



C O M V I E W  
MEDICAL SYSTEMS

What's New: DICOM in 2001

# What's New in DICOM in 2001 ?

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*Development Director, Imaging Products*

*ComView Corporation*



## What's New: DICOM in 2001

### Added in 2000 Printed Standard

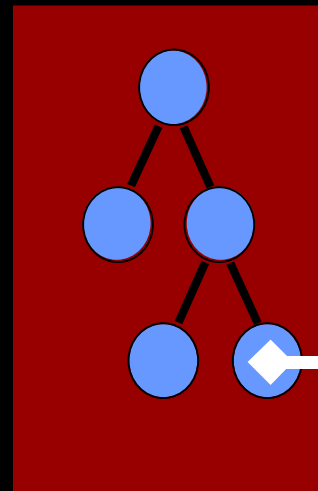
- Sup 23: Structured Reporting
- Sup 30: Waveform
- Sup 31: Network Security
- Sup 33: Softcopy Presentation State
- 42 Correction Items, including:
  - JPEG-LS, Thai & Korean, timezones, case insensitive name queries



## What's New: DICOM in 2001

# Sup 23: Structured Reporting

```
(0x0040,0xa491) <COMPLETE>  
(0x0040,0xa493) <VERIFIED>  
(0x0040,0xa730) Content Sequence  
(0x0040,0xa010) <HAS OBS CONTEXT>  
(0x0040,0xa040) <PNAME >  
(0x0040,0xa043) Concept Name Code Sequence  
(0x0008,0x0100) <000555>  
(0x0008,0x0102) <LNdemo>  
(0x0008,0x0104) <Recording Observer>  
(0x0040,0xa123) <Smith^John^^Dr^ >  
...
```



*Hierarchical structure, codes, image references*



## What's New: DICOM in 2001

# Headings, Findings, Images, Codes

**Chest X-ray Report:**

**Recording Observer:** Clunie^David^A^Dr.

**History:** malignant melanoma excised 1Y

**Findings:**

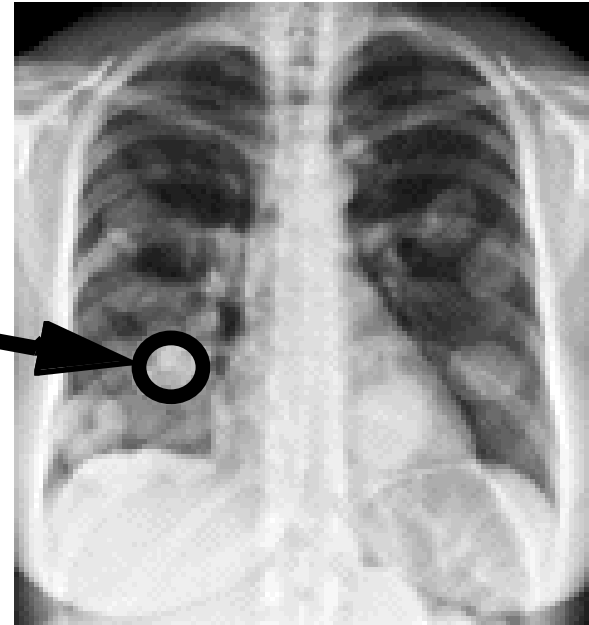
- finding: multiple masses in both lung fields
- best illustration of findings:

