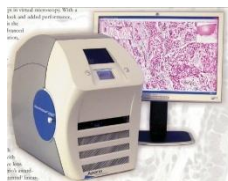


Digital Pathology in Europe: Coordinating Patient Care and Research Efforts

Informatics Standards in Anatomic Pathology

Dr Christel DANIEL

INSERM, U872, eq. 20 - Paris Descartes
University, - AP-HP, Georges
Pompidou European Hospital, FRANCE



Agenda

- **What is anatomic pathology (AP)?**
- **Informatics Standards in Anatomic Pathology**
 - “Interoperability framework”
- **Results of recent efforts**
 - IHE anatomic pathology
 - DICOM, HL7
 - “Specimen tracking”
- **Further steps**
 - IHE, DICOM, HL7
 - IHTSDO
 - jpeg2000

What is anatomic pathology?

It is not clinical pathology

- **Diagnostic process in anatomic pathology**
 - Mainly based on image interpretation
 - Little use of automatons

What is anatomic pathology?

It is not radiology

- **Diagnostic process in anatomic pathology**
 - Specimen-driven.
 - Images of the same study corresponding to the same order may be related to different specimen (parts and/or slides) from the patient
 - Images of the same study may be related to different specimen even from different patients (e.g. in anatomic pathology imaging for research e.g in case of digital Tissue Micro Array).
 - Unlike patients in radiology, in AP, slides are always available to acquire more images, if needed.
 - Involves multiple acquisition modalities
 - Gross imaging
 - Microscopic imaging
 - Microscopic still imaging
 - Whole slide imaging
 - Multispectral imaging

Informatics Standards in Anatomic Pathology

- **Objective**

- Providing an interoperability framework to enhance patient care & research
 - “Integrating digital pathology to healthcare & research enterprise”
 - Sharing formats of AP reports & images (“virtual slides”)
- Defining “relevant, useful & coherent standards”
 - Corresponding to **clearly defined user needs**
 - Business analysis: process models, use cases
 - **Implementable** by vendors in real-life environments
 - Defined according to a **clear international healthcare IT infrastructure development governance** (ISO, HL7, CEN – OMG, W3C)

Informatics Standards in Anatomic Pathology

- **First step : business analysis**
 - Research in general business process modeling
 - Modeling AP processes & defining the road map
 - Business processes to implement (using standards) for both patient care and research
- **Second step : implementation guides**
 - Best use of existing standards to implement processes
 - IHE integration profile & profile contents
- **Facultative step : defining/changing standards**
 - DICOM, HL7, SNOMED CT etc

Integrating the Healthcare Enterprise

Both a process and a forum for encouraging integration efforts

- **“Technical framework”**
 - Users’ needs & Implementation guide
- **“Connectathons”** →
 - Rigorous testing process
- **“Demos”** →
 - Educational sessions & exhibits (RSNA, HIMSS)



Noordwijkerhout 2005: 300 participants, 100 systems, 62 vendors



IHE : the grows



DOMAINS



REGIONS

RADIOLOGY: 1998

IT INFRASTRUCTURE: 2002

LABORATORY: 2003

CARDIOLOGY: 2004

NUCLEAR MEDICINE: 2004

ANATOMIC PATHOLOGY: 2005

RADIATION ONCOLOGY: 2005

PATIENT CARE COORD: 2005

Informatics Standards in Anatomic Pathology

IHE
(ITI, Laboratory, Laboratory, PCC, etc)

IHE Anatomic Pathology

Integration Profiles

Content profiles

HL7 Pathology SIG

HL7
(Orders, RCRIM, etc)

DICOM WG26

DICOM
(WG6, WG13)

CDISC

OMG, W3C

MIE 2009 – Sarajevo - Tuesday, 1 September



Informatics Standards in AP HL7 web site (<http://www.hl7.org>)




May Working Group Meeting
May 4-9, 2008
Phoenix, AZ
[Click here for information
and Registration](#)



WEDI HL7 Claims
Attachments Audiocast
May 13, 2008
2:00 - 3:15 PM ET
[Click here for information](#)



Health Level Seven

ABOUT HL7	EVENTS	MEMBERS ONLY	MEMBERSHIP	RESOURCES	COMMITTEES
What is HL7? FAQs ANSI-Approved Standards Press Releases Newsletters <hr/> Board Members Advisory Council Member Directories HL7 Staff Past Board Chairs Volunteer Awards International Affiliates <hr/> Bylaws Agreements ...	Calendar <hr/> 2008 Publishing Schedule <hr/> Educational Summits <hr/> Event Sponsors <hr/> Attending a WGM for the First Time?	Member Login Online Balloting Member Directory Submit 2.x Proposals Submit CDA Proposals Submit 2.x Global Message Profile Opt-In Program	Benefits <hr/> Join HL7 <hr/> Renew <hr/> Transition Planning	Book Store Data Models <hr/> HL7 Standards <hr/> HL7 Library Opt-In Document Center <hr/> Early Adopters <hr/> Job Links Training/Certification Standards Organizations HIMSS Presentations <hr/> About CDA & CCR OID Registry Vocab Resources ...	Technical Committees Special Interest Groups Decision Making and Best Practices Meeting Minutes List Services Conference Calls <hr/>  Clinical Interoperability Council <hr/> Co-Chair Handbook Change Control



Informatics Standards in AP

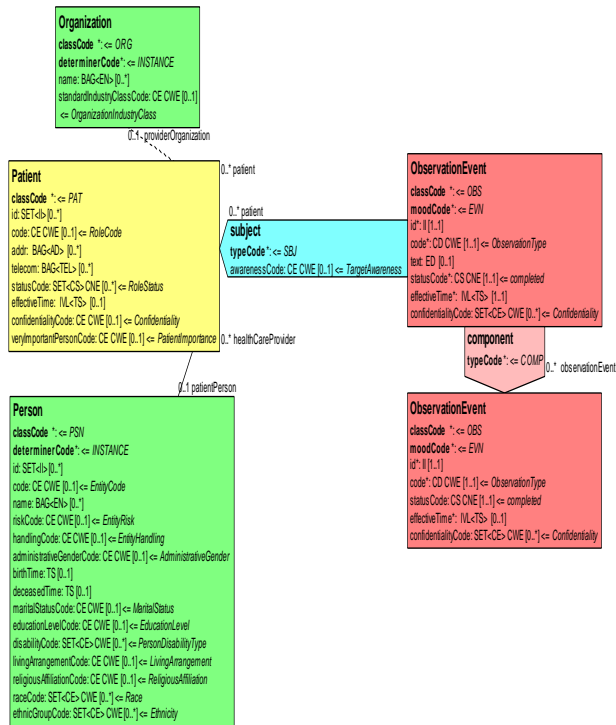
HL7 : standards for patient care

- **Standards for interoperability among computerized information systems in healthcare.**
 - A key aspect of the HL7 methodology is the HL7 Reference Information Model (HL7 RIM).”
- **HL7 version 2 messaging standards for**
 - Patient administration, Order Entry, Results
- **HL7 version 3 specifications for**
 - Reference Information Model (RIM) for Healthcare
 - Data Type Specification for health care
 - XML Data Formats for Medical Information
 - Controlled Vocabulary
 - Clinical Document Architecture



