Diagnostic ultrasonography": adds "*Context:Diagnostic*"
- Multiple different Source Concepts map to same IPCMR concept
  - duplicates from national extensions now absorbed
    - "CT and aspiration of abdomen" (420230009)
    - "Computed tomography and aspiration of abdomen" (CA - 2578450013)
  - genuine duplicates
    - "Computerized axial tomography" (77477000)
    - "CT of regions" (303678006) (assuming "regions" is spurious)
  - incorrect/dubious IPCMR lexical or semantic canonicalization
    - "CT of head" (303653007) ("structure of" rather than "entire")
    - "CT of entire head" (408754009) (IPCMR discards "entire")

Anatomy, Region, Focus



- "Lumpers" versus "splitters"
- Is a "XX Pancreas" an "XX Abdomen"?
  - e.g., CT, MR, US
- "Spurious" Abdomen prevents merge
  - "*Modality:US Anatomy:PANCREAS*" matches
    - SNOMED, UK NICIP, Ontario-DI,LOINC, ICD10PCS
    - Not RadLex without additional "*Anatomy:ABDOMEN*"
- Spurious "limited" modifier" (with respect to what?)
  - billing artifact, useful for order/protocol, implicit in anatomy?
  - e.g., RadLex
    - "An ultrasound radiology orderable imaging procedure focused on the pancreas in the abdomen" (RPID2000) (removed from RadLex 2.0)
    - "An ultrasound radiology orderable limited procedure focused on the pancreas in the abdomen" (RPID2183)
    - in 2.0, "US Abdomen Limited Pancreas" (RPID2183)
    - c.f. in 2.0 "US Gallbladder" (RPID1986) (state of flux +/- inconsistent policy)

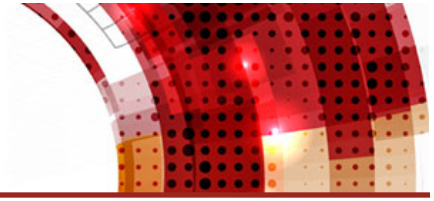
Anatomy, Region, Focus

- "Spurious" "coarse region" useful for some purposes
  - arguably simplifies retrieval of relevant priors
  - grouping for simplicity of appropriateness criteria for clinical decision support (ordering)
- But
  - is it needed in the human-readable term?
    - if so, complicates lexical mapping
  - is it sufficient to be implicit?
    - look up in "ontology" (by hierarchy of procedures, or of anatomy)
    - distinguish (or not) between "entire" vs. "structure of" anatomy
  - is it needed explicitly in the structured definition?
    - "behind the scenes" (assumes definition is available to recipient)
    - e.g., RadLex Body Region vs. Anatomic Focus "attributes"
    - e.g., ACRCommon "body_area" vs. "anatomy" "tags"

Highly Specific Procedures

- Is a procedure the sum of its structured components?
  - or does it need a specific attribute value to flag it as distinct?
- Challenge for both diagnostic and interventional
- E.g., FAST Ultrasound
  - "Focused Assessment with Sonography in Trauma" (FAST)
  - IPCMR
    - "*Modality:US Anatomy:ABDOMEN Anatomy:CHEST Anatomy:PELVIS Extent:Limited Reason:Trauma*"
    - ? "*Anatomy:PLEURA Anatomy:PERICARDIUM Anatomy:PERITONEUM*"
  - very specific purpose: find blood/air where it shouldn't be
  - very specific views of narrowly selected regions:
    - pericardium: subxiphoid or parasternal views
    - pleural space, perisplenic space, Morrison's pouch (liver and right kidney)
    - pelvis behind bladder or uterus (Pouch of Douglas)
    - +/- anterior chest: pneumomothorax ("extended", eFAST)

Anatomy: What is a Head?



- Sometimes
  - a “head” is a “brain” (are all “brains” “heads”?)
- Sometimes it is not:
  - cranial cavity
  - face
  - facial bones
  - faciomaxillary
  - zygoma
  - zygomatic arch
- Editorial guidance for each source scheme
  - if any
  - varies significantly (often depending on primary goal)