**Conclusions:**

- conclusion: cannon-ball metastases
- conclusion: recurrent malignant melanoma

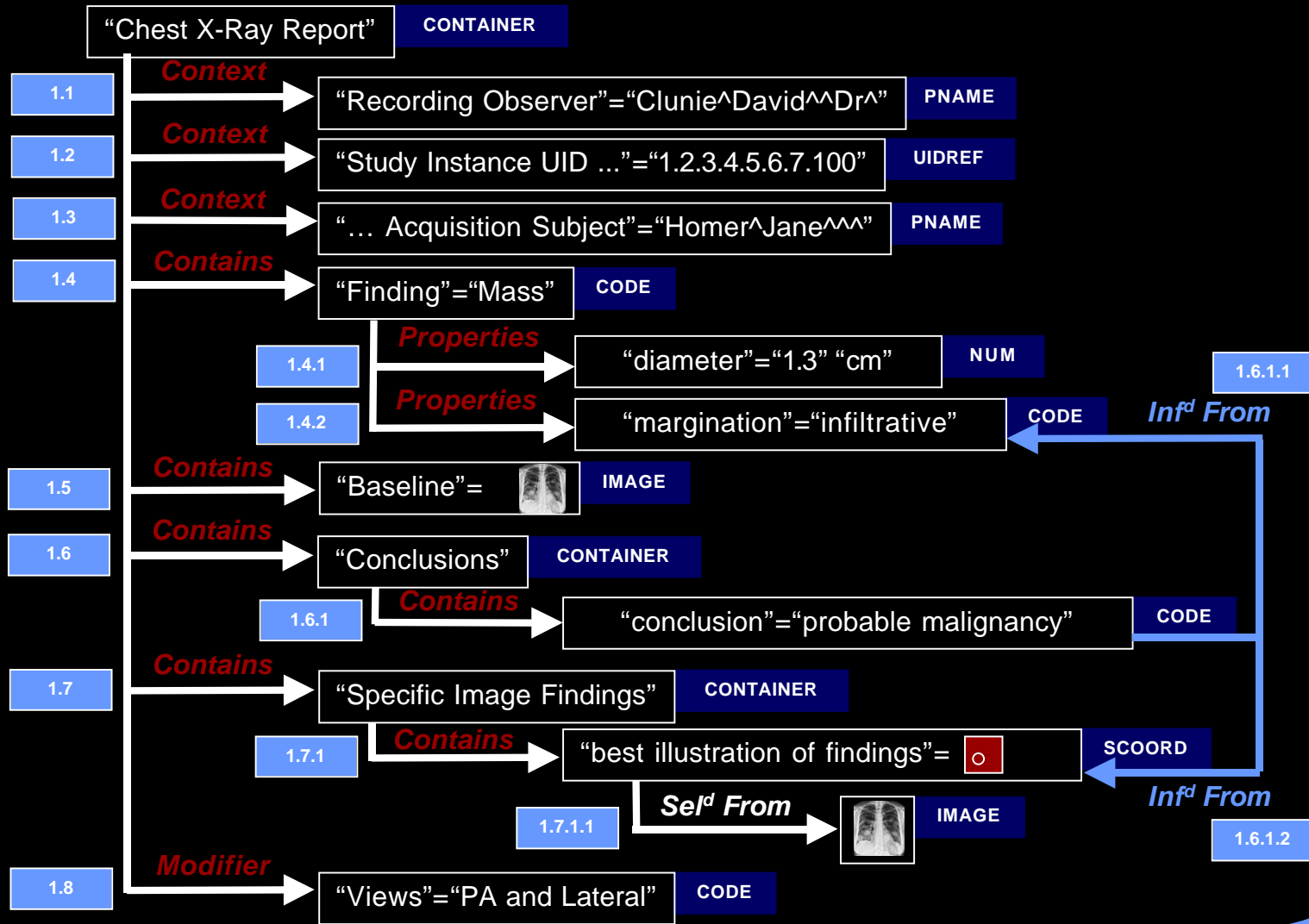
**Diagnosis Codes:**

- diagnosis: 172.9/ICD9
- diagnosis: 197.0/ICD9





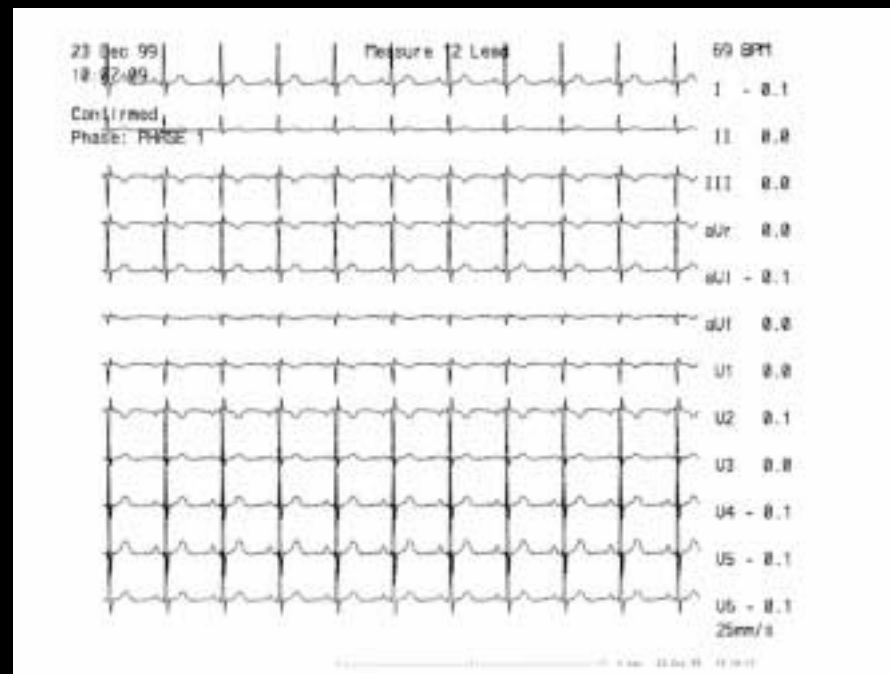
# What's New: DICOM in 2001





## What's New: DICOM in 2001

# Sup 30: Waveform

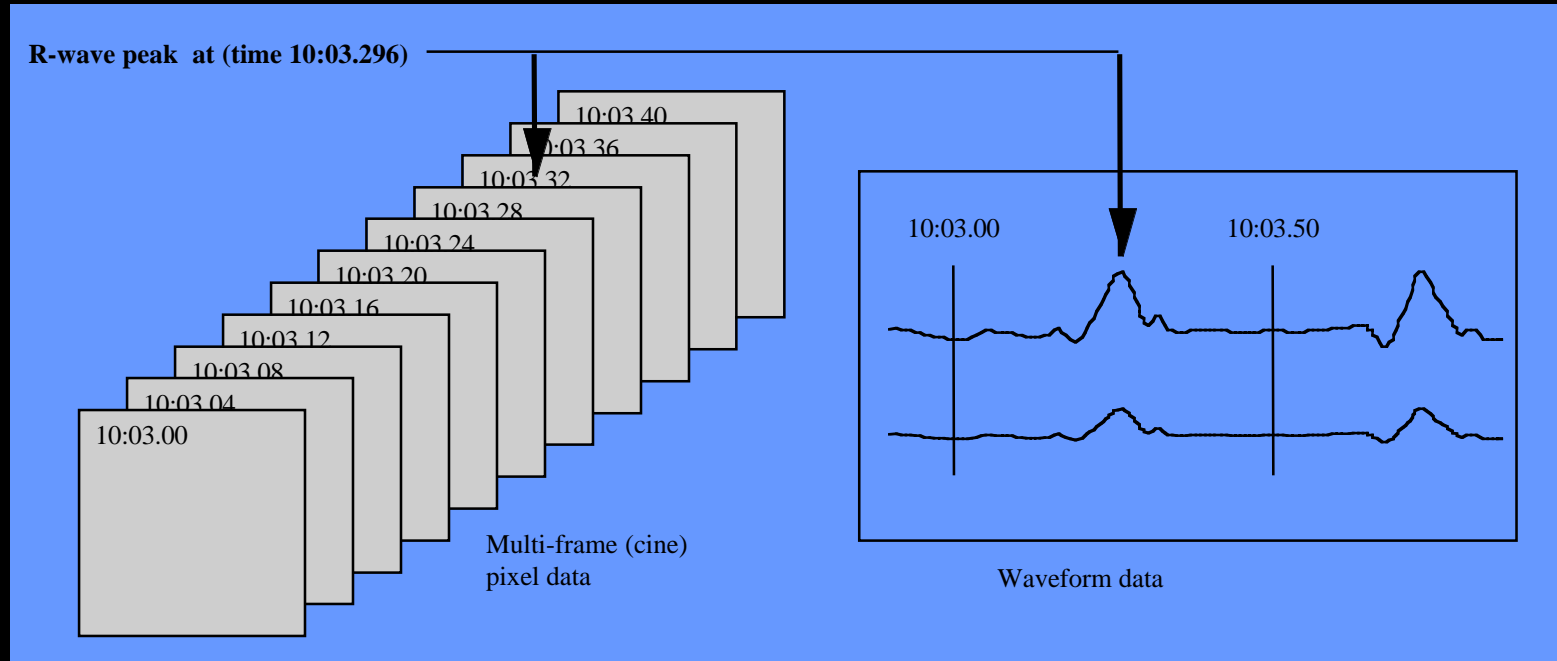