Informatics Standards in AP

HL7 v3 : Refined Models for XML observation on patient (messages & documents)



```

<observationEvent classCode="OBS" moodCode="EVN">
  <id root="1.3.6.1.4.1.12009.3" extension="A1234"/>
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        <name><given>John</given><family>Doe</family></name>
      </patientPerson>
      <providerOrganization classCode="ORG">
        <name>St., Josephs Hospital</name>
      </providerOrganization>
    </patient>
  </subject>
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  </component>
</observationEvent>
  
```



Informatics Standards in AP

HL7 Pathology Special Interest Group

- **Created in January 2006**
 - Specimen model, orders and reports aspects of the anatomic pathology workflow



Informatics Standards in AP DICOM

- **DICOM : Digital Imaging and Communication in Medicine**
 - Create standards for integration of electronic healthcare information in medical imaging
 - Network communication protocols between informatic modules in medical imaging



Informatics Standards in AP DICOM WG26 for pathology

- **Created in October 2005**
- **Specific challenges**
 - Some pathology-related image formats do not as yet have applicable DICOM Information Object Definitions
 - whole slide images, high-order multi-spectral images, flow cytometry, electron microscopy and others
 - Imaging studies are of specimens and not of patients
 - revision and extension of specimen specification
 - Images are closely associated with tissue processing (i.e. fixing, staining, etc.) image metadata may need to include tissue processing information



Informatics Standards in AP CDISC website (www.cdisc.org)

The screenshot shows the CDISC website in a Microsoft Internet Explorer browser window. The address bar displays <http://www.cdisc.org/>. The website features a navigation menu with links for ABOUT CDISC, SPONSORS & MEMBERS, EVENTS, NEWS ROOM, PUBLICATIONS & PRESENTATIONS, FAQ, INTERNATIONAL, and CONTACT. The main content area is titled "CLINICAL DATA INTERCHANGE STANDARDS CONSORTIUM" and includes a "PUBLIC DISCUSSION FORUMS" section with the mission statement: "The mission of CDISC is to develop and support global, platform-independent data standards that enable information system interoperability to improve medical research and related areas of healthcare." A "What's New" section lists recent events, including a CDISC Webinar on Defining CRF Standards (22 January 2007) and a CDISC Boston Area User Network Meeting (16 February 2007). A "MEMBERS AREA" section is also visible, containing links for STANDARDS, EDUCATION/TRAINING, BRIDG PROJECT, REGISTERED SOLUTIONS PROVIDERS, CATALOG OF RESOURCES, and GLOSSARY. A "Join Our Email List" form is located at the bottom right of the page.



Informatics Standards in AP

CDISC : standards for clinical research

- **Clinical Data Interchange Standards Consortium**
- **Open multi-disciplinary non-profit organization**
 - Founded in 1997, liaison with ISO TC 215, agreement with HL7 since 2001
 - Over 200 member organizations : US, Europe, Japan, Australia, India, S. America and Africa
- **Platform-independent data standards to support the electronic acquisition, exchange, submission and archiving of data to support regulated clinical research.**
 - Freely available on the CDISC website (www.cdisc.org)
 - Developed through open, consensus-based approach

Results of recent efforts

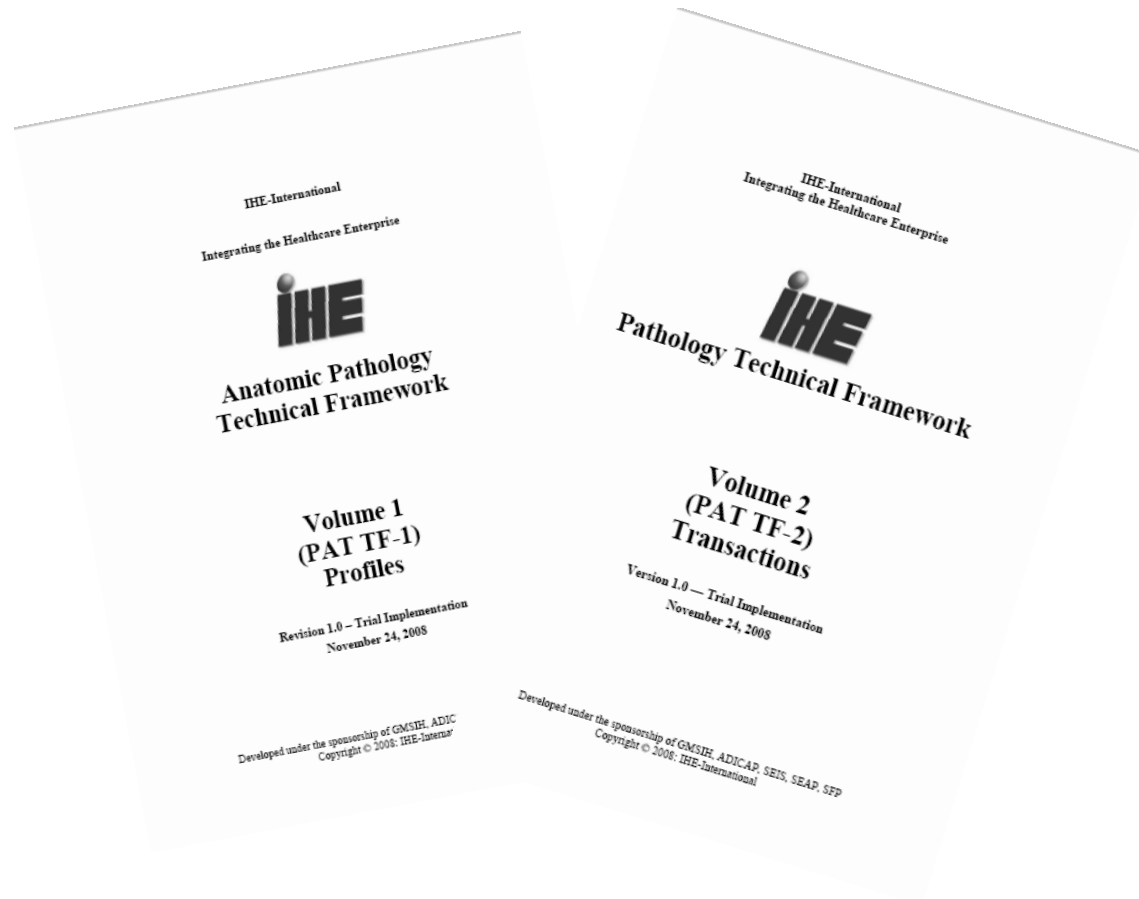
- **Patient care**

- Intra hospital integration profile : Anatomic Pathology Workflow (APW)
 - Ordering and performing anatomic pathology exams

