



# IHE/HL7 Anatomic Pathology Joint with Vocabulary

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September 13, 2011



# Anatomic Pathology Structured Report (APSR)

# [APSR] – Anatomic Pathology Structured Report

- 21 CDA templates (Document Content Modules)
  - Generic APSR template
    - All organs & fields of anatomic pathology (inflammatory, vascular, traumatic, metabolic diseases as well as cancer)
  - 20 organ-specific APSR templates
    - Cancer-specific organizers covering 85% of incident cancers
- 490 observations & procedure templates
  - 21 procedure templates
  - 469 observation templates (including 73 TNM observation templates)

# Structure : Common hierarchy for all APSR document content modules



# Structure & vocabulary

## Element Content Modules (n=11)

- Header (n=5)
- Body (n=5)
  - Describing Anatomic Pathology observations grouped per specimen and per problem
    - **Specimen Information Organizer**
    - **Specimen Collection Procedure(n=21)**
      - the characteristics of the specimen (identifiers and type)
      - the procedure that collected it
        - **Type of procedure**, time interval, performer (person and organization), approach site, **target site**.
    - **Problem Organizer**
    - **AP Observation (n=469 )**
      - including TNM observation templates (n=73)
    - **Embedded Image**

# Structure & vocabulary: Example Anatomic Pathology Observation (data element)

- Breast-In situ neoplasm-Histologic type (template ID 1.3.6.1.4.1.19376.1.8.1.4.446)
  - observation.code : Pathlex code = 436
  - observation.value (Concept Descriptor (CD))
    - Value set OID: 1.3.6.1.4.1.19376.1.8.5.254

PathLex code (finding)	Label
2308	Ductal carcinoma in situ with microinvasion
2309	Lobular carcinoma in situ with microinvasion
2557	DCIS Comedo
....	....
2562	DCIS Solid

# Vocabulary constraints

- Available IHE\_PAT\_Suppl\_APSR\_AppendixValue\_Sets - <http://www.ihe.net> (excel file)

IHE Anatomic Pathology Technical Framework Supplement Appendix Value Sets for APSR value sets bound to the content modules described in the "Anatomic Pathology Structured Reports" (APSR) supplement to the AP TF			
Document Identification			
Name	IHE_PAT_TF_Supplement_APSR_Appendix_Value_Sets		
Creation date	06/07/2010		
Version	Trial Implementation		
Historique			
Version	Date	Changes from Previous Release	Action
Draft for public comment	06/07/2010		Publication
Trial Implementation	March 3, 2011	Change of publication format (from word document to excel file) in order to ease import in Terminology Servers Updated of value sets Explicit links between element templates and value sets	Publication in ihe.net

- Scope : Element Content Modules
  - Specimen collection procedure
  - AP observation

# Vocabulary constraints

- Also available through Web services
  - STS (Standard Terminology Server)

**WebService**

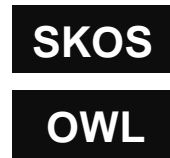
Post R110 - Webservice - Version 2.1.25 du 04/03/2011

Les opérations suivantes sont prises en charge. Pour une définition formelle, prenez connaissance de la [description du service](#).

- **CTS2\_Beta\_ChangeCodeSystemStatus**  
Changes the state of a code system (includes inactivation, activation etc.)
- **CTS2\_Beta\_CheckConceptForConceptDomainAssociation**  
Determines whether the supplied coded concept exists in a code system in use for the specified concept domain
- **CTS2\_Beta\_CheckConceptValueSetMembership**  
Determines whether the supplied coded concept exists in the supplied value set
- **CTS2\_Beta\_CheckValueSetSubsumption**  
Determines whether one of the two supplied value sets subsumes the other
- **CTS2\_Beta\_ComputeSubsumptionRelationship**  
Subsumes tests whether the parent coded attribute subsumes (is implied by) the child
- **CTS2\_Beta\_CreateAssociation**  
Relates a single specific coded concept (source) to a corresponding single specific coded concept (target) within the same or another code system
- **CTS2\_Beta\_CreateAssociationType**  
Create a new relationship type, an instance of which may be used to link two concepts
- **CTS2\_Beta\_CreateCodeSystem**  
Create a new Code System to contain a set of new coded concepts