*ECG, Hemodynamic and Voice Waveforms*



## What's New: DICOM in 2001

# Sup 30: Waveforms



*Image-related waveforms with synchronization*



## What's New: DICOM in 2001

### Sup 31: Network Security

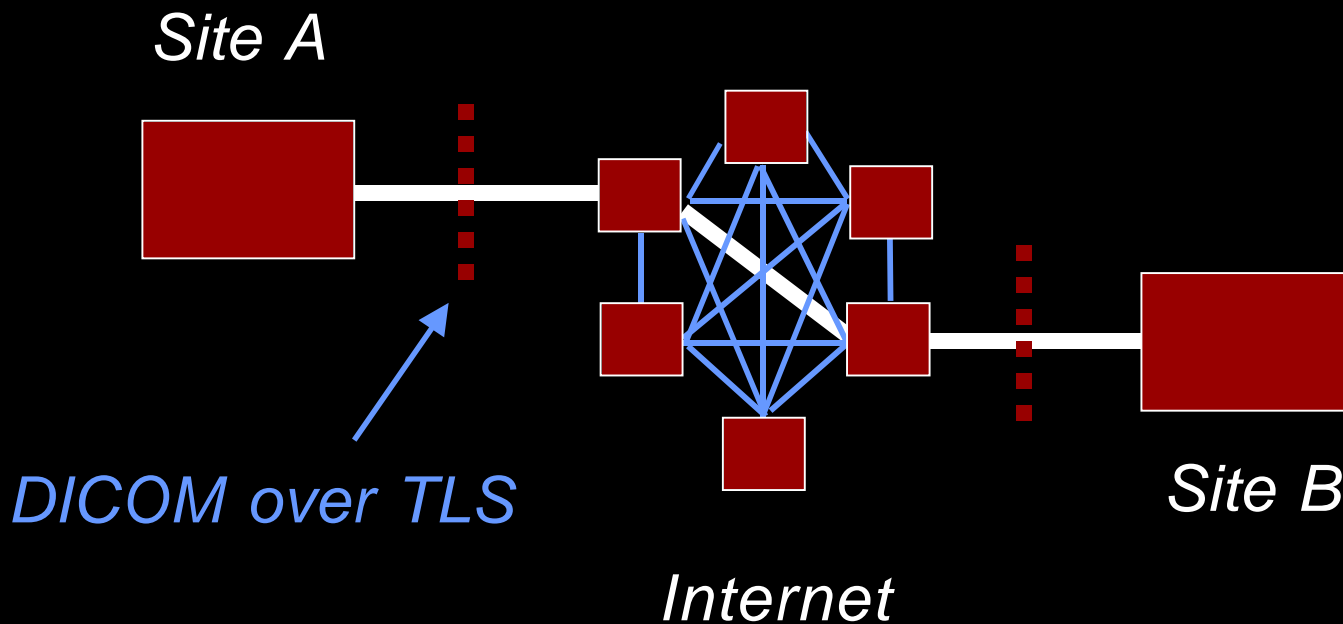
- Use TLS (SSL) or ISCL
- Provides:
  - Confidentiality (bulk encryption)
  - Peer authentication (device or human)
- Layer between DICOM and TCP/IP