- **Public health, research**

- Anatomic Reporting for Public Health (ARPH)

Organization of Anatomic Pathology Technical Framework



Integrating the Healthcare Enterprise



**IHE Anatomic Pathology
Technical Framework Supplement**

**Anatomic Pathology Reporting to
Public Health
(ARPH)**

Draft for Trial Implementation

Date: August 27, 2009

Authors:

Christel Daniel : christel.daniel@spun.jussieu.fr

Wendy Scharber : wendy@registrywidgets.com

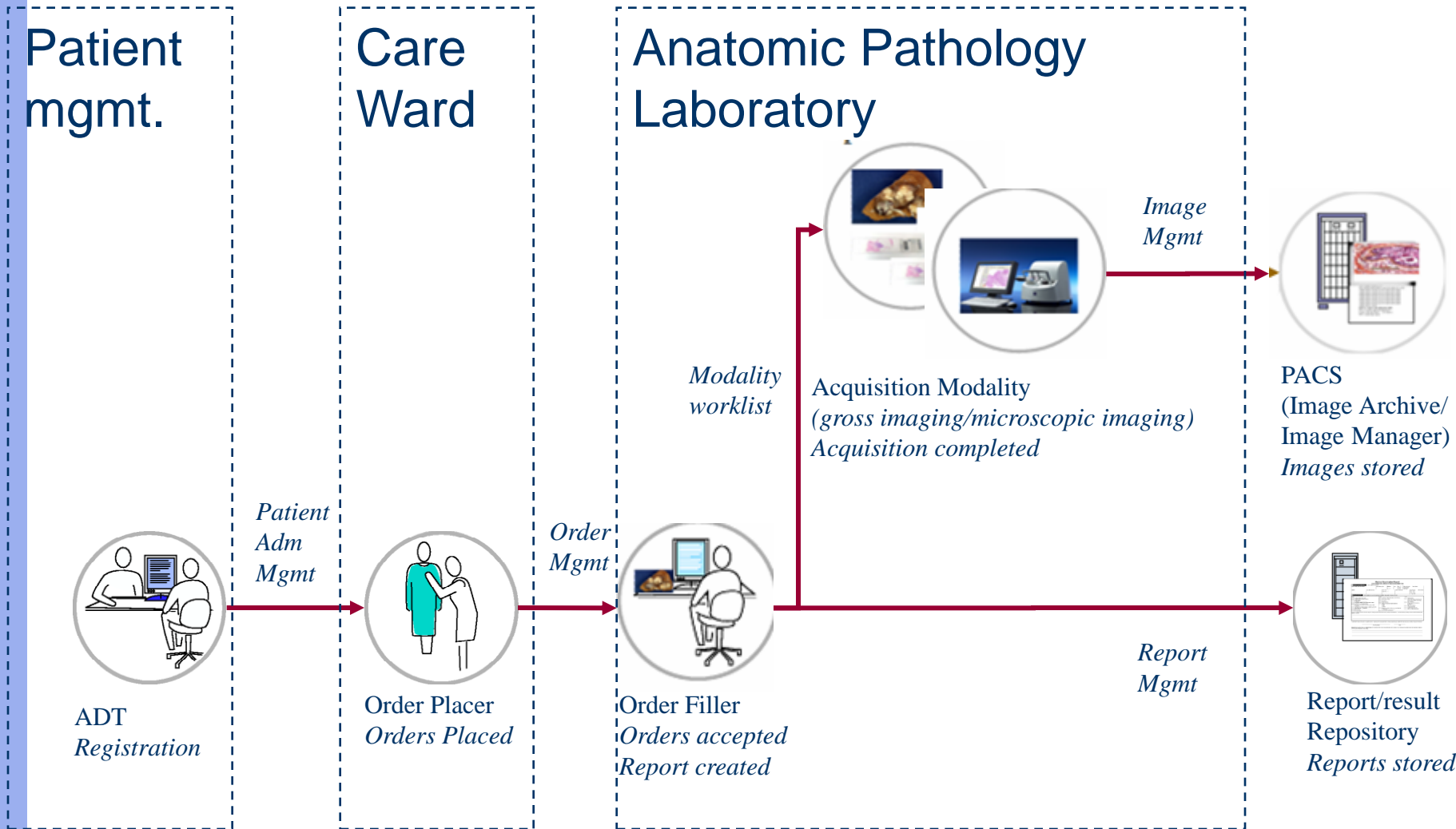
François Macary : francois.macary@sante.gouv.fr

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Anatomic Pathology Workflow (APW)

- **Addressed by the 2008-09 cycle**
- **Scope**
 - Establishes the continuity and integrity of basic pathology data
 - Ordering and reporting aspects of the workflow
 - Transactions maintaining the consistency of ordering information, specimen management information and anatomic pathology reports.
 - Imaging aspects of the workflow
 - Acquisition, storage and distribution processes of images among multiple systems, enterprises and remote workstations.

Anatomic Pathology Workflow (APW)



Anatomic Pathology Workflow (APW)

- **Surgical Pathology**
 - Surgical specimen
 - Biopsies
- **Cytopathology**
- **Clinical Autopsy**
- **Research (TMA)**