- About 20 « read only » services are available
- Testables via STS web site

**CTS2**



# PathLex

# PathLex, a single lexicon in the Anatomic Pathology domain

- Launched by IHE Anatomic Pathology
  - Collaboration of College of American Pathologists (CAP), ADICAP, French Society of Pathologists (SFP), SEAP (Spanish Society of Pathology).
  - Registered as external terminology used by HL7
- Purpose and scope (very similar to those of the RadLex project )
  - “designed to satisfy the needs of Anatomic Pathology information system vendors and users by **adopting the best features of existing terminology systems**
    - using if possible available concepts defined in reference biomedical terminologies or ontologies like SNOMED-CT or CIM-O (rather than “re-inventing the wheel”)
    - **while producing new terms to fill critical gaps.**

# PathLex

## Current status

- Structure
  - Permanent identifiers (codes) are meaningless
  - PathLex preferred terms are organized into a is-a hierarchy
    - Histological type
      - Histological type of breast neoplasm
        - Histological type of in situ neoplasm of the breast
  - Multilingual : universal value sets include all possible values available in the local extensions.
    - Common values are therefore available in multiple languages (currently English and French).
- Open access
  - “Appendix Value Sets for APSR” as part of the IHE content profile “Anatomic Pathology Structured Report” (APSR) (<https://ihe.net>)
  - STS (PHAST, France) (CTS2 services)



# SNOMED CT in Pathology

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# Why is it useful? Sharing/ exchanging/mining AP data

- Free text reports
  - Coding specimens, anatomy and diagnosis
- Structured reports
  - Coding both the question and the answer
    - Question: Observable entity (Histological grade?)
    - Answer: Diagnosis and qualifiers

# Why is it useful? Sharing/ exchanging/mining AP images

*Case ID (official): 09B0012219*

**Detailed diagnose:**

BIOPSIA DE PIEL DE REGIÓN DELTOIDEA: PIEL CON HIPERPLASIA FOLICULAR LINFOIDE REACTIVA. (VER COMENTARIO). COMENTARIO: El cuadro histológico de esta biopsia es superponible al de la biopsia 07B5955. Se envió como caso de consulta al Dr. Paris del CNIO quien confirmó el diagnóstico emitido. INFORME COMPLEMENTARIO 14.12.09: El estudio de PCR realizado en el CNIO muestra un patrón de reordenamiento policlonal para IgH (CDR2, CDR3) y TCR (G1, G2, B1, B2). No se identifican reordenamientos de BCL2 (MBR y 3'MBR). Estos datos apoyan el diagnóstico de hiperplasia folicular linfoide reactiva.

**Local code:** M01068

**SNOMED CT - FSN Spanish:** hiperplasia linfoide (anomalía morfológica)

**Case ID (entered):** 09B-12219-1

[Digital slide \(Intranet\)](#)

[Digital slide \(Internet\)](#)

**Case ID (entered):** 09B-12219-CD3

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[Digital slide \(Internet\)](#)

**Case ID (entered):** 09B-12219-L26

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**Case ID (entered):** 09B-12219-Bcl-2

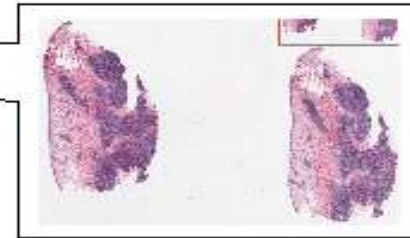
[Digital slide \(Intranet\)](#)

[Digital slide \(Internet\)](#)

**Case ID (entered):** 09B-12219-ki67

[Digital slide \(Intranet\)](#)

[Digital slide \(Internet\)](#)



- Specimen Obtained (types, anatomic location, collection procedure)
- Specimen processing (sampling procedure, preparation procedure, stains, fixatives, embedding)
- Diagnosis...