What's New: DICOM in 2001

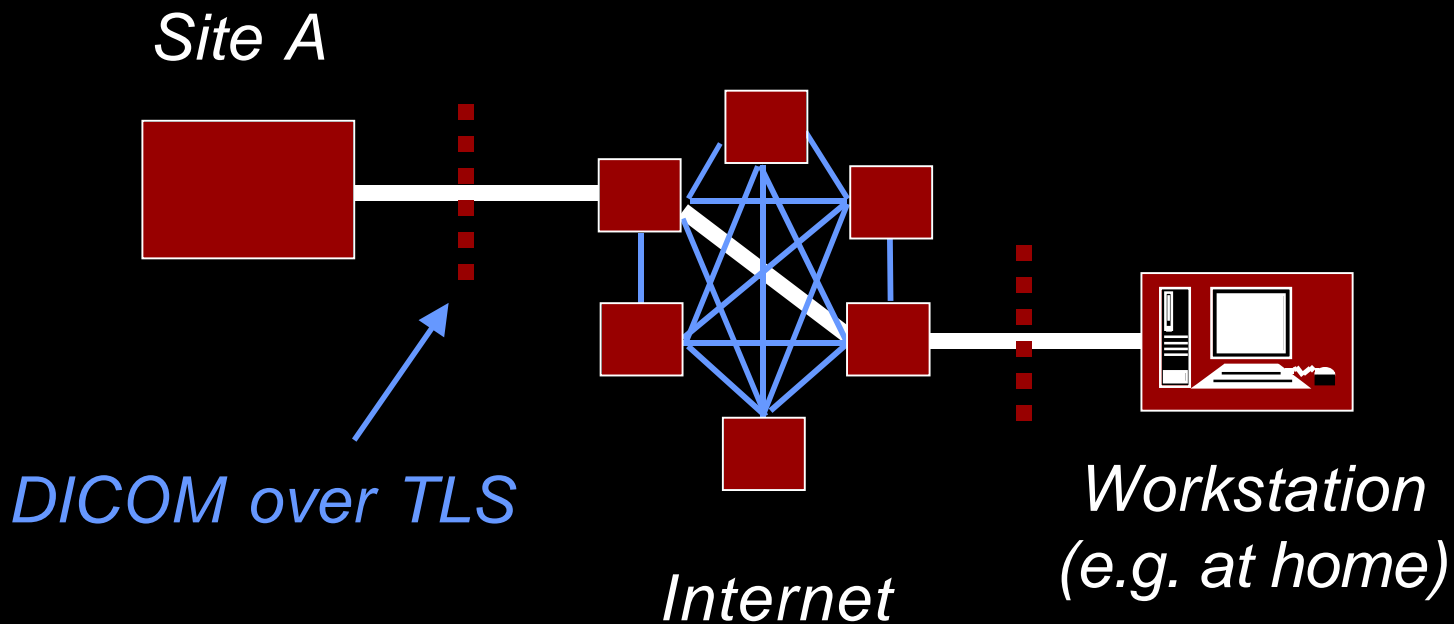
# Sup 31: Network Security





# What's New: DICOM in 2001

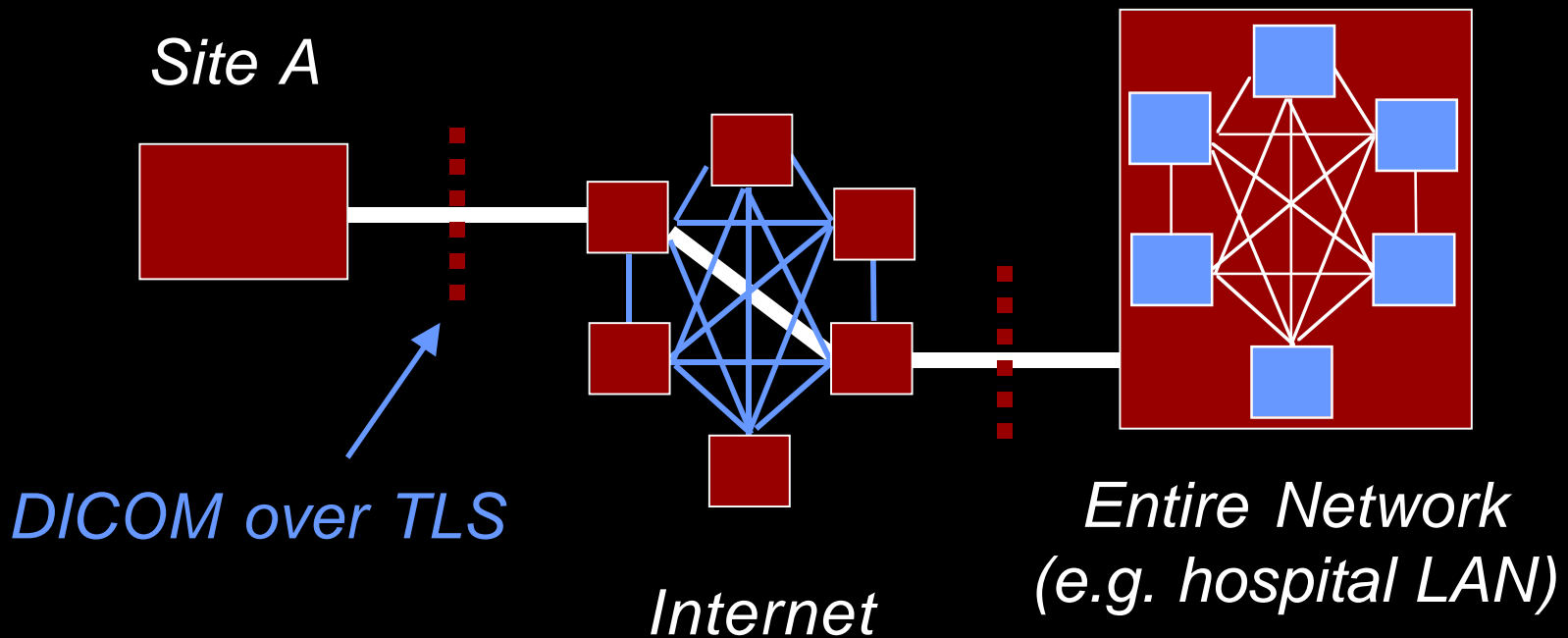
## Sup 31: Network Security





# What's New: DICOM in 2001

## Sup 31: Network Security





## What's New: DICOM in 2001

### Sup 33: Presentation State

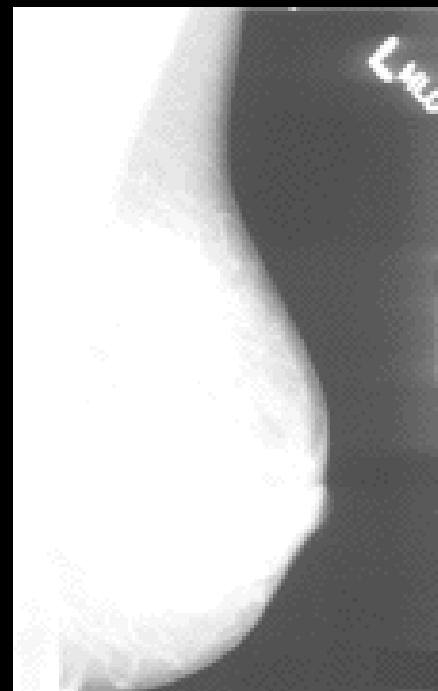
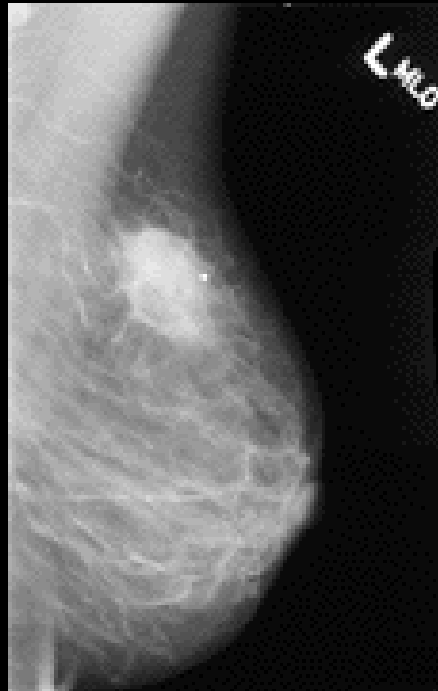
- Grayscale single & multi-frame images
- Grayscale transformation pipeline
  - Rescale, Window, P-Values
- Grayscale Standard Display Function
- Spatial transformations
- Display and print