APW actors & transactions

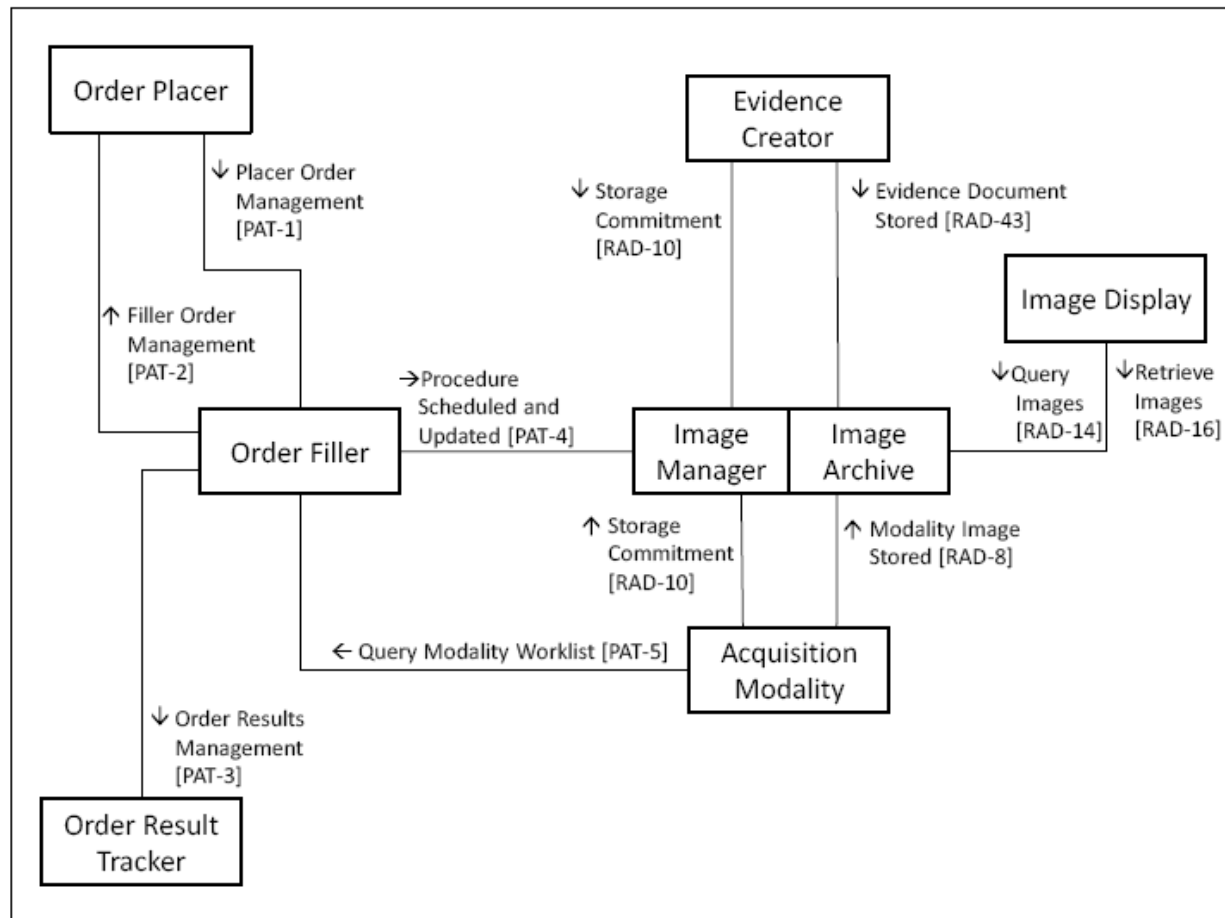
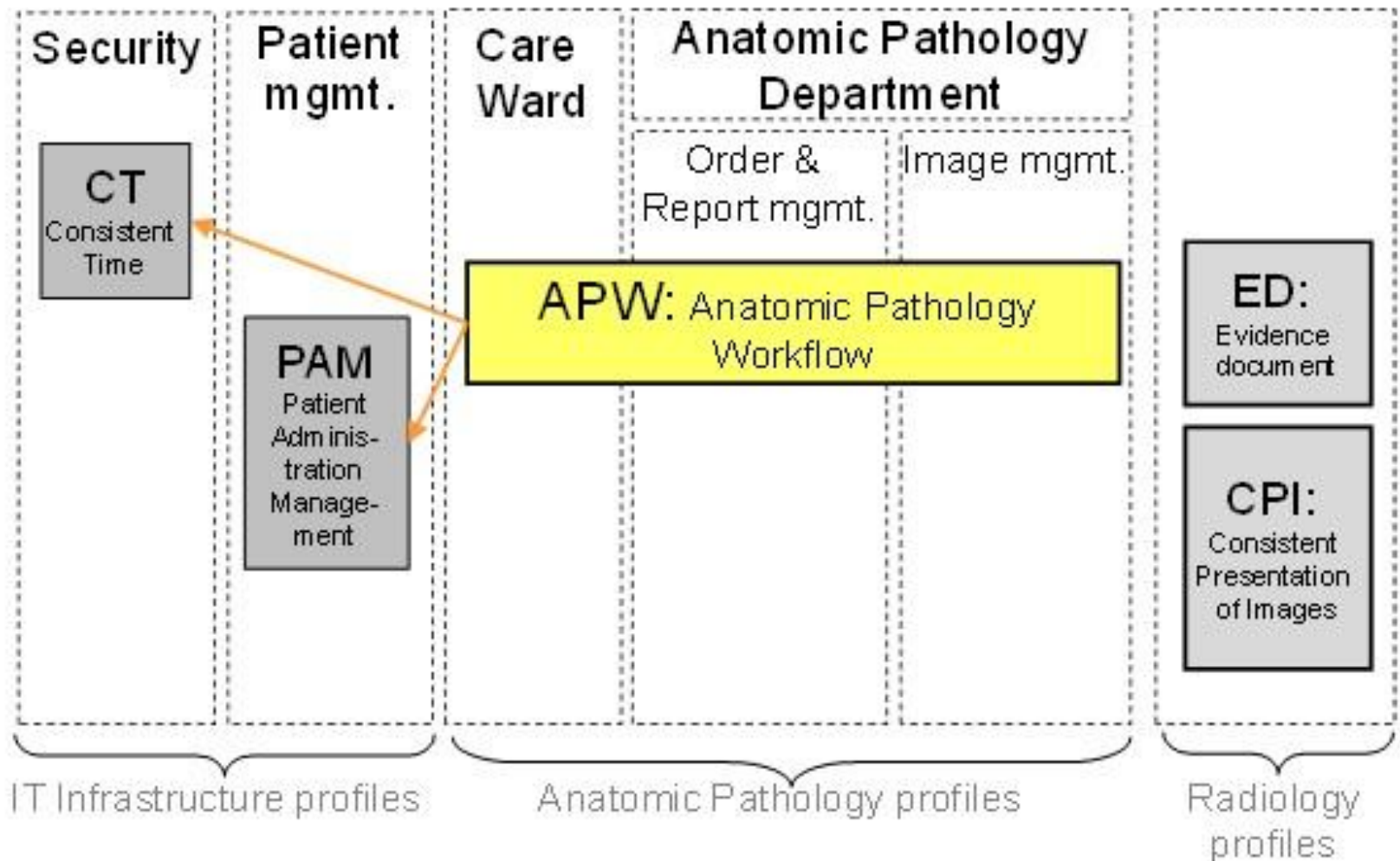


Figure 2.1-1: Anatomic Pathology Workflow (APW)

APW profile dependencies



HL7 & DICOM standard versions used

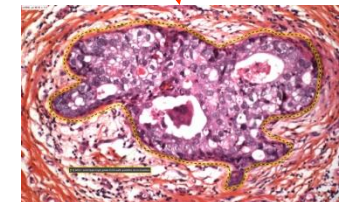
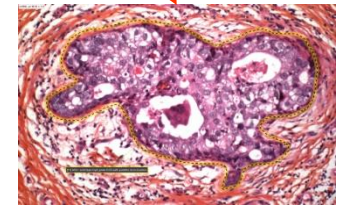
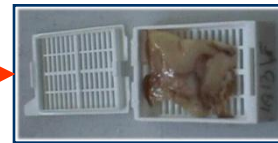
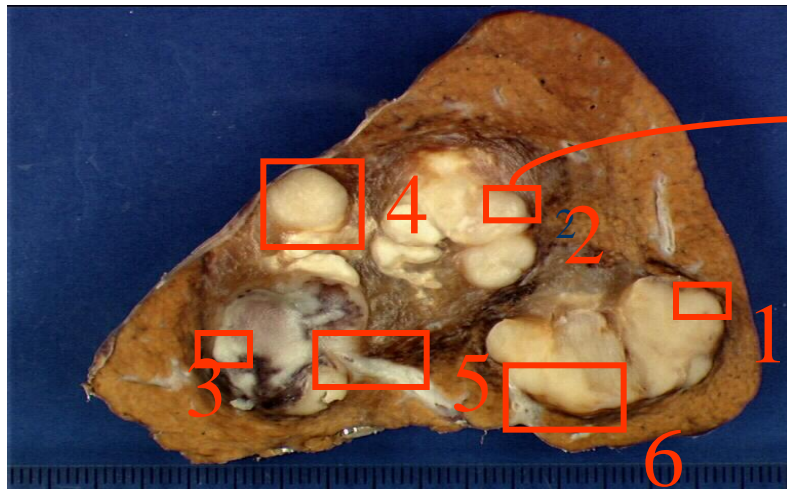
- **HL7 v2.5**

