

DICOM SR

DICOM Structured Reporting and templates

Herman Oosterwijk,
OTech Inc.
Connectivity training and consulting
www.otechimg.com



SPIE 2001 slide A 1 -1

DICOM SR

Agenda:

- **SR structure**
- **SR templates**

- **(Note: D. Clunie's book (www.pixelmed.com) is an excellent source)**



SPIE 2001 slide A 1 -2

DICOM SR

Structured Reporting:

Why yet another way of encapsulating reports ?

- **HL/7 has limited context information**
- **No relationship and/or references to DICOM Waveforms, Images, Presentation States)**
- **No structure present (reqd for CAD)**
- **Not very suitable for outcome measurements**
- **No tagging clinically significant images with context information**



SPIE 2001 slide A 1 -3

DICOM SR

Structured Reporting examples:

- **CT/MR: Text, selected images, spatial coordinates; “after exam”**
- **Ultrasound: Measurements; “during exam”**
- **CAD: machine generates output: mammography, lung nodule detection, etc.**
- **Endoscopy: Observations; “during exam”**



SPIE 2001 slide A 1 -4

DICOM SR

Structured Reporting examples Cath Lab:

- 1 **Procedure Log:** time-stamped record of all events that occur during a procedure.
- 2 **Hemodynamics Report:** detail of scientific findings from waveforms and other measurements
- 3 **QCA/QVA Report:** analysis of the x-ray angiographic images
- 4 **Electrocardiography Report:** findings associated with an ECG
- 5 **Cardiac Cath Report:** overall clinical results of the catheterization procedure.

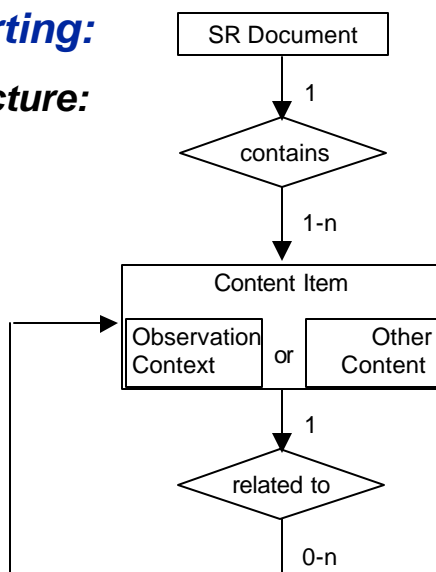


SPIE 2001 slide A 1 -5

DICOM SR

Structured Reporting:

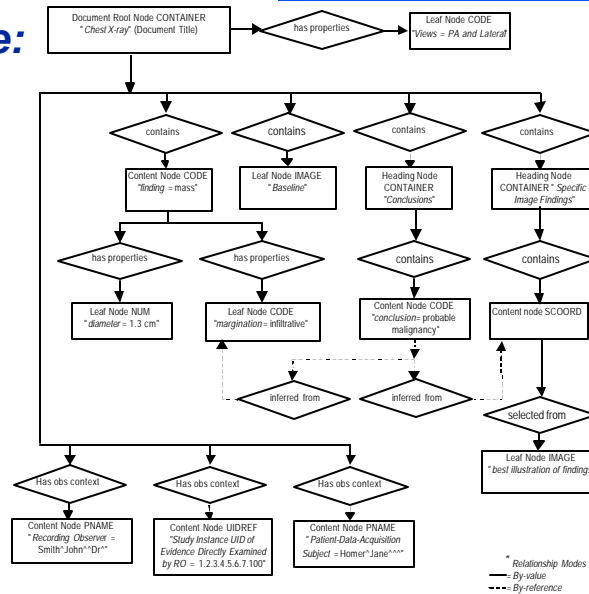
- **Nested tree structure:**



SPIE 2001 slide A 1 -6

DICOM SR

SR example:



Relationship Modes
 - By-value
 - - By-reference
 SPIE 2001 slide A 1 -7

DICOM SR

14 Structured Reporting Content Items:

- plain text
- numeric values
- codes
- dates and times
- dates
- times
- person names
- Unique Identifier references
- references to:
 - Images,
 - Waveforms
 - Composite Instances
- Spatial coordinates
- Temporal coordinates
- Containers of other items.



SPIE 2001 slide A 1 -8

DICOM SR

7 SR relationships; for example:

- **CONTAINS: Source Item contains Target Content Item.**
E.g.: CONTAINER "History" {CONTAINS: TEXT:
"mother had breast cancer"; CONTAINS IMAGE 36}
- **HAS OBS CONTEXT: Target Content Items shall convey any specialization of Observation Context needed for unambiguous documentation of the Source Content Item.**
E.g: CONTAINER: "Report" {HAS OBS CONTEXT:
PNAME:
"Recording Observer" = "Smith^John^^Dr^"}



SPIE 2001 slide A 1 -9

DICOM SR

A structure within the SR structure is needed, i.e. "templates" otherwise:

- **Almost infinite number of variations for SCU: makes it really hard for SCP**
- **Allow potentially straight forward XML conversion and/or generic/standard display formats**



SPIE 2001 slide A 1 -10

DICOM SR

How to create better compatibility:

1. Distinguish between SR SOP Classes:

- **Basic**
- **Enhanced**
- **Comprehensive**

2. Use Templates (TID xxx: DICOM part 16)

3. Generate new SOP Classes, requiring template support, which is a “specialization” of the SR SOP classes e.g.:

- **Mammography Computer-Aided Detection SR SOP Class (suppl 50)**



SPIE 2001 slide A 1 -11

DICOM SR

Key Object Note:

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Specimen Identification	C.7.1.2	C - Required if the Observation Subject is a Specimen
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
Series	KN Document Series	C.17.6.1	M
Equipment	General Equipment	C.7.5.1	M
Document	KN Document General	C.17.6.2	M
	SR Document Content	C.17.3	M
	SOP Common	C.12.1	M



SPIE 2001 slide A 1 -12

DICOM SR

Key Object Note:

KN DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Modality type. Enumerated Value: KN = Key Object Note
Series Instance UID	(0020,000E)	1	Unique identifier of the Series.
Series Number	(0020,0011)	1	A number that identifies the Series.
Referenced Study Component Sequence	(0008,1111)	2	Uniquely identifies the Performed Procedure Step SOP Instance for which the Series is created. Only a single Item shall be permitted in this sequence.