*Consistent appearance regardless of device*



## What's New: DICOM in 2001

# Importance of Presentation State





## What's New: DICOM in 2001

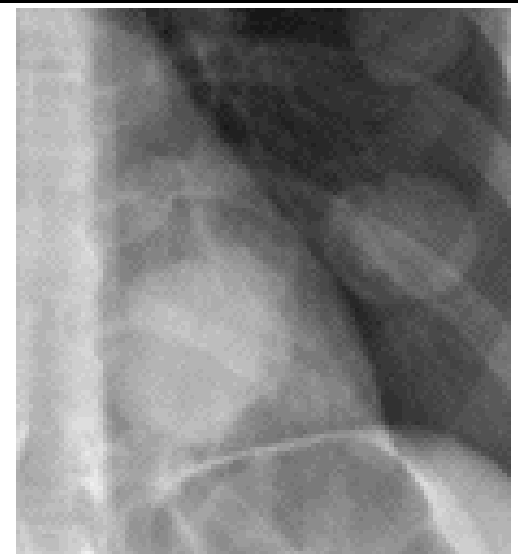
# Importance of Presentation State



Original is wrong way  
around



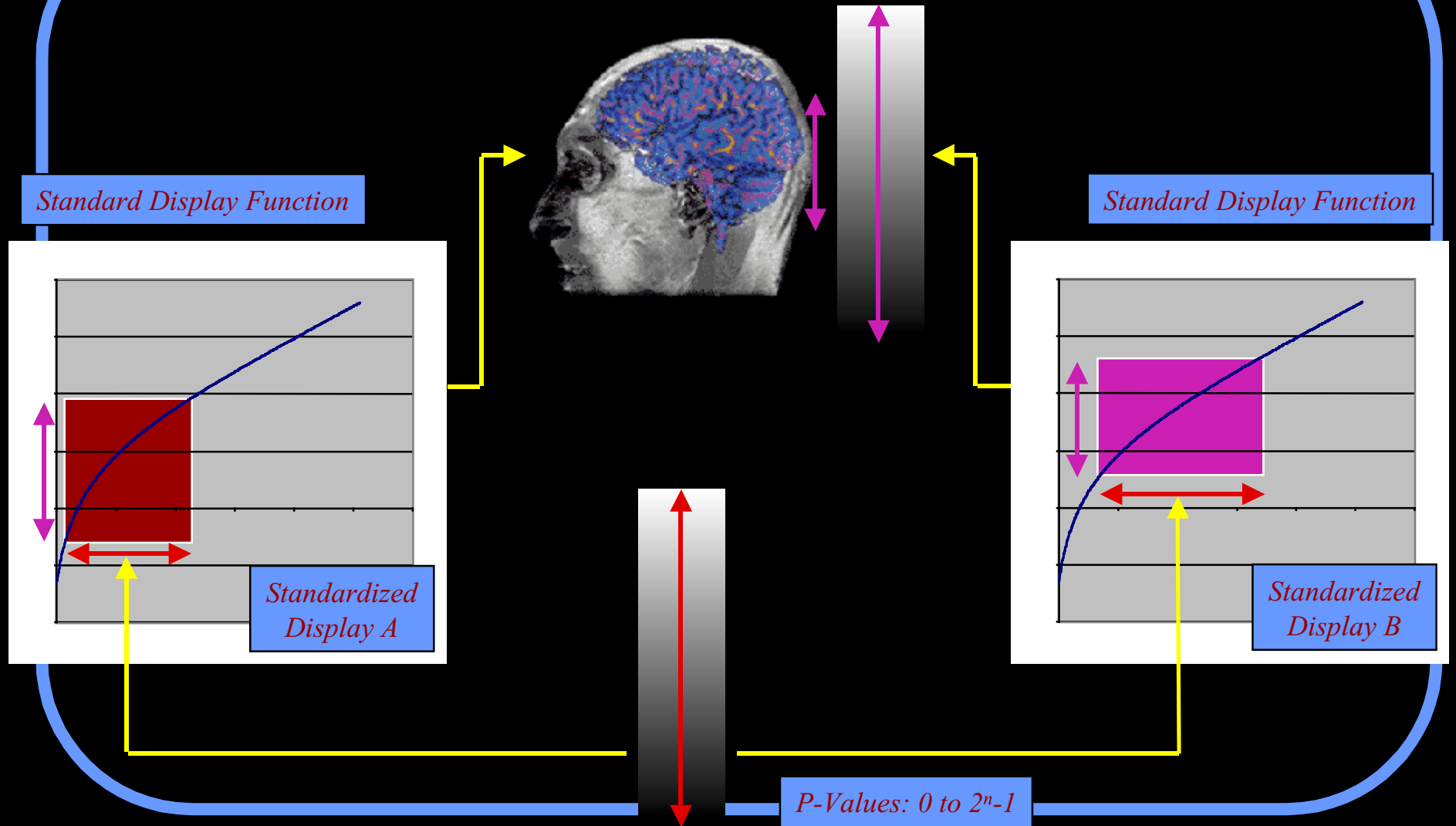
Apply horizontal flip to  
correct orientation



Show retrocardiac mass by  
zoom/crop/adjust contrast



# What's New: DICOM in 2001





## What's New: DICOM in 2001

### Final Text since 2000 Printed

- Sup 52: General Purpose Worklist
- Sup 54: MIME Content Type





## What's New: DICOM in 2001

### Sup 52: General Purpose Worklist

- Success of Modality WL & PPS
  - Schedule work
  - Consistent demographics & identifiers
  - Work status
- Workflow management for steps beyond acquisition
  - e.g. interpretation, QC, 3D, CAD