- PAT-1, 2 & 4 : OML^O21/ORL^O22
- PAT 3 : ORU^R01 + report

- **DICOM**

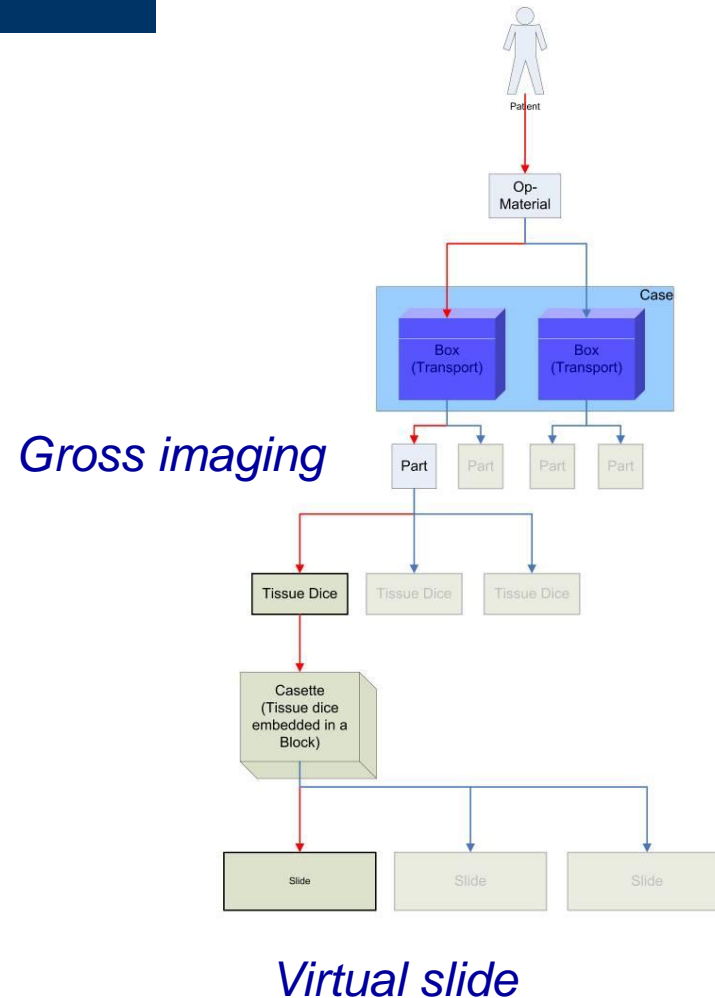
- PAT 5 : DICOM 2003 PS 3.4: Modality Worklist SOP Class (PAT-5)
- RAD 8, 10, 43
 - DICOM 2007 PS 3.4: Storage Service Class
 - DICOM 2007 PS 3.4: Storage Commitment Push Model SOP Class
- RAD 14, 16 : DICOM 2007 PS 3.4: Query/Retrieve Service Class
- **Supplément 122 : Specimen Identification and Revised Pathology SOP Classes**

Specimen tracking across the sampling process



Specimen tracking

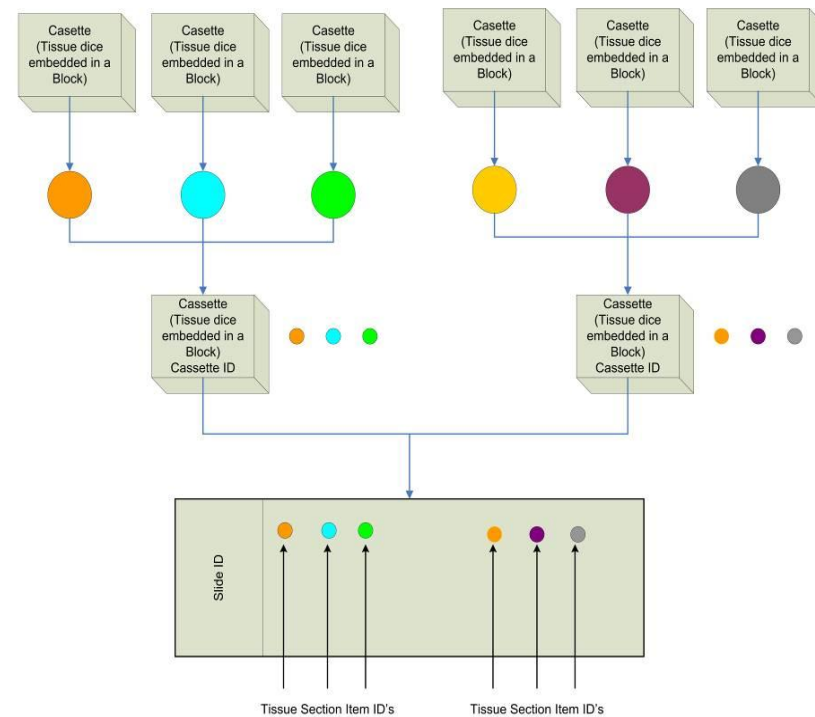
- **DICOM supp122 (public comments version)**
 - IHE, HL7
- **Specimen tracking across systems**
- **Applicable to each use case**
 - Specimen can be identified by containers' ID



Specimen tracking

- Specimen can **NOT** be identified by containers' ID

- TMA : More than one tissue from different blocks and **different patients** tissue item (spots) per slide.