**Comment:** It would also be possible to additionally retrieve the corresponding SNOMED CT code per case.

# CAP Anatomic Pathology Subset

<u>Hierarchy</u>	<u>Approximate Count</u>
Body structure	3,805
Clinical Finding	2,024
Procedure	780
Observable entity	386
Specimen	264
Pharmaceutical / Biologic product	83
Record artifact	67
Organism	61
Staging and scales	33
Substance	24
Qualifier value	21
Special concept	12
Events	9
Situation with explicit context	9
Physical object	4
<b>TOTAL CONCEPTS</b> (Jan 2010)	<b>7,582</b>

**In daily practice, this subset was not considered useful by pathologists**

- **Mixture of different hierarchies (clinical findings, body structure, observations,..)**
- **Lack of basic pathology diagnosis**

# Implementation of SNOMED CT

## Gap analysis



- IHE Anatomic Pathology Technical Framework Supplement Anatomic Pathology Structured Reports (APSR) Closed Issues:
- APSR-14 – Gaps in SNOMED CT: It is not straightforward to encode Anatomic Pathology observations and their corresponding value sets described in Volume IV (Value Sets for APSR) using SNOMED CT concepts (missing concepts, issues of postcoordination versus precoordination).
- Therefore these observations and value sets are encoded using a coding system currently being built by the IHE Anatomic Pathology domain (PathLex - OID: 1.3.6.1.4.1.19376.1.8.2.1). PathLex codes are provided with the “Trial Implementation” version of this profile.
- Using SNOMED CT as a reference terminology offers promising perspectives. The terms and expressions of PathLex will be mapped to SNOMED CT concepts in collaboration with IHTSDO. This mapping will be available in the “Trial Implementation” version and completed over time.

# Implementation of SNOMED CT in Hospital General de Ciudad Real

- IHE: Structured Reports Value Sets (1,840 possible values for observations)
- HGUCR: 2,320 pathology diagnosis codes mapped to SNOMED CT
- Search for descriptions that match the local legacy codes was performed using CliniClue Xplorer version 2010 1.243, using SNOMED CT 2011-01-31 International Release and 2010-04-30 Spanish Edition.

# Search strategy for AP diagnosis

- Morphologically abnormal structure
  - Searching for a unique ConceptId identifier/SNOMED Clinical Terms Identifier (SCTID) from the body structure (morphologically abnormal structure sub-hierarchy)
- Clinical finding
- Post-coordination
  - Combination of two or more morphologically abnormal structures
  - Combination of qualifiers and a morphologically abnormal structure or a clinical finding
  - Any other combination of terms

# Results

- Morphology – Abnormal body structure hierarchy
  - Only 44% of the codes! (1076)
- Disorder hierarchy
  - 48% of the codes
    - In 1104 terms, using “disorder” hierarchy, e.g. Rosacea
    - In 71 terms, using “finding” hierarchy, e.g. World Health Organization (WHO) grade I (central nervous system tumor)
- Postcoordination needed in 19%
  - 3 conceptID needed only rarely

# Results

## Other hierararchies

- 6% of the local morphological diagnosis that were not well represented using either morphological abnormality or disorder/finding hierarchies
- Usefull SNOMED CT hierarchies
  - Qualifiers (generally combined with clinical or morphological codes) (95 local terms), e.g. Granulomatous
  - Body structures was found useful (68 local terms), e.g. Undescended testis
  - Other: procedures, physical object, substance, organism

# Conclusions

- SNOMED CT morphology hierarchy (and other hierarchies of interest in AP) SHOULD be improved
- Pathologists SHOULD become aware of the structure and contents of SNOMED CT
- Pathologists SHOULD become aware of the shift of AP coding process (from Topography, Morphology schema to templates & binding with a polihierarchy and relationship schema)
- Pathologists SHOULD define top level rules for SNOMED CT coding process
- Pathology IS SHOULD allow coding with local terms and mappings to SNOMED CT

# Mapping PathLex to SNOMED CT

## *Preliminary study*

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AP-HP – Paris Descartes University – INSERM