## What's New: DICOM in 2001

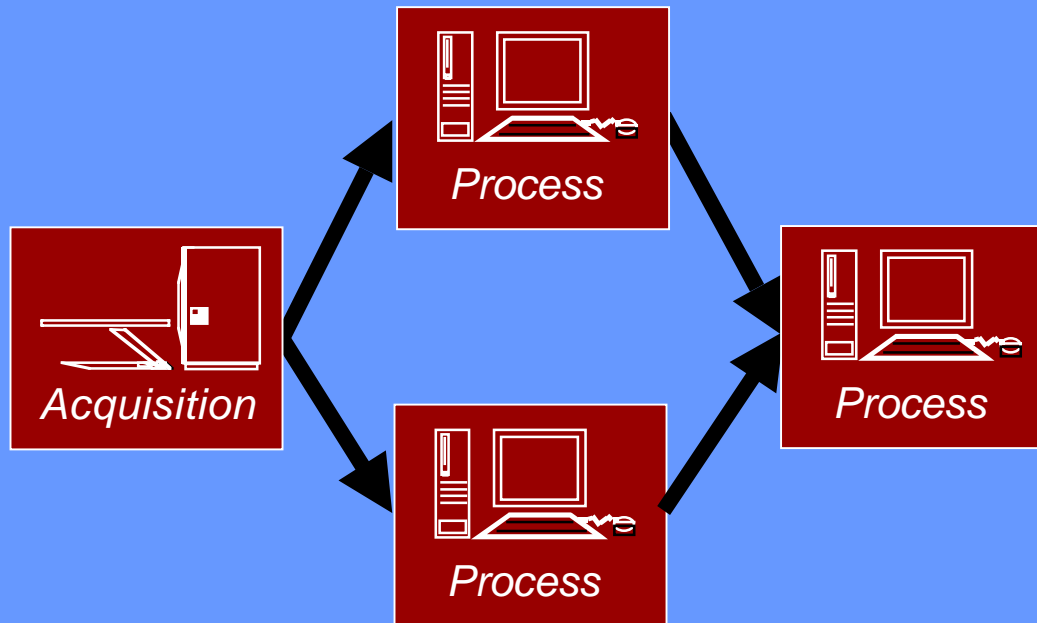
# Workflow Management





## What's New: DICOM in 2001

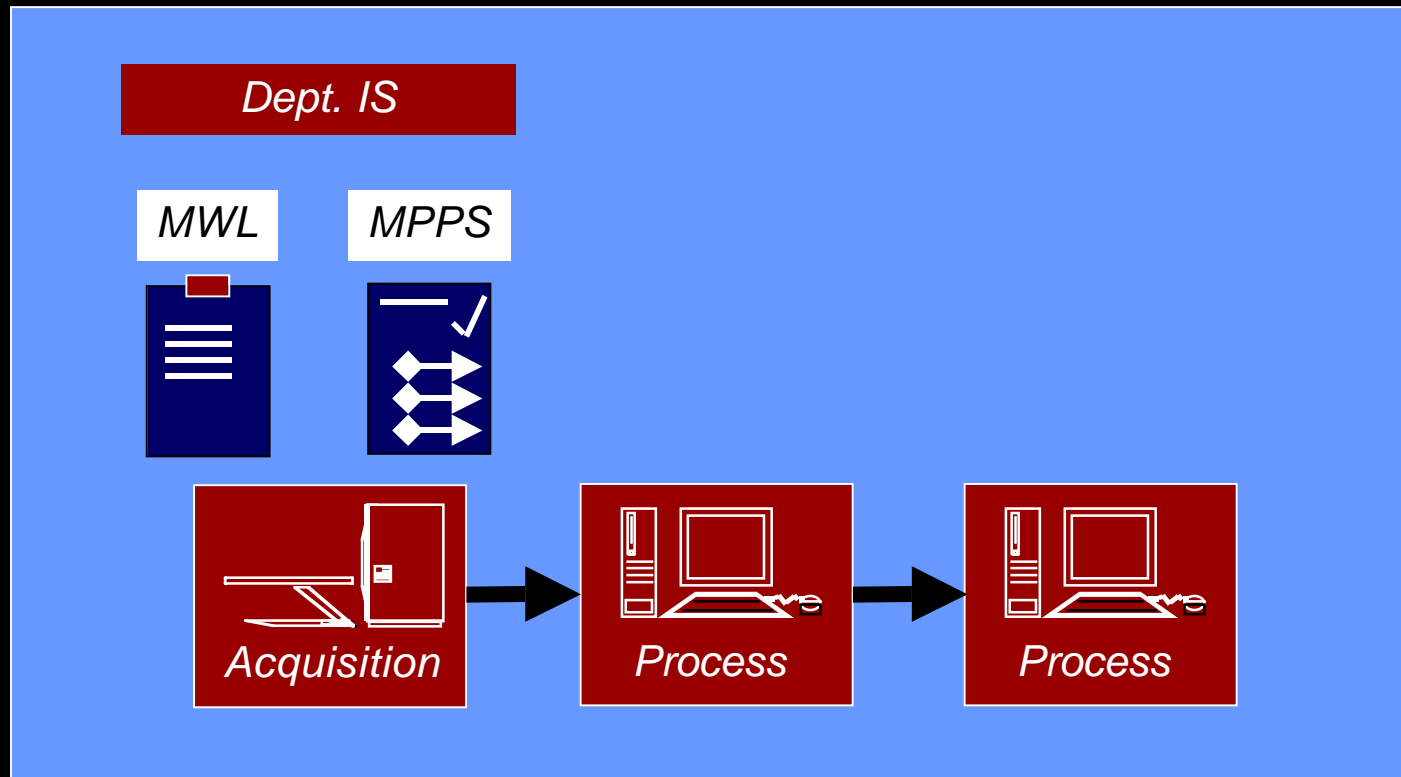
# Workflow Management





## What's New: DICOM in 2001

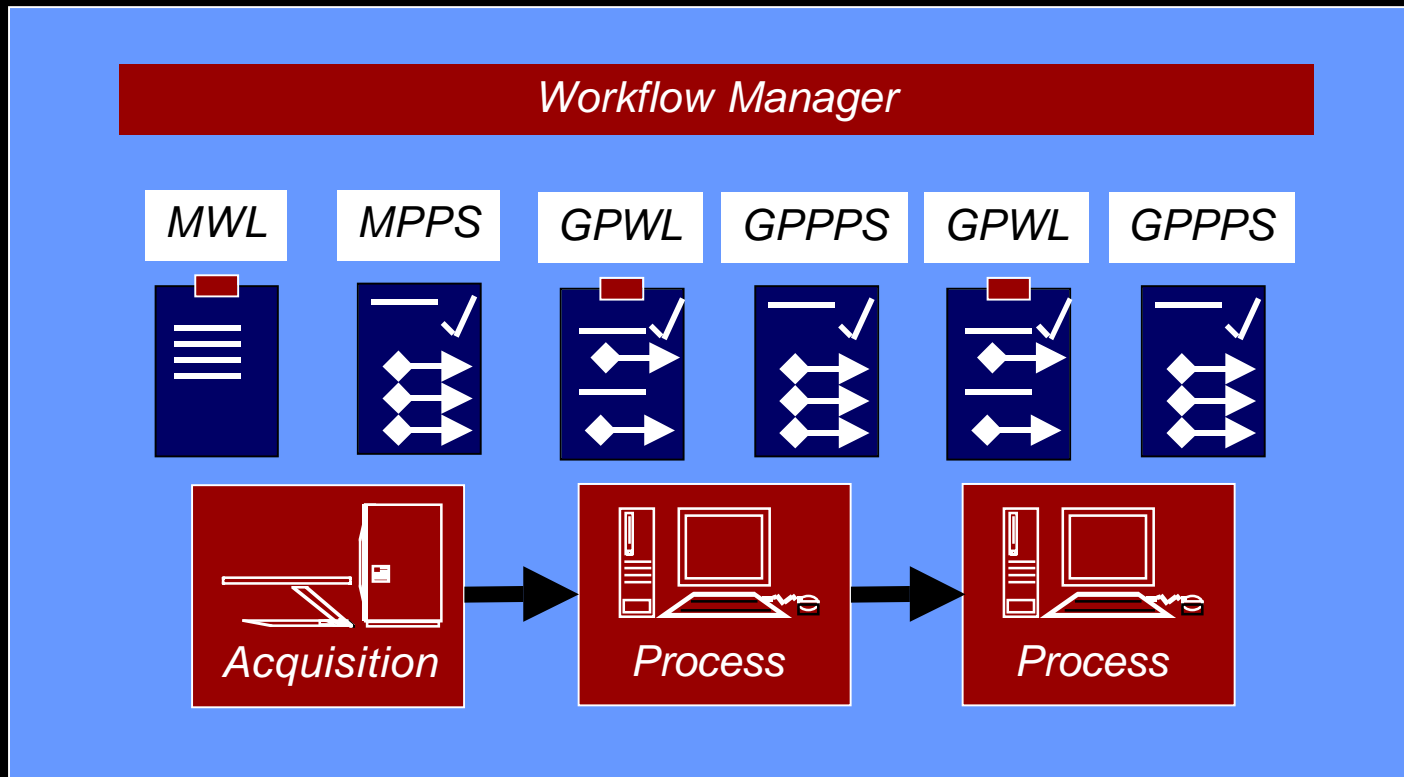
# Workflow Management





# What's New: DICOM in 2001

## Workflow Management





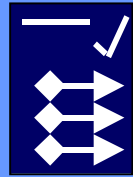
## What's New: DICOM in 2001

# Workflow Management

MWL



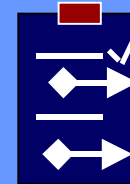
MPPS



GPWL:

- *Persistent*
- *State*
- *Input list*
- *Coded tasks*

GPWL



GPPPS





## What's New: DICOM in 2001

### Examples of Worklist Tasks

- Image Processing
- Quality Control