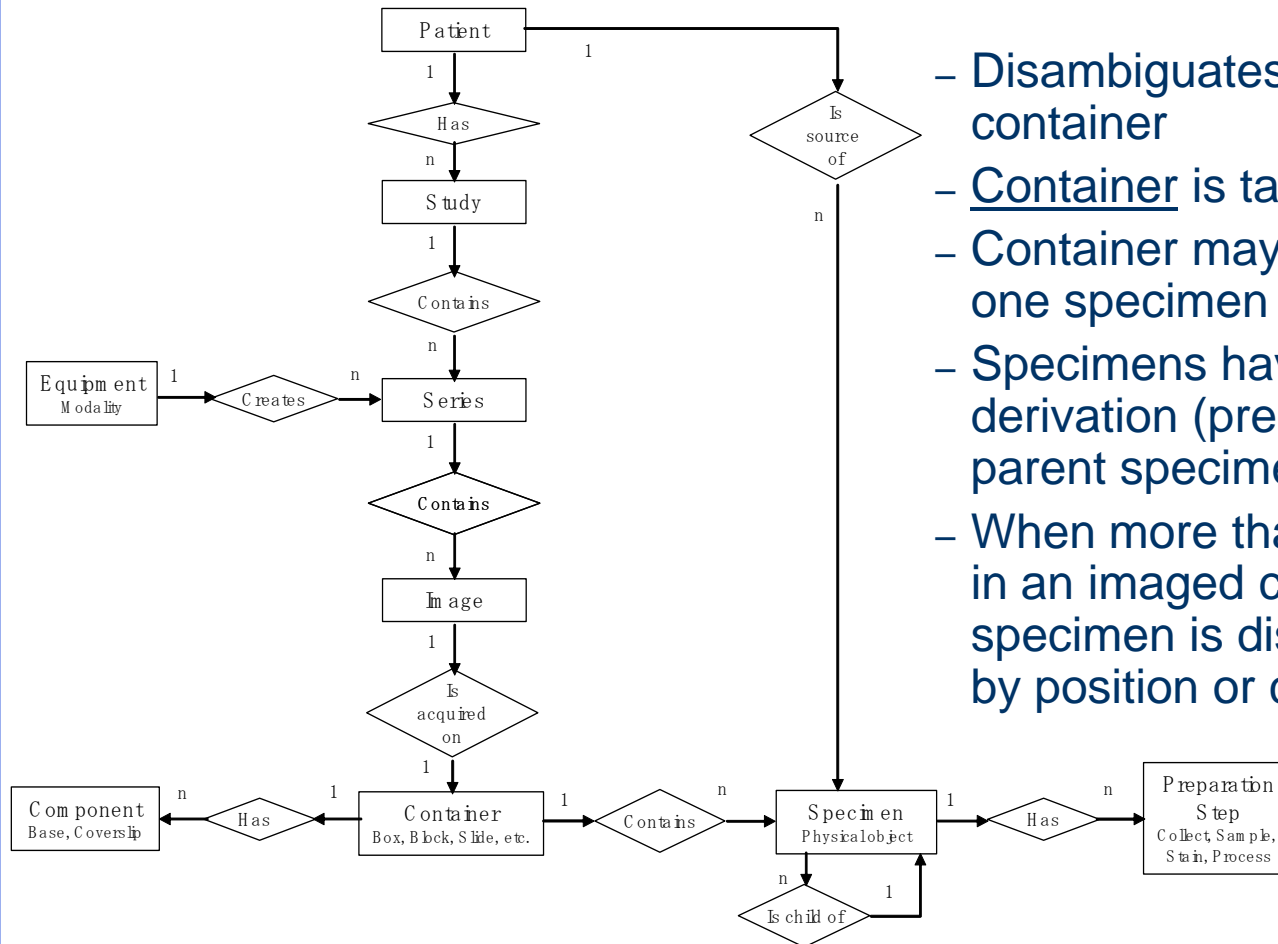


Specimen tracking across standards

- **Three parallel efforts : IHE-pathology, DICOM WG 26,HL7 Anatomic Pathology Special Interest Group**
 - Yet distinct, each with its own purpose and organizational context
- **Aligned**
 - **One** specimen model established in common across both standards.

IHE/HL7/DICOM Specimen imaging model

DICOM Sup 122 Specimen Identification



- Disambiguates specimen and container
- Container is target of image
- Container may have more than one specimen
- Specimens have a physical derivation (preparation) from parent specimens
- When more than one specimen in an imaged container, each specimen is distinguished (e.g., by position or color-coding)

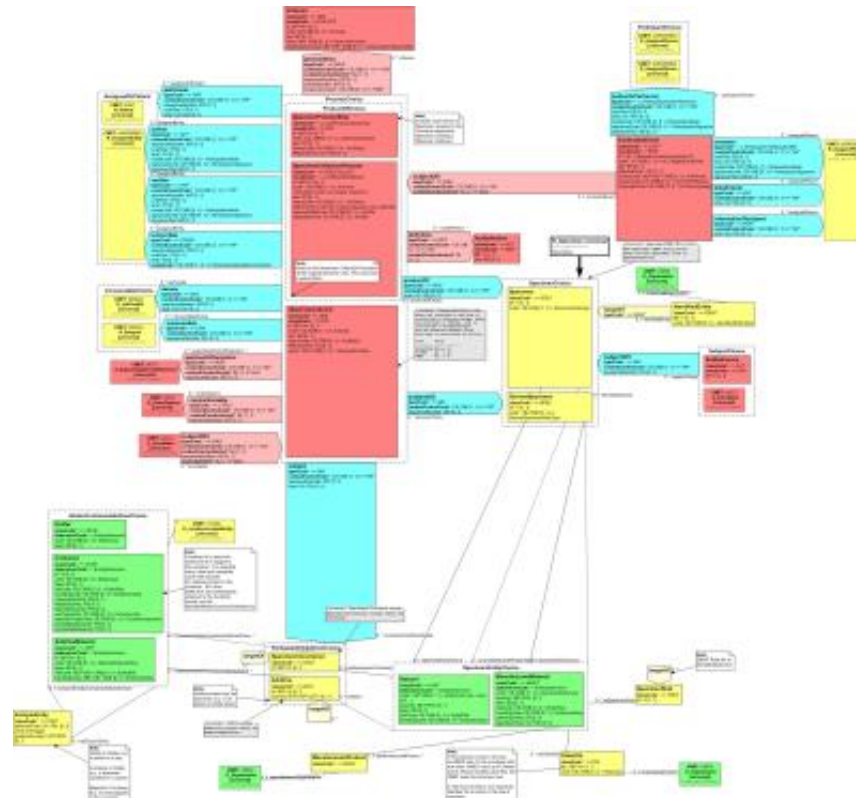
IHE/HL7/DICOM Specimen model

DICOM Sup 122 Specimen Identification

- **Final Text adoption 2008**
- **Support for pathology lab workflow, specimen-based imaging**
 - Gross specimens, blocks, vials, slides
 - Image-guided biopsy samples
- **Robust new Specimen Module at image level of hierarchy**
 - Identification, processing history
 - May be used with current Visible Light image object definitions
- **Update to Modality Worklist to allow Specimen Module**
 - Enables automated slide scanning devices to fully populate header
- **Update to Modality Performed Procedure Step to identify imaged specimen**
 - Allows LIS to track images for specimens
- **45 new concepts added to SNOMED**