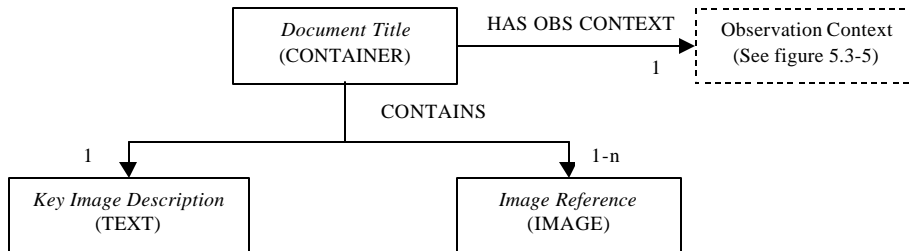


SPIE 2001 slide A 1 -13

DICOM SR

SR example

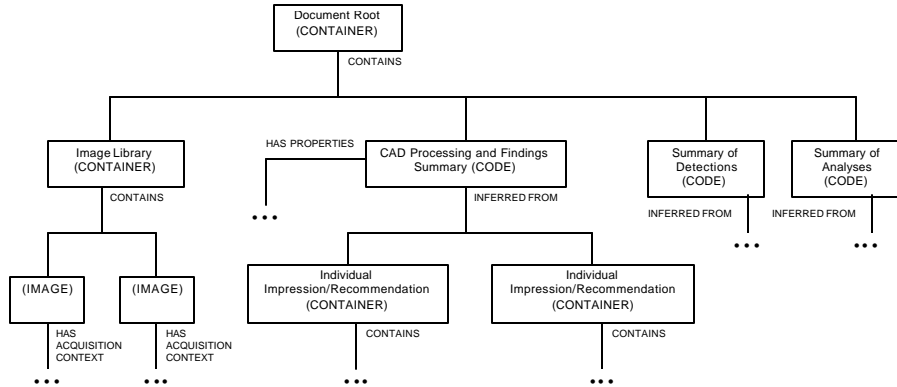
(Key Image-Object Note):



SPIE 2001 slide A 1 -14

DICOM SR

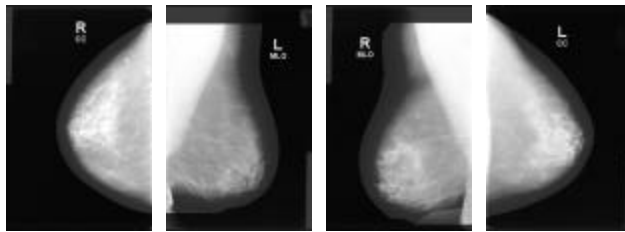
SR example (mammo):



SPIE 2001 slide A 1 -15

DICOM SR

Image Library (mammo):



Node	Code Meaning of Concept	Code Meaning or Example	TID
1	Mammography CAD Report		nnn1
1.1	Image Library		nnn1
1.1.1		IMAGE 1	nnn22
1.1.1.1	Image Laterality	Right	nnn22
1.1.1.2	Image View Code Sequence	Cranio-caudal	nnn22
1.1.1.3	Study Date	19980101	nnn22
1.1.2		IMAGE 2	nnn22
1.1.2.1	Image Laterality	Left	nnn22
1.1.2.2	Image View Code Sequence	Cranio-caudal	nnn22
1.1.2.3	Study Date	19980101	nnn22
1.1.3		IMAGE 3	nnn22



SPIE 2001 slide A 1 -16

DICOM SR

IHE report uses TID 2000:

NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set
		CONTAINER	BCID(7000) Diagnostic Imaging Report Document Titles	1	M		Root node
>	HAS CONCEPT MOD	CODE	EV (cv,csd,"Procedure reported")	1-n	U		
>	HAS CONCEPT MOD	INCLUDE	ETID(1204) Language of Content Item and Descendants	1	M		
>	HAS CONCEPT MOD	INCLUDE	ETID (1210) Equivalent Meaning of Concept Name	1-n	U		
>	HAS OBS CONTEXT	INCLUDE	ETID(1001) Observation Context	1	M		
>	CONTAINS	CONTAINER	BCID(7001) Diagnostic Imaging Report Headings	1-n	U		
>>	CONTAINS	CODE	BCID(7002) Diagnostic Imaging Report Elements	1-n	U		
>>	CONTAINS	TEXT	BCID(7002) Diagnostic Imaging Report Elements	1-n	U		
>>	CONTAINS	IMAGE	BCID(7003) Diagnostic Imaging Report Purposes of Reference	1-n	U		
>>	CONTAINS	INCLUDE	TID(1400) Linear Measurements	1-n	U		
>>	CONTAINS	INCLUDE	TID(1401) Area Measurements	1-n	U		
>>	CONTAINS	INCLUDE	TID(1402) Volume Measurements	1-n	U		



SPIE 2001 slide A 1 -17

DICOM SR

Comments/Questions:

herman@otechimg.com

www.otechimg.com has link to public source implementation and examples of SR



SPIE 2001 slide A 1 -18