- Computer Aided Diagnosis/Detection
- Interpretation
- Transcription
- Report Verification
- Print



## What's New: DICOM in 2001

### Sup 54: MIME Content Type

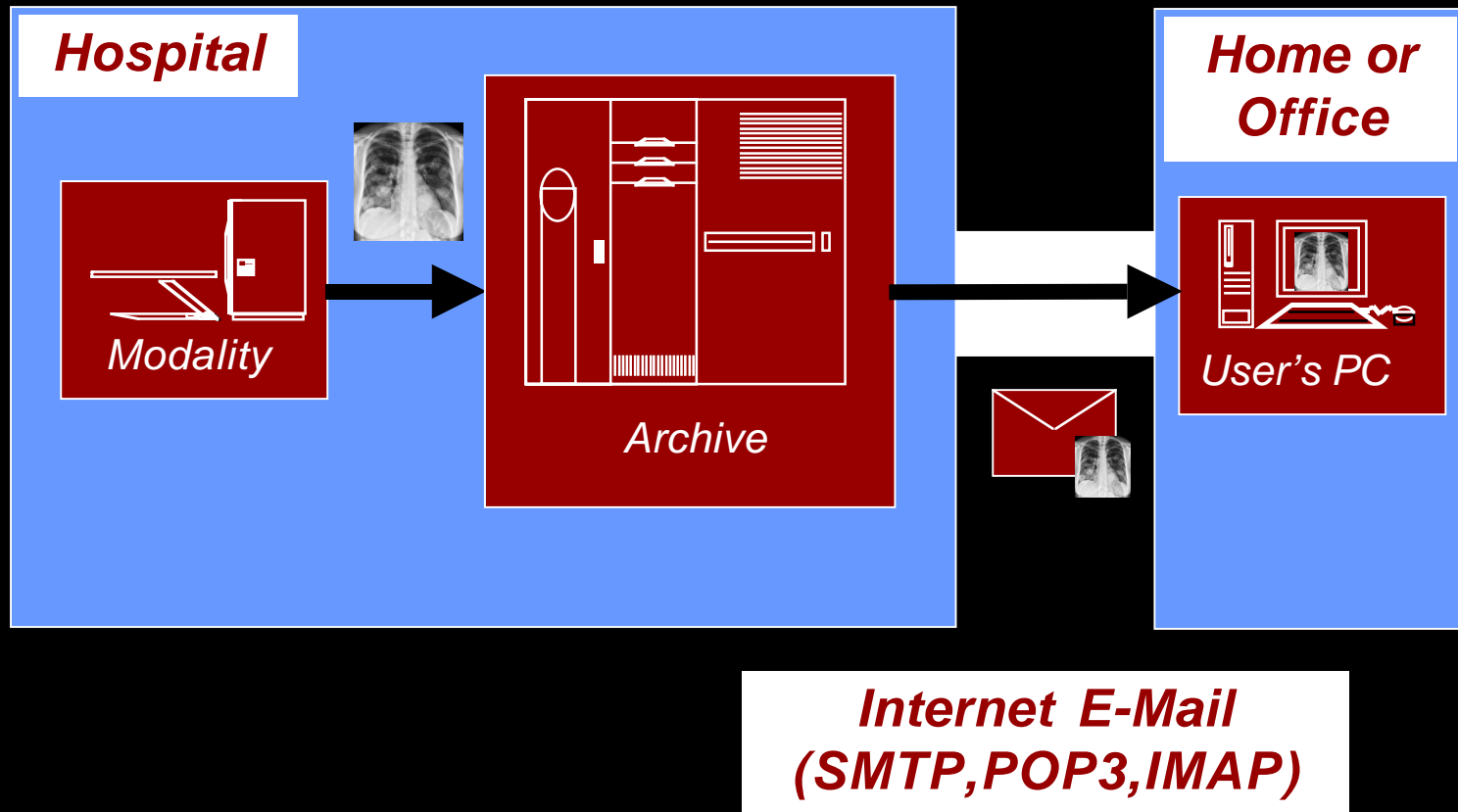
- Internet standard for:
  - E-mail attachments
  - Web content identification
- Standard “content type” allows
  - Recognition of content
  - Spawn appropriate helper app or plug-in
- “application/dicom”





# What's New: DICOM in 2001

## DICOM E-mail Attachments





## What's New: DICOM in 2001

### Currently out for Letter Ballot

- Sup 50: Mammography CAD
- Sup 53: Content Mapping Resource
- Sup 57: Revised Secondary Capture
- Sup 59: Key Object Selection