IHE/HL7/DICOM Specimen model

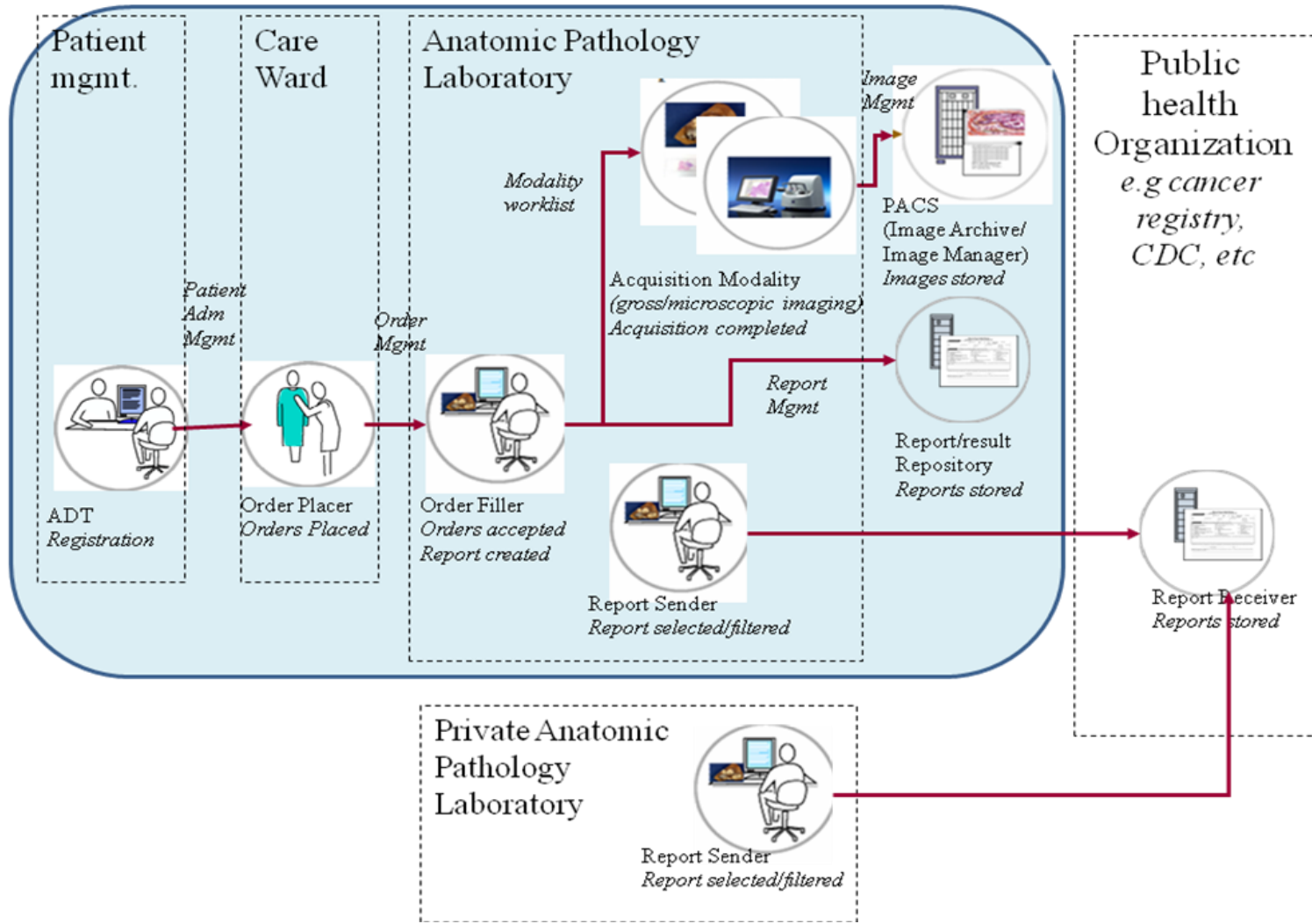
- R_Specimen universal (COCT HD080000UV) /R_Specimen minimal (COCT HD080100UV)



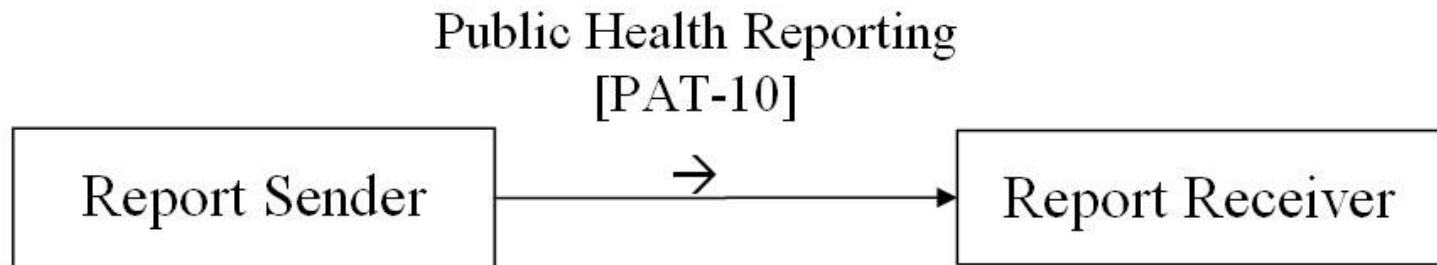
Reporting Anatomic pathology to public health repositories (ARPH)

- **Addressed by the 2009-10 cycle**
- **Scope**
 - defines the actors and transactions involved in anatomic pathology reporting to public health organizations.
- **Expected outcomes**
 - *make it easier for anatomic pathology laboratories, public health agencies, and software vendors to adopt a uniform method for report or data transmission and processing*
 - *facilitate international electronic reporting of anatomic pathology data in public health domain.*

Reporting Anatomic pathology to public health repositories (ARPH)



ARPH actors & transactions



Standards Used

- **HL7 v2.5**
 - ORU^R01 message (PAT-10)
- **Reference terminologies**
 - LOINC, SNOMED CT, ICD-10
- **Inputs from**
 - NAACCR* Standards for Cancer Registries Volume V: Pathology Laboratory Electronic Reporting v3.0
 - NAACCR Search Term List

Further steps

Structured reporting in AP

- **Objective**

- Analysis of national initiatives for standardizing Anatomic Pathology structured reports
 - e.g CAP Cancer Checklists (US), SFP templates (France)
- Choice of the IT format to store and share structured reports in anatomic pathology

- **Standards & Systems**

- HL7 v2;5
- HL7 CDA
- HL7 v3 : Domains Laboratory, Specimen, Observation
- DICOM SR

- **Implementation guides**

Further steps

- **Structured reporting in AP**
 - Objective
 - Analysis of national initiatives for standardizing Anatomic Pathology structured reports
 - e.g CAP Cancer Checklists (US), SFP templates (France)
 - Choice of the IT format to store and share structured reports in anatomic pathology
 - Standards & Systems
 - HL7 v2;5
 - HL7 CDA
 - HL7 v3 : Domains Laboratory, Specimen, Observation
 - DICOM SR
 - Implementation guides
 - IHE content profile (XDS integration profile)