Angiography

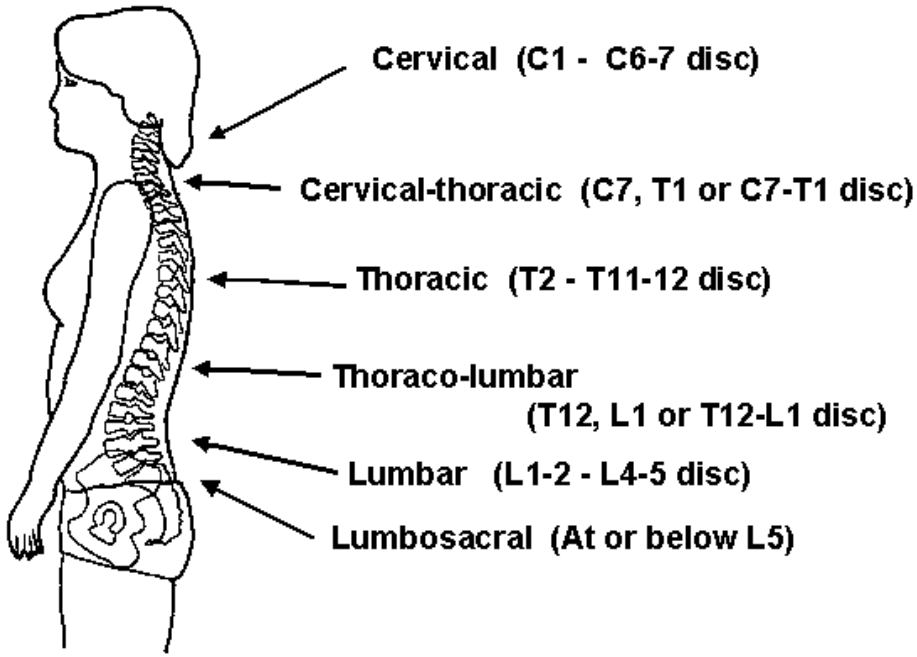
- XA (“catheter”) versus CT, MR
- +/- contrast
- IV DSA versus IA (versus venography)
- Angiography
  - == arteriography only?
  - == arteriography or venography?
  - includes lymphography?
- Different schemes
  - different editorial guidance (if any)

Arthrography, etc.

- Arthrography
  - do all arthrograms have intraarticular contrast if not explicitly specified?
  - if contrast but not route is specified, can one assume it is intraarticular?
  - does it matter? should one remove it if specified?
  - cf. MR angiograms where there (may be) intrinsic “contrast”
- Myelography …
- Discography …

Multiple Regions vs Junctions

- L-S Junction versus both L & S spine
- ICD10PCS says LS and TL “joint” when they probably mean “junction”
- UK NICIP means junction not both regions

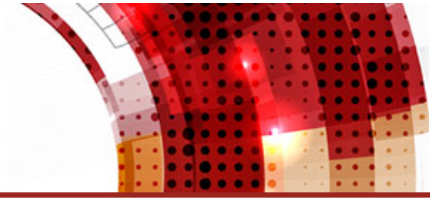


What they say vs. meant?

- “discography w IV contrast”
- did they really mean w contrast (IDisc)?

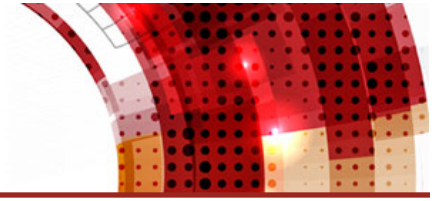
- “fix” in IPCMR to achieve greater concordance?
- leave as is and ask source to fix?
- flag as “bad” or “improbable” in IPCMR?
- probably never used anyway if “wrong”

Statistics So Far



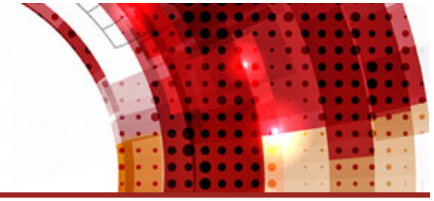
- Canonicalization of any term for any source concept
  - total number 58378
  - nothing canonicalized = 141
  - incompletely canonicalized = 12094
  - completely canonicalized = 46143 (79%)
  - completely canonicalized and has modality identified = 44419 (76%)
- Source concepts
  - total number 40155 (< terms due to synonyms, multiple versions of source scheme)
  - with at least one matching canonicalized synonym = 21253 (53%)
  - without at least one matching canonicalized synonym = 18902 (47%)
  - with ambiguous mapping to canonicalized synonyms = 3953 (9.8%)
- IPCMR
  - completely canonicalized and has modality (not necessarily “right”, or even “plausible”)
  - total number of distinct concepts = 18899 (43% of terms canonicalized with modality)
  - concept overlap estimate (source-IPCMR)/source = 21253-18899/21253*100 (11%)

Maintenance



- Need stable concepts and codes for them
  - Cimino et al “desiderata”
  - never re-use code for a different concept
- Formal definition representation may evolve
- Synthesized term may evolve
- Mappings may be
  - added/removed/split/merged
- Audit trail
  - who, what, why, when
  - events: create, release, change, retire, …

Delivery



- HTML pages with
  - IPCMR concepts mapped to source concepts
    - code, canonicalized form, synthesized description
  - source concepts with canonicalization
    - ambiguities (multiple possible mappings: synonyms)
- Machine usable content
  - CSV files with same content as HTML
- Model
  - flat list of attribute:value pairs
  - when canonicalized components mature, will formalize into a "model"

Conclusion

- See work in progress at http://www.ipcmr.org/

- Useful mapping is probably tractable
- Improve by iterative human curation of mapping rules
- Curation of veracity of result not explored yet
- There is modest overlap of schemes
- The union of all source terms is large
- Interventional procedures are especially numerous
- Need to prioritize “useful” concepts
- Need a maintenance process after first release
- There is hope (maybe)!