## What's New: DICOM in 2001

### Sup 50: Mammography CAD

- Specific form of Structured Report
- Encodes:
  - types of findings (masses, calcifications)
  - locations on referenced images
  - derived findings
  - temporal change
- Codes derived from ACR BI-RADS



## What's New: DICOM in 2001

# Sup 53: Content Mapping Resource

- Codes
  - formalization of Dean Bidgood's SNOMED-DICOM Micro-glossary
  - lists of codes, definitions, translations
- Templates
  - for structured reports
  - for acquisition context (e.g. waveform)



## What's New: DICOM in 2001

# Sup 53: Content Mapping Resource

- Codes
  - SNOMED: e.g. "T-04000" "Breast"
  - LOINC: e.g. "11528-7" "Radiology Report"
  - UCUM: e.g. "mm" "millimeter"
  - ISO 639: e.g. "fr" "French"
  - ISO 5218: e.g. "F" "female"
  - DICOM: e.g. "110002" "Quality Control"



## What's New: DICOM in 2001

# Sup 53: Content Mapping Resource

- Templates for structured reports
  - for entire document:
    - TID 2000: basic diagnostic imaging report
  - for reusable “patterns” within documents:
    - TID 1001: observation context
    - TID 1204: language of content item
    - TID 1350: negation modifier
    - TID 1400: linear measurement

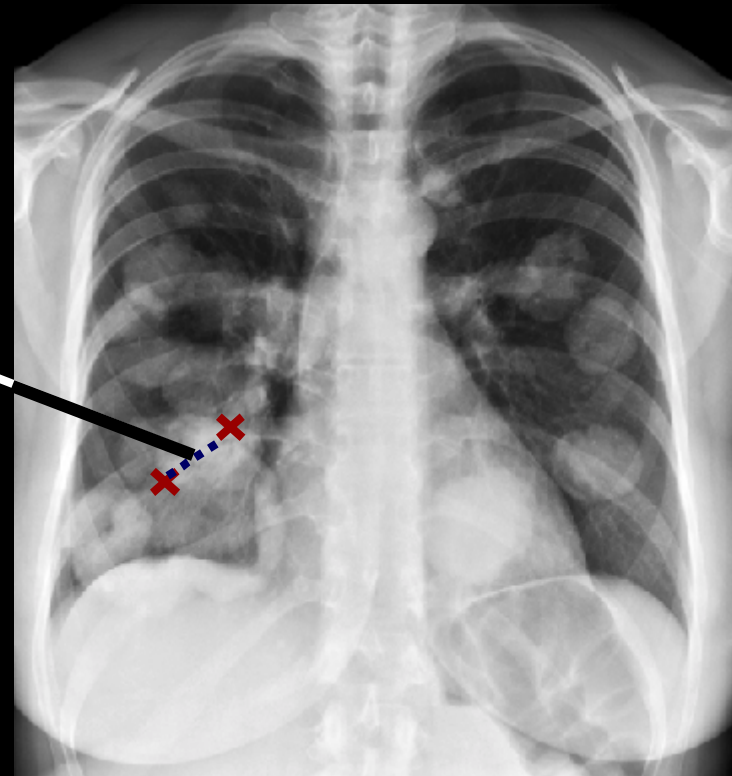


## What's New: DICOM in 2001

# TID 1400: Linear Measurement

width=13.5 millimeter

> *inferred from*





## What's New: DICOM in 2001

# TID 1400: Linear Measurement

	NL	Relationship with Parent	Value Type	Concept Name	VM	Type	Condition	Value Set Constraint
1			NUM	DCID(7470) Linear Measurements	1	M		UNITS=DCID(7460)
2	>	INFERRED FROM	SCCOORD	(xxx050,DCM,"Path")	1	M		
3	>>	R-SELECTED FROM	IMAGE		1	MC	XOR Row 3	
4	>>	SELECTED FROM	IMAGE		1	MC	XOR Row 4	





## What's New: DICOM in 2001

# TID 1400: Linear Measurement

*has properties* NUM: (G-A220,SNM3,"width")=

13.5 (mm,UCUM,"millimeter")

>*inferred from* SCOORD: (xxx055,DCM,"path")

POLYLINE (122.1,34.6,123.7,39.2)

>>*selected from* IMAGE: UID 1.2.3.4.548758.327493



## What's New: DICOM in 2001

### Sup 59: Key Object Selection

- Based on IHE “key image note”
- Specific, simple, SR SOP Class
- Idea is to “select” one or more objects from a larger set (study or series) and flag them as somehow interesting
- Composite objects, not just images:
  - waveforms, reports, RT plans, etc.



## What's New: DICOM in 2001

# Key Object Document Titles

- ¥ Of Interest
- ¥ Rejected for Quality Reasons
- ¥ For Referring Provider
- ¥ For Surgery
- ¥ For Teaching
- ¥ For Conference
- ¥ For Therapy
- ¥ For Patient
- ¥ For Peer Review
- ¥ For Research
- ¥ Quality Issue



## What's New: DICOM in 2001

### Sup 57: Revised Secondary Capture

- Existing Secondary Capture object has
  - no constraints on Photometric Interpretation, especially grayscale vs. color
  - no constraints on bit depth
  - poor support for 1 bit
  - no support for scanned document concepts like pages
  - no multi-frame capability



## What's New: DICOM in 2001

### Sup 57: Revised Secondary Capture

- New family of multi-frame SOP Classes stratified by bit depth, photometric interpretation:
  - 1 bit MONOCHROME2 single component
  - 8 bit unsigned grayscale MONOCHROME2 & VOI LUT to P-Values
  - 9-16 bit unsigned grayscale MONOCHROME2 & VOI LUT to P-Values
  - 8 bit per channel color-by-pixel RGB



## What's New: DICOM in 2001

# Sup 57: Revised Secondary Capture

- scanned (multi-page) documents
- frame grab acquisitions
- screen shots
  - from grayscale with windowing intact
  - from true or indexed color
- sets of synthesized images
  - pan around 3D reconstructions (multi-frame movies)



## What's New: DICOM in 2001

### Currently out for Public Comment

- Sup 49: Multi-frame MR Image
- Sup 51: Media Security
- Sup 55: Attribute Level Confidentiality



## What's New: DICOM in 2001

### Other Work in Progress

- Sup 40: DVD Media
- Sup 56: Ultrasound Waveform
- Sup 58: Multi-frame CT Image
- Sup 60: Hanging Protocols
- Sup 61: JPEG 2000 Transfer Syntax