Further step

- **Enhanced imaging workflow**
 - Whole slide image
 - DICOM worklist
 - Image display
 - Specific specimen-based image queries & browsing processes in PACS/Image

Further step Enhanced imaging workflow

WEB1000

Etude | Miniature | Afficher | Compte rendu | Conférence

WEB1000 🔍

Emplacement | Date | Modalité | Critère de recherche 3 | Critère de recherche 4 | Critère de recherche 5

Mémoire cache Web | Aujourd'hui | CR

Recherche par nom | IRM de la semaine | Echo de la semaine | Scanner de la semaine

	Nom du patient	Id patient	No d'entrée	Mo.	Date de l'étude	Heure de l'étude	Description de l'étude	Images	Etat de l'e...	Etat de l'imag...
	LAMOUREUX, HELENE	0706315131	0603892650	CR	14 juin 2006	00:06:21	FRXVPLIT	2		
	FOUILLARD, GILLES	0999439236	06038927090							
	YAPO, STEPHANE	0706316359	06038928090							
	SIMON, ANTOINE	0706316361	92508821050							
	KUREMSZI, CSABANE	0706316360								
	KUREMSZI, CSABANE	0706316360	92508817050							
	KUREMSZI, CSABANE	0706316360	92508816050							
	BITOUN, YVES	0706308266	92508828050							
	RAKOTOMALALA, FARA ONI...	0504176254	06038930050							
	LEBAIGLE, MICHEL	0403169931	06038931050							
	LACOSTE, EDOUARD	0099491342								
	CAMPANA, REGIS	0706316369	06038933050							
	ROVELLA, JULIEN	0706316368								
	KOENG, PIERRE	0099398304	92508835050							
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Recherche annulée

Démarrer | Microsoft Outlook Web Ac... | Web

WEB1000

Etude | Miniature | Afficher | Compte rendu | Conférence

DESIMEUR, CLAUDE

Série Images sélectionné... Description de la série

1	0/94	SANS INJECTION	
2	0/735	ARTERIEL PORTAL	
3	0/4	Séries Smart Prep	
4	0/18	AVV electronic film	

Affichage de miniatures

Id. utilisateur : tech2928, Equipe

Démarrer | Microsoft Outlook Web Ac... | Web1000 Login - Microsof... | Micro

WEB1000

Etude | Miniature | Afficher | Compte rendu | Conférence

DESIMEUR, CLAUDE

SANS INJECTION | ARTERIEL PORTAL

Scanogramme : Premier Ecran

S90

R 2 6 5

Browsing tool

SERIES IMAGES

SE 3 DESIMEUR, CLAUDE
IM 185 ACCESF 9249669050
0706306507
25.janv.-1934
0721
M

ARTERIEL PORTAL VASVAREINV
W: 400, C: 40
MAG: 45%
LOSSLESS: HEQP

P192

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0721
M

ARTERIEL PORTAL VASVAREINV
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MAG: 45%
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P192

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P192

Affichage d'images...

Id. utilisateur : tech2928, Equipe : unrestricted_team

web-41 00:07

Démarrer | Microsoft Outlook Web Ac... | Web1000 Login - Microsof... | Microsoft PowerPoint - [P... | WEB1000

19:06

Further steps

- **Patient care**

- Connection to automatons
- Integrating pathology information systems & biobanking

- **Research**

- Integrating digital pathology to networked research (HL7/CDISC)
- Image repositories & tissue banks

More information

IHE Anatomic Pathology - Users

- **France**
 - ADICAP (Association for the Development of Informatics in Cytology and Pathology), SFP (French Society of Pathology)
- **Spain**
 - SEIS (Spanish Society of Health Informatics), SEAP (Spanish Society of Pathology), SESCAM, Servicio de Salud de Castilla-La Mancha
- **Germany**
 - Charité Universitätsmedizin Berlin
- **Italy**
 - Udine University
- **US/Canada**
 - CAP, NAACCR (North American Association of Central Cancer Registries)
- **Japan**
 - IHE-Japan

More information

IHE Anatomic Pathology - Vendors

- **Acquisition modalities**

- Tribvn/Aperio, Zeiss, VMScope, Hamamatsu, Aurora

- **LIS**

- Technidata, Infologic, Satec, Isoft, Nexus, Paschmann GMBH

- **PACS Vendors**

- Agfa, GE, ETIAM

- **EHR**

- Medasys

More information

- **Googlegroup : ihe-anatomic-pathology-committee@googlegroups.com**
- **Road map & change proposals**
 - [http://wiki.ihe.net/index.php?title=Anatomic Pathology](http://wiki.ihe.net/index.php?title=Anatomic_Pathology)

The screenshot shows the IHE Anatomic Pathology wiki page. The page title is "Anatomic Pathology". The main content area contains a paragraph describing the initiative and a "Contents (hide)" table of contents with 7 items. The page also features a navigation sidebar on the left, a search box, and a toolbox. The IHE logo is visible in the top left corner of the page content.

IHE

Log in / create account

article | discussion | edit | history

Anatomic Pathology

IHE Anatomic Pathology addresses information sharing, workflow and patient care in Pathology, including anatomical pathology.

IHE Anatomic Pathology is sponsored by the Organization for the Modernization of French Hospital Information Systems (GMSIH) [↗](#), the French Association for the Development of Informatics in Pathology (ADICAP), the Spanish Health Informatics Society (SEIS) [↗](#), the Spanish Society of Pathology (SEAP) [↗](#), the French Society of Pathology (SFP) [↗](#). It manages the Pathology Profiles and the Pathology Technical Framework.

Contents (hide)
1 How to participate
2 Timeline - 2008-2009 Development Cycle
3 Roadmap
4 Current Activity
4.1 Profile Selection
5 Demonstrations & Presentations
6 Supporters and Endorsements
7 See Also

The aim is to extend the IHE initiative to anatomic pathology laboratories, their information, automation, imaging systems and equipments.

The scope of the anatomic pathology includes surgical pathology, biopsies pathology, cytopathology, autopsies, and related techniques (immunohistochemistry, molecular pathology, etc).

Information systems in anatomic pathology laboratories gather medical data (text, images, etc) throughout specimen management from specimen reception to report editing. The diagnostic process in anatomical pathology (figure 1) differs from that in the clinical laboratory since it relies on image interpretation. It also differs from that in radiology since it is specimen-driven and when digital imaging is performed many types of imaging equipments (gross imaging, microscopic still imaging, whole slide imaging, multispectral imaging, etc) may be involved for a single examination. Moreover, images of the same study may be related to different specimen (parts and/or slides) from one or even different patients (e.g Tissue

navigation

- Main Page
- Technical Frameworks
- Domains
- Committees
- Process
- Implementation
- International
- Recent changes
- Help

search

Go Search

toolbox

- What links here
- Related changes
- Upload file
- Special pages

- **Thank you for your attention**
- **Any questions?**

Christel DANIEL

Christel.daniel@spim.jussieu.fr