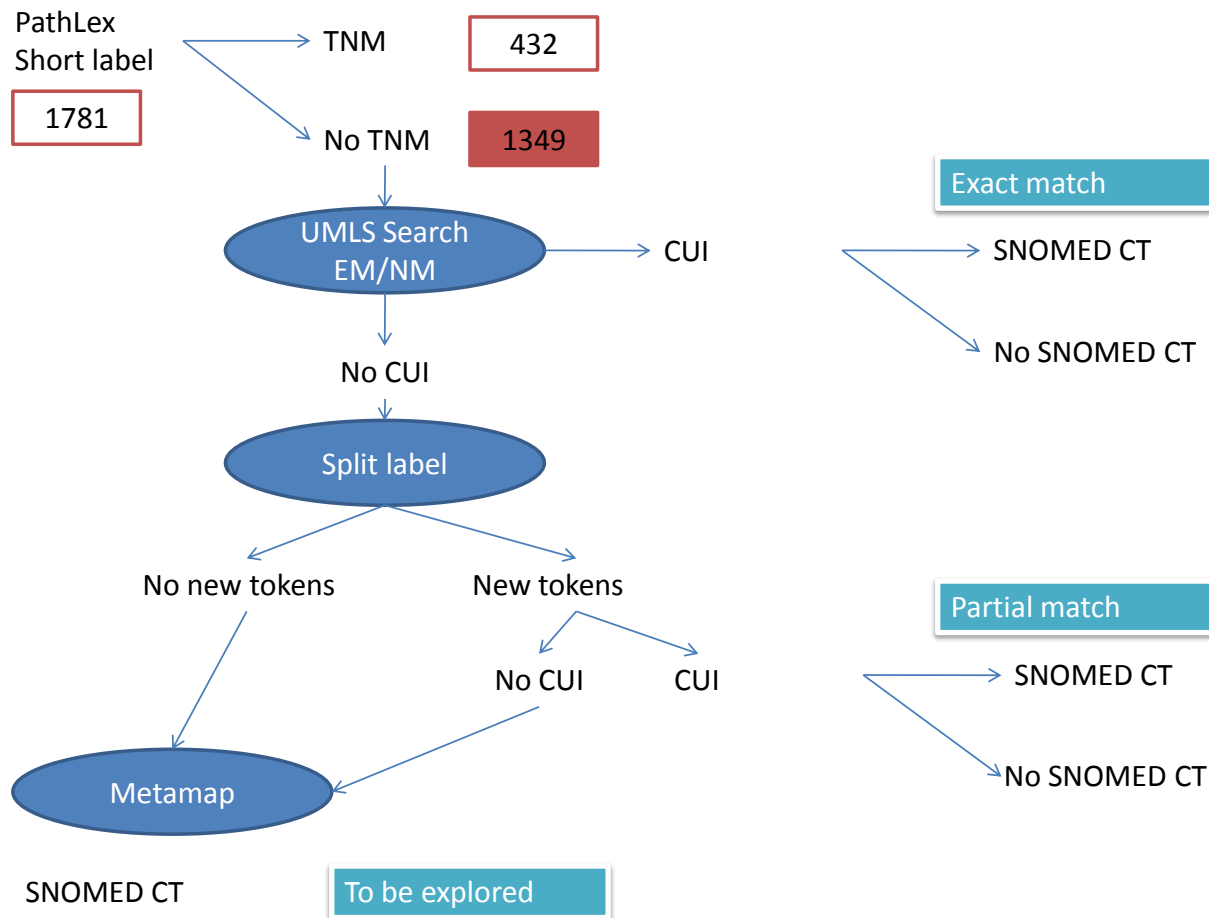
**Olivier Bodenreider, Bastien Rance**

NLM

# Mapping interface terminologies (legacy codes) to SNOMED CT

- Snapper (<http://www.aehrc.com.au/snapper/>).
  - CSIRO (Commonwealth Scientific and Industrial Research Organisation) (Hansen, 2011)
- NLM, Biportal

# Mapping PathLex to SNOMED CT (using UMLS)



# Results of the automatic mapping process

Matching situations	Number of labels	Percent ages of labels
Labels mapped to SNOMED CT through exact match (EM) or normalized match (NM) to UMLS	609	45%
Labels mapped to another terminology through exact match (EM) or normalized match (NM) to UMLS	79	6%
Tokens mapped to SNOMED CT through exact match (EM) or normalized match (NM) to UMLS	232	17%
Tokens mapped to another terminology through exact match (EM) or normalized match (NM) to UMLS	25	2%
Tokens without any match	80	6%
Labels without any match and that cannot be split in tokens	324	24%
TOTAL	1349	100%

# Examples of PathLex labels/expressions with automatic mappings

Categories of observations	PathLex label	CUI	SNOMED CT code
Examples of AP macroscopic observation types related to the specimen	Specimen size, largest dimension	C1273739	384627007
	Specimen size, additional dimension	C1273738	384626003
Examples of AP microscopic observation types related to a lesion related to a lesion	Lesion size, largest dimension	C1275593	396361002
	Lesion site	C0449685	246300000
	Histologic type	C0449574	263541007
	Histologic grade	C0919553	371469007
	Margins involvement	C1269794	371488000

# No automatic match

	Label
Types of ancillary techniques	HER2/neu (FISH method)
	Mismatch Repair Proteins-MLH1 (Immunohistochemistry Study)
Types of histologic grades	Histologic grade (Clark)
	Histologic grade (Gleason-Primary (Predominant) Pattern)
	Histologic grade (Gleason-Total Gleason Score)
Extension	Number of lymph nodes with isolated tumor cells ( $\leq 0.2$ mm and $\leq 200$ cells)

# No automatic match

	Label
Anatomic location	Anterior floor of mouth (qualifier : right, left, medial)
	Distal esophagus
Histologic types	Atelectasis Extends to the hilar region but does not involve entire lung
	Atypical squamous cells for which a high-grade lesion cannot be excluded (ASC-H)
	Cirrhosis/severe fibrosis (Ishak score 5-6) (F1)
	Combined small cell carcinoma (small cell carcinoma and non-small cell component)
	Complex hyperplasia without cytologic atypia
	DCIS Comedo
	Ductal carcinoma in situ involving nipple skin (Paget disease) with microinvasion

# No automatic match

	Label
Histologic grades	FIGO grade 1
	G1: Nuclei round, uniform, approximately 10 mm; nucleoli inconspicuous or absent
	Low-grade squamous intraepithelial lesion encompassing HPV infection or mild dysplasia (CIN 1)
	Score 2: 10% to 75% of tumor area forming glandular/tubular structures
Extension	<50% myometrial invasion
Results of AP ancillary techniques	Amplified (HER2 gene copy >6.0 or ratio >2.2)
	Equivocal (HER2 gene copy 4.0 to 6.0 or ratio 1.8 to 2.2)
	Immunoreactive tumor cells present (> = 1%) (Specify Quantitation)
	Mild to moderate (0-2 per high-power [X400] field) Intratumoral Lymphocytic Response (tumor-infiltrating lymphocytes)

# Shall we map TNM to SNOMED CT?

	Label
TNM values	pM1c: Metastasis to all other visceral sites or distant metastasis at any site associated with an elevated serum lactic dehydrogenase (LDH)
	pN2: Metastasis in a single ipsilateral lymph node, more than 3 cm but not more than 6 cm in greatest dimension, or in multiple ipsilateral lymph nodes, none more than 6 cm in greatest dimension, or in bilateral or contralateral lymph nodes, none more than 6 cm in greatest dimension
	pT2a: Tumor greater than 3 cm, but 5 cm or less in greatest dimension surrounded by lung or visceral pleura, without bronchoscopic evidence of invasion more proximal than the lobar bronchus (ie, not in the main bronchus); or Tumor 5 cm or less in greatest dimension with any of the following features of extent: involves main bronchus, 2 cm or more distal to the carina; invades the visceral pleura; associated with atelectasi or obstructive pneumonitis that extends to the hilar region but does not involve the entire lung

# PathLex as a thematic extension of SNOMED CT ? Next steps

- A joint IHE/HL7 Anatomic Pathology – IpaLM initiative
  - Governance & technical issues (tooling) for the management of PathLex.
- IPALM SIG
  - Rajesh Dash, M.D. ([r.dash@duke.edu](mailto:r.dash@duke.edu))
  - Andrea Pitkus, CAP ([apitkus@cap.org](mailto:apitkus@cap.org))
  - Technical assistance IHTSDO
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- IPALM collaborative site
  - IC0604 members
    - Thomas Schrader (Germany) [thomas.schrader@computer.org](mailto:thomas.schrader@computer.org)
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